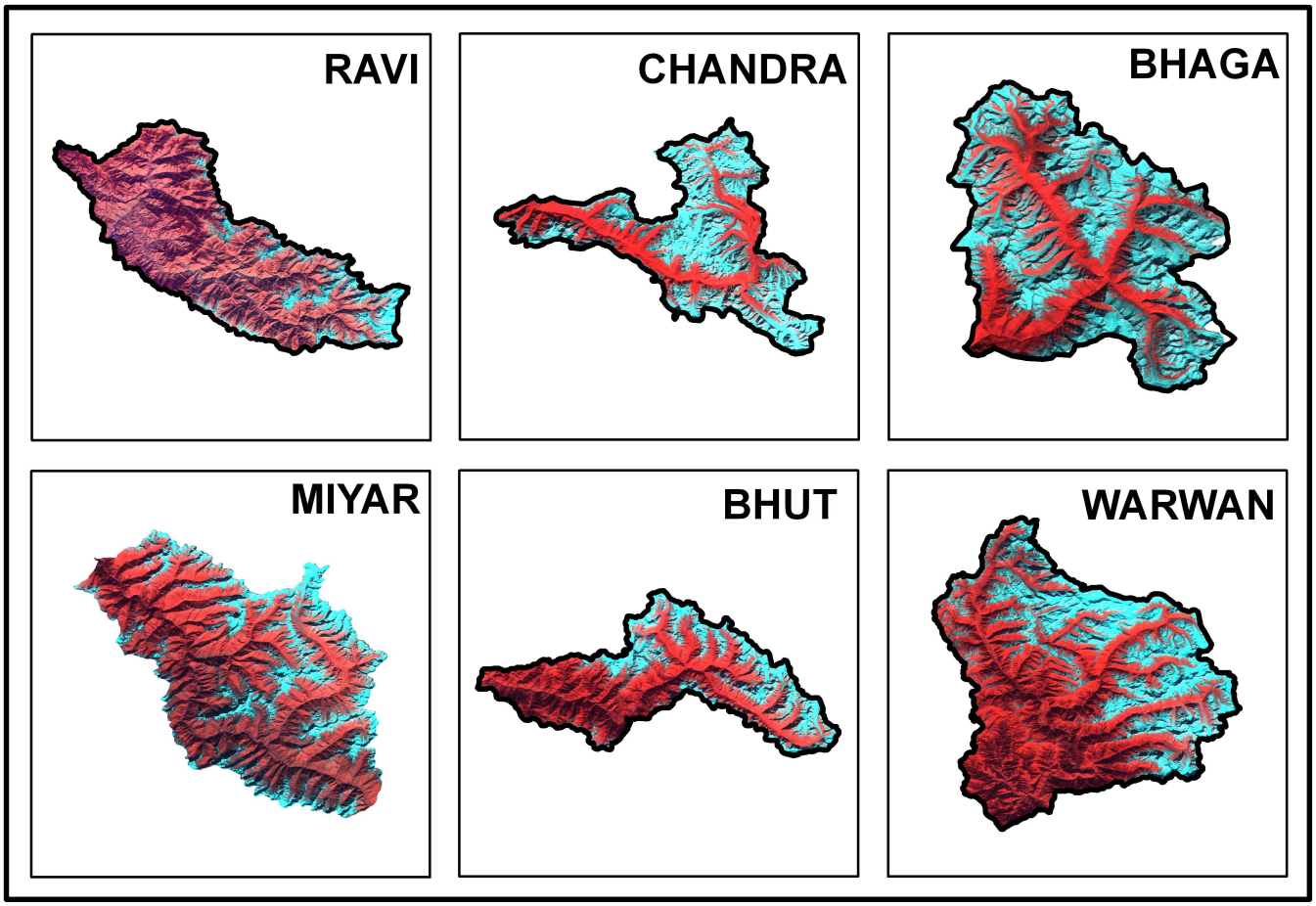
SNOW COVER ATLAS OF CHENAB BASIN

Sub basins: Ravi, Chandra, Bhaga, Miyar, Bhut and Warwan

(A Joint Project of Indian Space Research Organisation and Ministry of Environment and Forests, Govt. of India)

Year : 2009-10



Space Applications Centre (ISRO)
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Abstract	This atlas gives subbasin-wise distribution of snow cover in the Chenab basin from October 2009 to June 2010. The subbasins included in this report are Ravi, Chandra, Bhaga, Miyar, Bhut and Warwan. The areal extent of snow cover was estimated in fully automatic mode using Normalized Difference Snow Index (NDSI) based algorithm. For this purpose AWiFS sensor of Resourcesat satellite was used. This atlas gives snow cover products, statistics and seasonal snow depletion curve. It is expected that this data will be useful for hydrological and climatological applications.
Key words	Snow cover, NDSI, AWiFS, depletion curve, Ravi, Chandra, Bhaga, Miyar, Bhut and Warwan basins.
Security Classification	Unrestricted
Distribution	Among concerned

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1. **Introduction**

Snow covers almost 40 per cent of the Earth's land surface during Northern Hemisphere winter. This makes albedo and areal extent of snow as important component of the Earth's radiation balance (Foster and Chang, 1993). In addition, large areas in the Himalayas are also covered by snow during winter. Area of snow can change significantly during winter and spring. This can affect stream flow for rivers originating in the higher Himalayas. All the rivers originating from higher Himalayas receive almost 30-50 % of annual flow from snow and glacier melt run off (Agarwal et al., 1983). In addition, snow pack ablation is highly sensitive to climatic variation. Increase in atmospheric temperature can influence snowmelt and stream runoff pattern (Kulkarni et al., 2002). Therefore, mapping of the areal extent and reflectance of snow are important parameter for various climatological and hydrological applications. In addition, extent of snow cover can also be used as input for numerous other applications.

Mapping and monitoring of seasonal snow cover using field methods are normally very difficult in a mountainous terrain, like the Himalayas. Therefore, remote sensing techniques have been extensively used for snow cover monitoring. Snow cover monitoring using satellite images were started by using the TIROS-1 satellite from April 1960 (Singer and Popham 1963). Since then, the potential for operational satellite-based mapping has been enhanced by the development of higher temporal frequency and satellite sensors with higher spatial resolution. In addition, satellites with better radiometric resolutions, such as NOAA have been used successfully for snow mapping (Hall et al., 1995). This is possibly due to the distinct spectral reflectance characteristics of snow in visible and near infrared regions. India has launched series of Indian Remote Sensing satellite (IRS) to study the different earth resources. Previously launched satellites have flown with many sensors having different spatial, temporal and spectral resolutions. Recently launched RESOURCESAT-1 satellite has three different sensors namely LISS III, LISS IV & AWiFS with different spatial, temporal and spectral resolutions as desired for different applications. AWiFS (Advanced Wide Field Sensor) is an advanced version of earlier Indian satellite sensor WiFS (Wide Field Sensor) with improved spectral and spatial resolutions maintaining the same repetivity. There are a series of other polar orbiting satellites, like Landsat, NOAA and MODIS etc., which have provided information on different aspects of

snow. Geo-stationary satellites also proved their utility in mapping/monitoring the snow-covered regions. Information generated from satellite observations has been extensively used for snowmelt runoff modeling (Kulkarni et al., 1997).

2. Study Area:

This Atlas gives distribution of snow cover in six subbasins of the Chenab basin. These are Ravi, Chandra, Bhaga, Miyar, Bhut and Warwan sub basins. Locations of these basins are shown in Figure 1.

3. Data used:

AWiFS data from October 2009 to June 2010 were used in this study.

4. Normalised Difference Snow Index (NDSI):

In general, the reflectance of snow is high at the red end of the visible spectrum. It tends to decline in the near-infrared region until 1090 nm, where slight gain in reflectance occurs and gives a minor peak at approximately 1090 to 1100 nm. One of the important difficulties in snow cover monitoring is the presence of cloud cover. Cloud has strong reflectivity in visible, NIR and SWIR regions while snow absorbs in SWIR, and this difference can be utilized for snow/cloud discrimination. Normalized Difference Snow Index (NDSI) utilize the normalized ratio of green and SWIR and is used as an automated approach for snow mapping addressing the shadow and cloud problems in snow bound areas.

Normalized Difference Snow Index was calculated using the ratio of green wavelength (band 2) and SWIR (band 5) of AWiFS sensor:

$$Normalized\ Difference\ Snow\ Index(NDSI) = (band2 - band5)/(band2 + band5) \qquad ..(1)$$

To estimate NDSI, DN numbers were converted into reflectance. This involves conversion of digital numbers into the radiance values, known as sensor calibration, and then estimation of reflectance from these radiance values. Various parameters needed for estimating spectral reflectance are maximum and minimum radiances and mean solar exo-atmospheric spectral irradiances in the satellite sensor bands, satellite data acquisition time, solar declination, solar zenith and solar azimuth angles, mean Earth-Sun distance etc. (Markham and Barker, 1987; Srinivasulu and Kulkarni, 2004).

5. Snow cover monitoring algorithm

An algorithm is developed to provide changes in the areal extent of snow (Kulkarni et. al., 2006). Snow extent is estimated at an interval of 5-days and 10-days, depending upon availabilities of AWiFS data. In 5-daily product, snow extent is generated scene-wise. In this product, snow and cloud extents are given. Estimate of cloud is important because, at times, snow is covered by cloud and this may be classified as non-snow area, leading to erroneous conclusions. In 10-daily product, three scenes are analyzed, if available. For example, 10 March product data of 5, 10 and 15 March was used. If any pixel is identified as snow on any one date then this pixel will be classified as snow on final product. This provides snow cover at an interval of 10 days, an important requirement in hydrological applications. Therefore, this product is generated basin-wise. Since this product is using three scenes, probability becomes high that at least in one scene, pixel may be cloud-free and this helps in overcoming problem associated with snow under cloud cover. If three consecutive scenes are not available, then all available scenes in 10 days window was used in the analysis. Differentiation between water and snow is difficult using NDSI image. In addition, separation of snow and water pixels is also difficult based on reflectance due to mountain shadow. Therefore, in the present algorithm, water bodies are marked in pre-winter

season and are masked in the final products during winter. Flow diagram of the algorithm is given in Figure 2.

6. Results and discussions

In this atlas, basin-wise snow cover statistics, maps, and seasonal depletion curves have been provided from October 2009 to June 2010. Snow ablation pattern varies from basin to basin, depending on area altitude distribution in the basins. Accumulation and ablation pattern in Chandra, Bhaga and Miyar river basin is almost same and significant amount of melting was not observed in early part of winter. From November to mid of March almost entire basin is covered by snow for Chandra, Bhaga and Miyar. In the Bhut and Warwan sub-basins accumulation starts from mid of November and ablation starts from mid of March. In case of Ravi sub-basin less amount of areal extent of snow was observed due to lower latitude & altitude. Maximum snow was observed 86% in February and minimum 9% was observed in the month of November.

Acknowledgements

This investigation was carried out under Snow and Glacier Studies Project, a joint initiative of Ministry of Environment and Forest (MoEF) and Department of Space (DOS). The authors are grateful to Shri. A. S. Kirankumar, Director, Space Applications Centre, Ahmedabad for continuous guidance and encouragement during the investigation. Authors would like to thank Dr. J. S. Parihar, DD, EPSA for their suggestions and comments on the manuscript.

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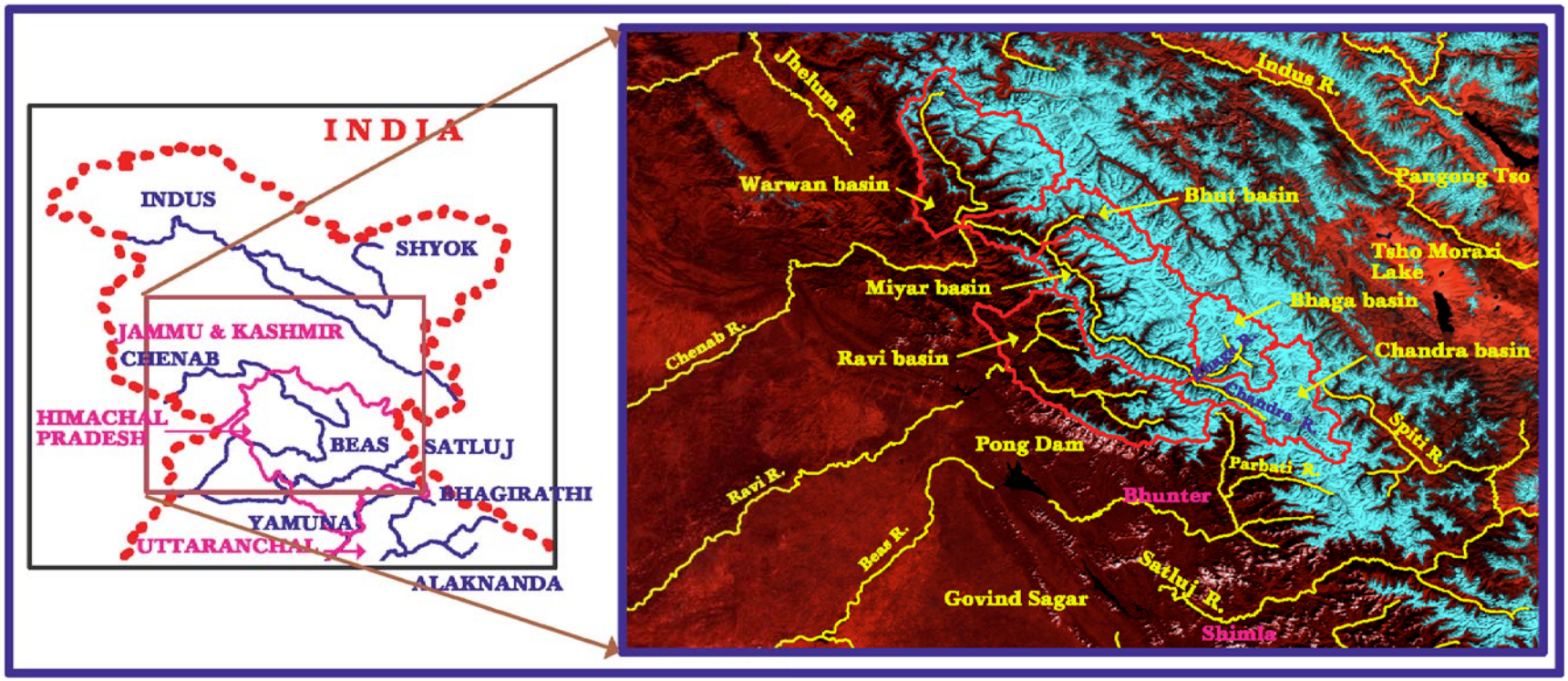


Figure 1: Location map of Ravi, Chandra, Bhaga, Miyar, Bhut and Warwan sub-basins (Part of Chenab basin)

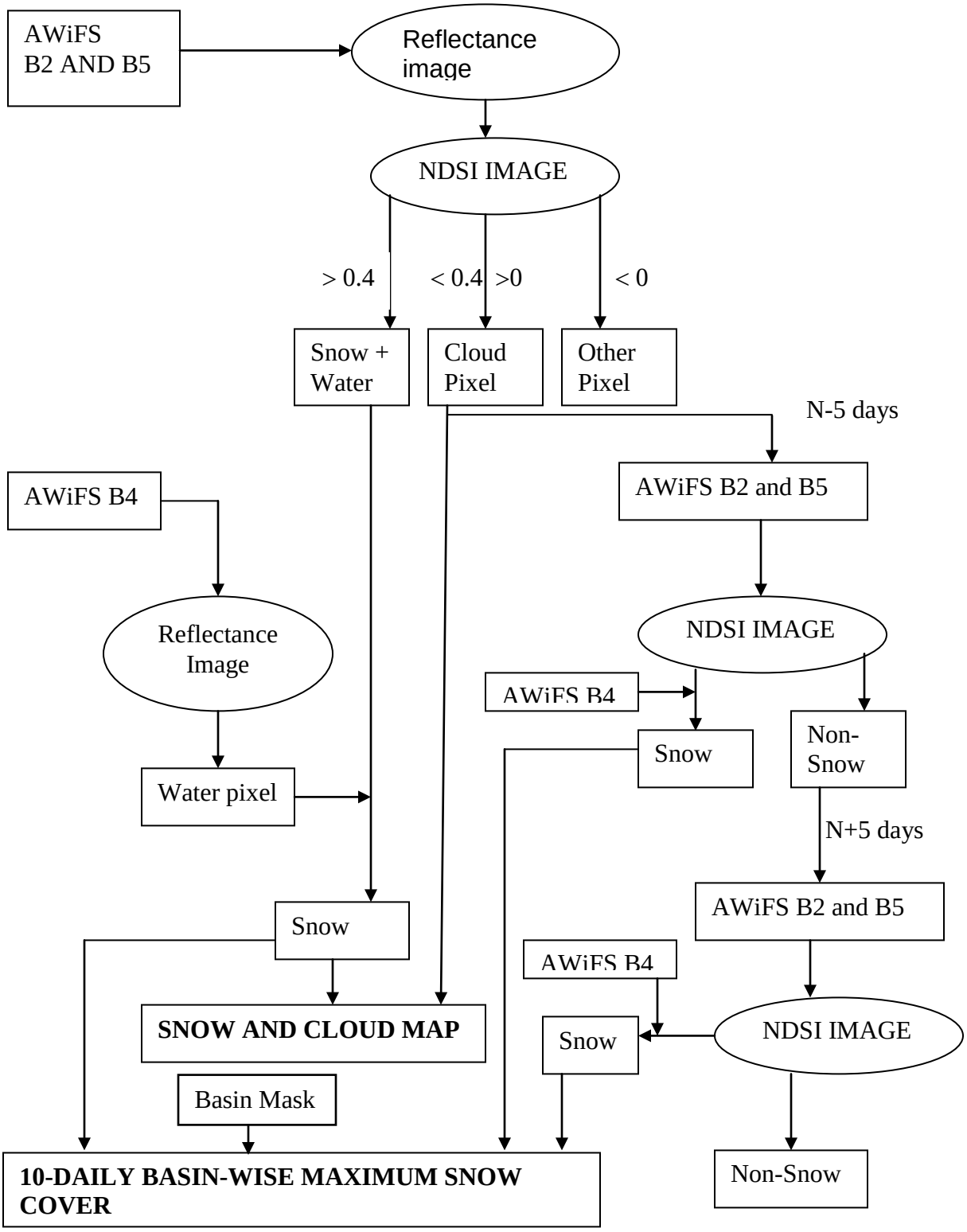


Figure 2: Algorithm for snow cover mapping using AWiFS data

RAVI BASIN

AREAL EXTENT OF SNOW (5 DAILY)

BASIN NAME: RAVI **BASIN AREA: 4907 sq km**

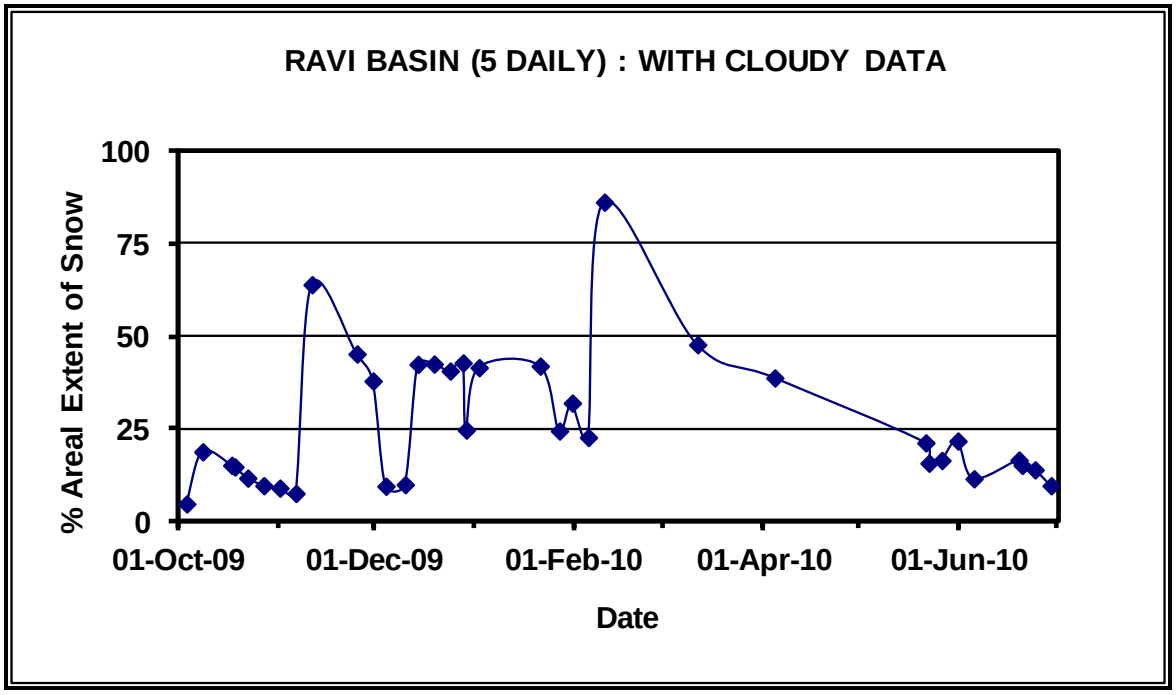
S No	Date	Snow cover (sq km)	Snow cover (%)	S No	Date	Snow cover (sq km)	Snow cover (%)
October 2009							
1	3-Oct-09	235.6	5	2	8-Oct-09	925.9	19
3	17-Oct-09	747.2	15	4	18-Oct-09	725.4	15
5	22-Oct-09	577.6	12	6	27-Oct-09	477.6	10
November 2009							
7	1-Nov-09	444.7	9	8	6-Nov-09	374.5	8
9	11-Nov-09	3138.8	64	10	25-Nov-09	2221.1	45
11	30-Nov-09	1863.2	38				
December 2009							
12	4-Dec-09	469.8	10	13	10-Dec-09	490.9	10
14	14-Dec-09	2083.8	42	15	19-Dec-09	2087.8	43
16	24-Dec-09	1995.8	41	17	28-Dec-09	2103.0	43
18	29-Dec-09	1214.1	25				
January 2010							
19	2-Jan-10	2040.3	42	20	21-Jan-10	1736.7	35
21	27-Jan-10	1201.7	24	22	31-Jan-10	1570.7	32
February 2010							
23	5-Feb-10	1115.7	23	24	10-Feb-10	4231.7	86
March 2010							
25	11-Mar-10	2344.1	48				
April 2010							
26	4-Apr-10	1904.4	39				
May 2010							
27	21-May-10	1044.2	21	28	22-May-10	775.0	16
29	26-May-10	811.0	17	30	31-May-10	1068.2	22
June 2010							
31	5-Jun-10	568.6	12	32	19-Jun-10	816.6	17
33	20-Jun-10	745.7	15	34	24-Jun-10	644.0	13
35	29-Jun-10	476.5	10				
July 2010							
36	8-Jul-10	441.4	9	37	14-Jul-10	385.4	8

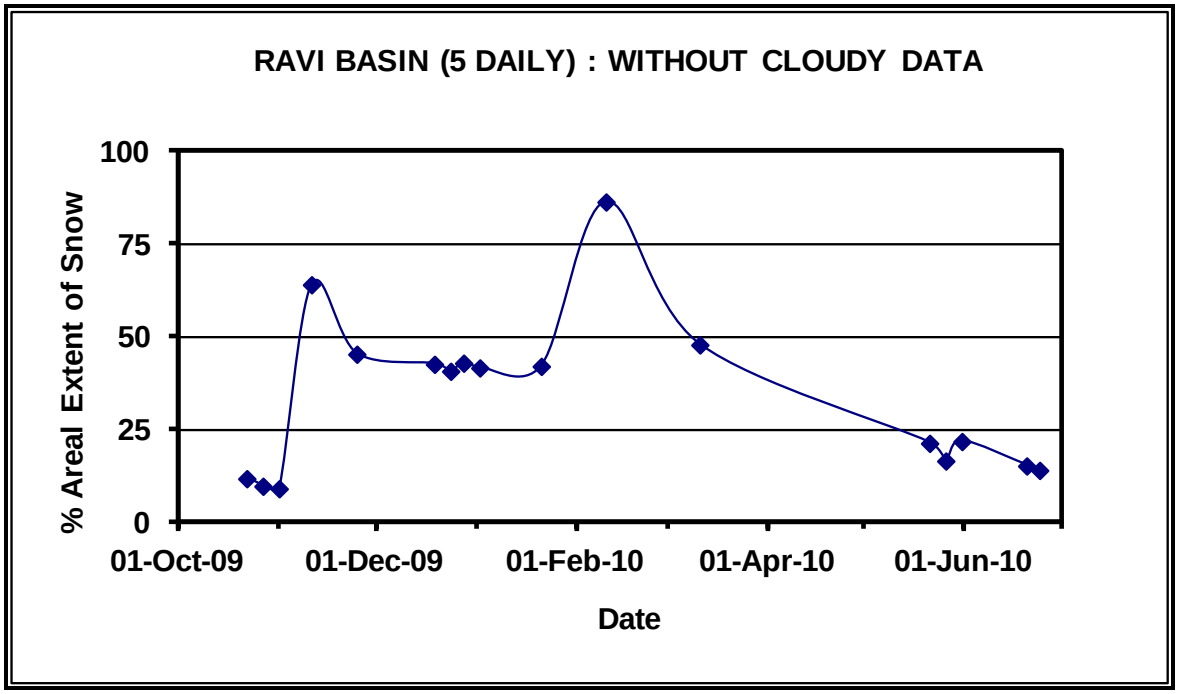
AREAL EXTENT OF SNOW (10 DAILY)

BASIN NAME: RAVI **BASIN AREA: 4907 sq km**

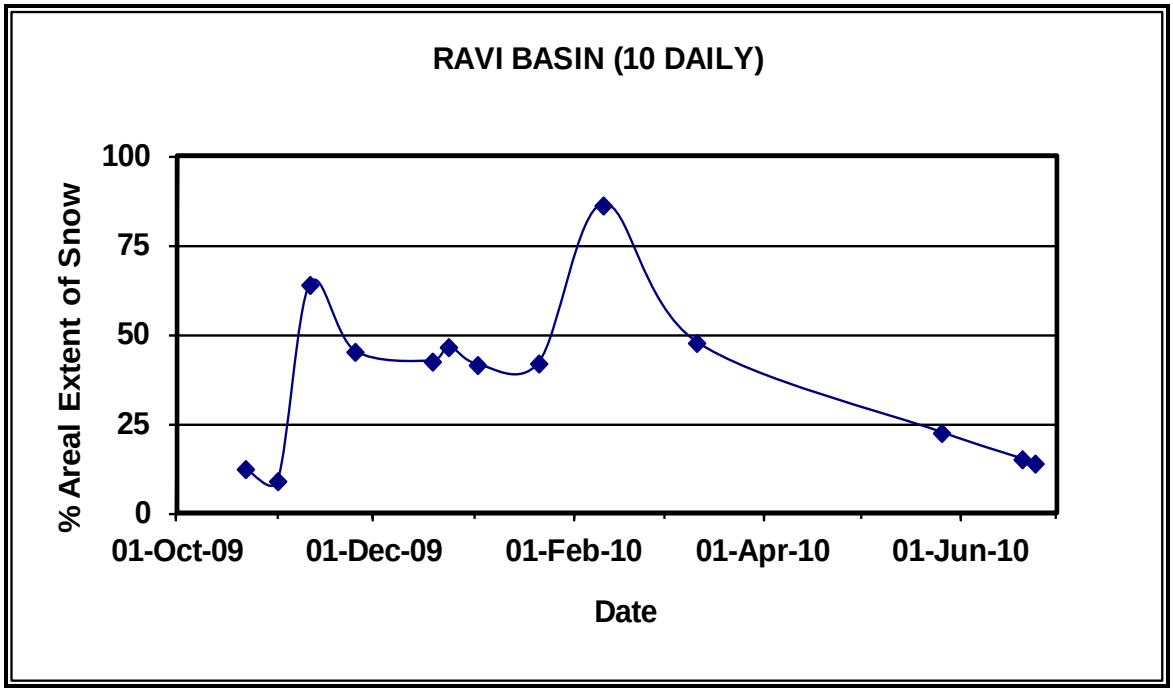
S No	Date	Snow cover (sq km)	Snow cover (%)	S No	Date	Snow cover (sq km)	Snow cover (%)
October 2009				**November 2009**			
1	22-Oct-09	611.1	12	2	1-Nov-09	444.7	9
				3	11-Nov-09	2928.7	60
				4	25-Nov-09	2221.1	45
December 2009				**January 2010**			
5	19-Dec-09	2087.8	43	7	2-Jan-10	2040.3	42
6	24-Dec-09	2286.1	47	8	21-Jan-10	1736.7	35
February 2010				**March 2010**			
9	10-Feb-10	4231.7	86	10	11-Mar-10	2344.1	48
April 2010				**May 2010**			
				11	26-May-10	1107.5	23
June 2010				**July2010**			
12	20-Jun-10	745.7	15	14	14-Jul-10	385.4	8
13	24-Jun-10	644.0	13				

Snow cover depletion curve



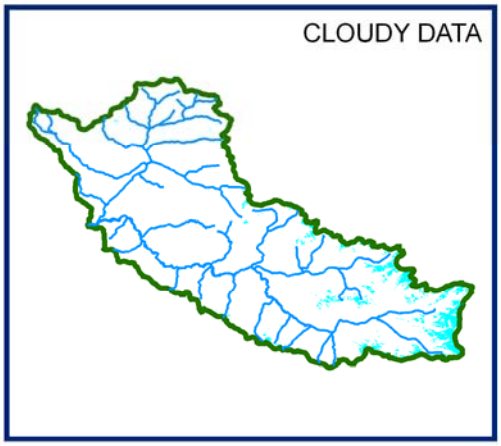


Snow cover depletion curve



SNOW COVER MAP

SNOW COVER MAP : RAVI BASIN



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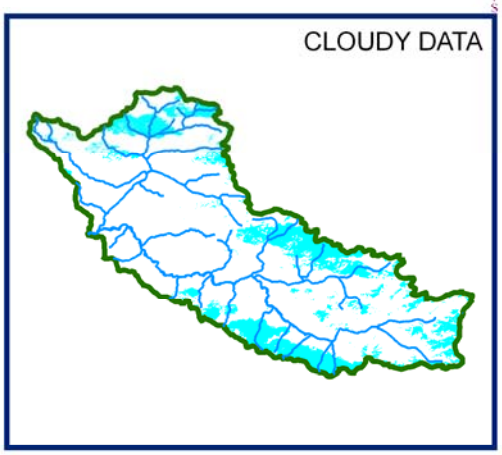

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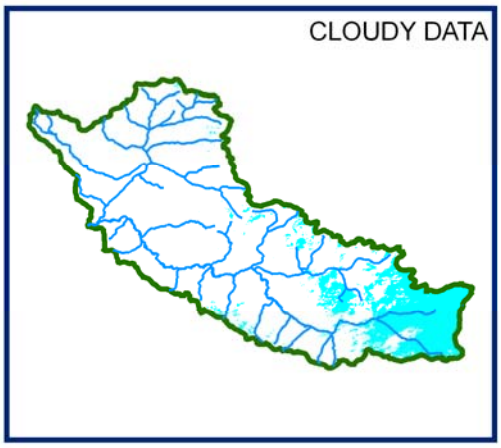

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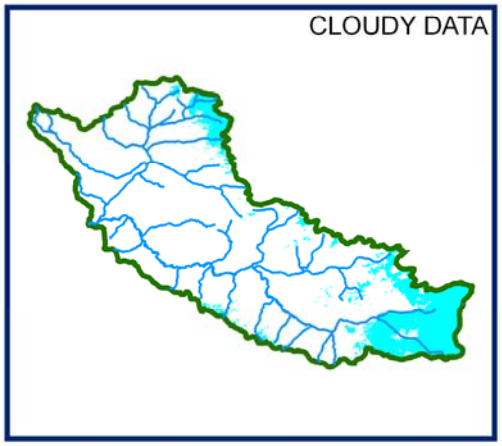

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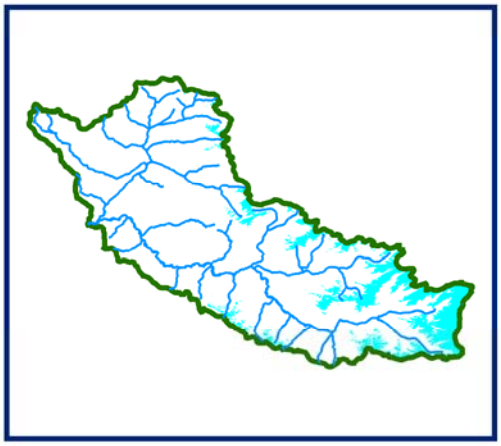

22 OCTOBER 2009

27 OCTOBER 2009

SNOW

0 20 40 80 120 160

Kilometers

10 DAILY SNOW COVER MAP : RAVI BASIN

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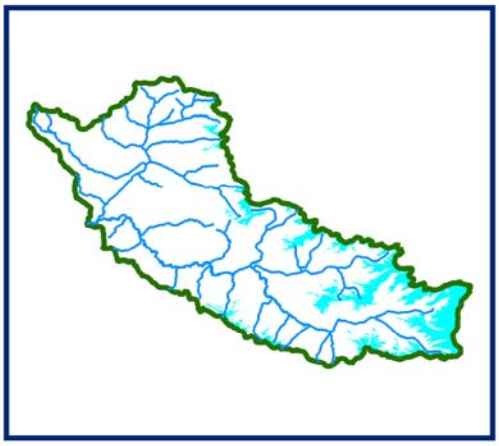

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SNOW

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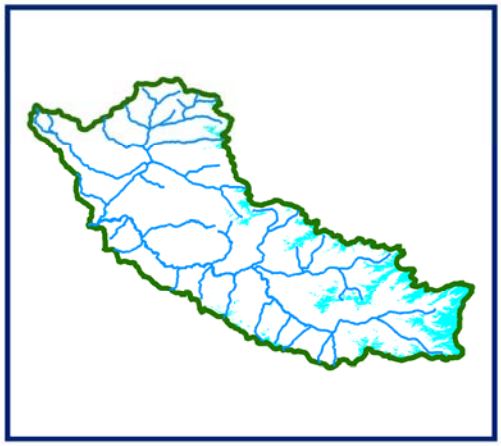
SNOW COVER MAP : RAVI BASIN



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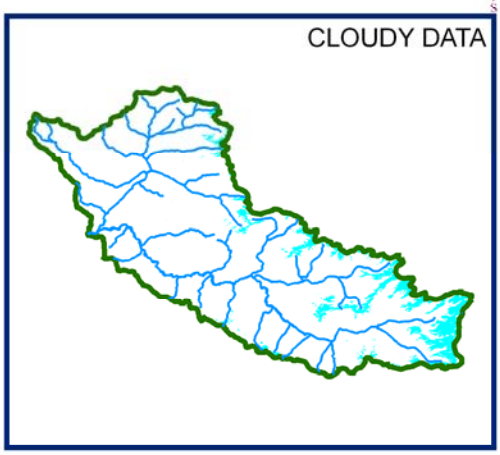

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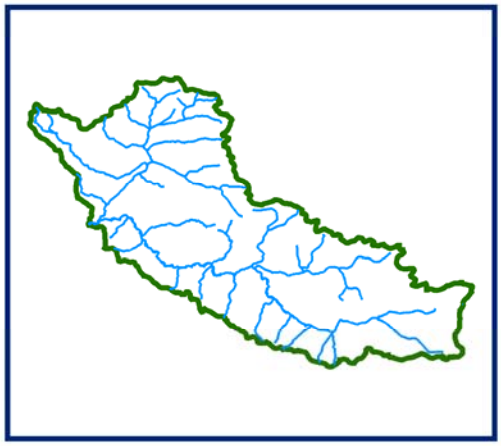

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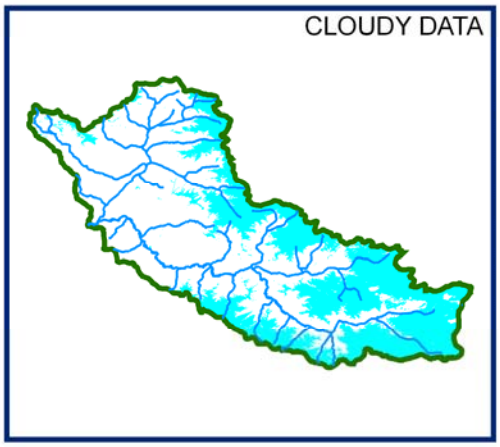

30 NOVEMBER 2009

SNOW

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Kilometers

10 DAILY SNOW COVER MAP : RAVI BASIN

DATA USED
01 NOVEMBER 2009

DATA USED
11 NOVEMBER 2009

DATA USED
25 NOVEMBER 2009

SNOW

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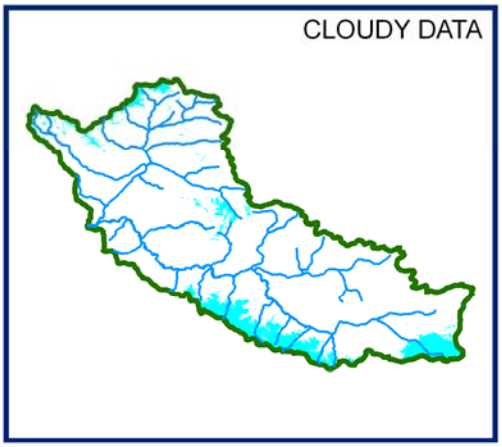
Kilometers

SNOW COVER MAP : RAVI BASIN



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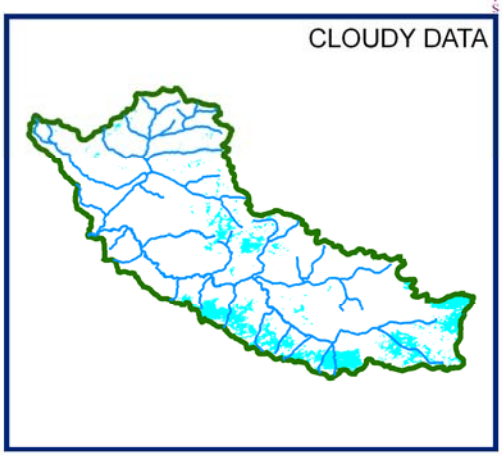

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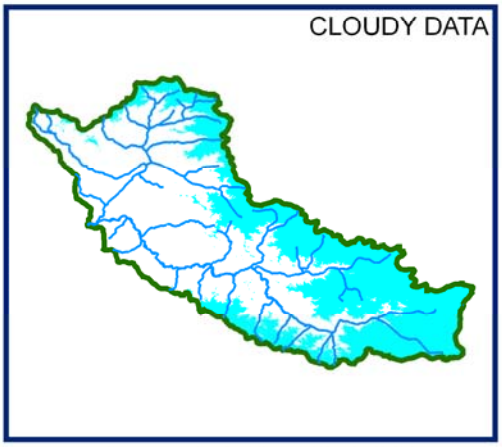

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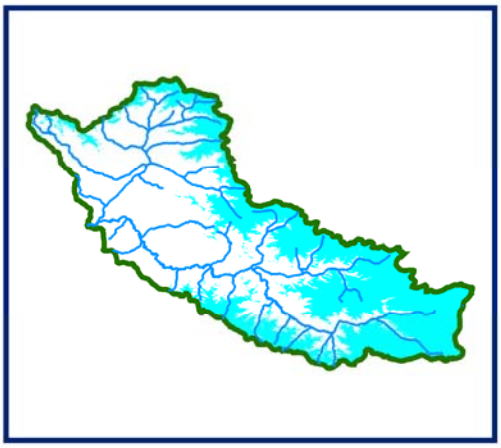

19 DECEMBER 2009

24 DECEMBER 2009

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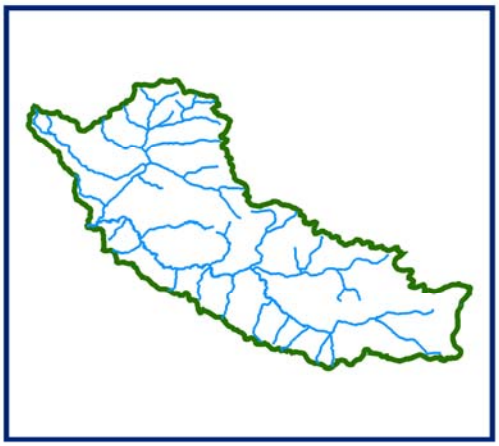
SNOW

0 20 40 80 120 160

Kilometers

10 DAILY SNOW COVER MAP : RAVI BASIN



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SNOW

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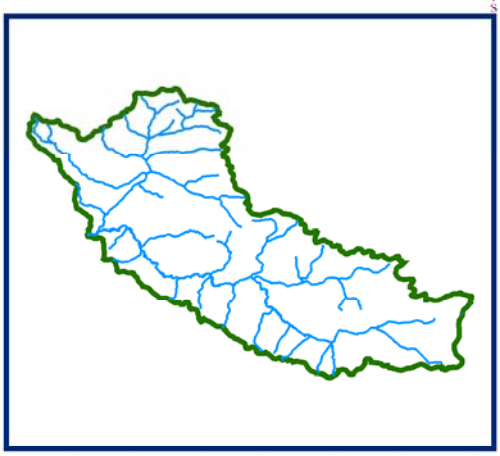
Kilometers

SNOW COVER MAP : RAVI BASIN

02 JANUARY 2010



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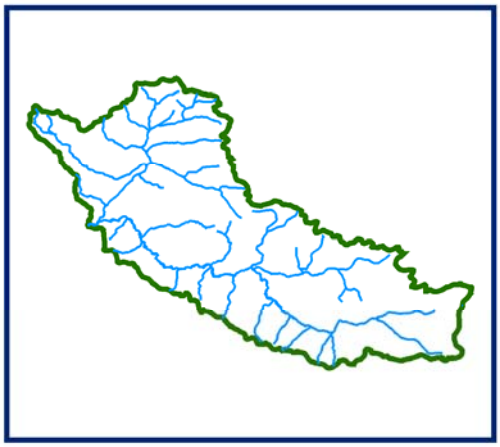

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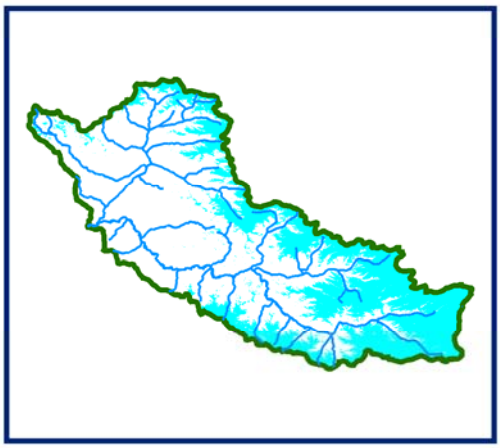
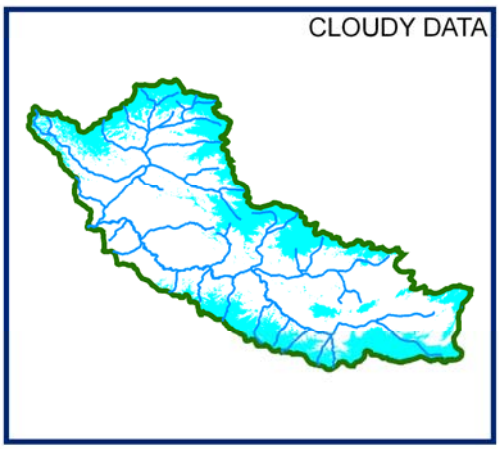


21 JANUARY 2010



31 JANUARY 2010

SNOW

0 20 40 80 120 160

Kilometers

10 DAILY SNOW COVER MAP : RAVI BASIN

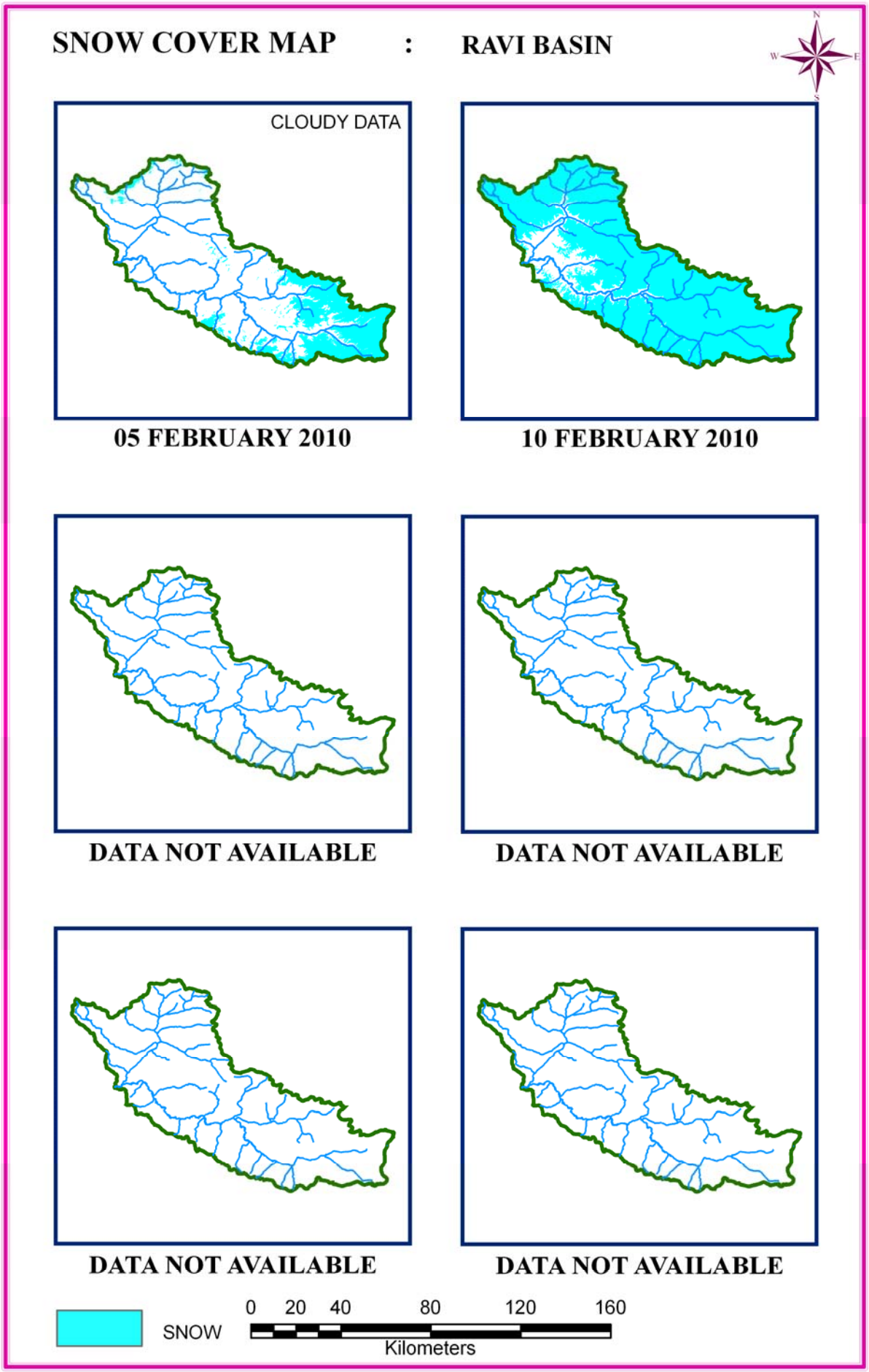
DATA USED
02 JANUARY 2010

DATA USED
DATA NOT AVAILABLE

DATA USED
21 JANUARY 2010

SNOW

0 20 40 80 120 160
Kilometers


SNOW COVER MAP : RAVI BASIN
CLOUDY DATA
05 FEBRUARY 2010
10 FEBRUARY 2010
DATA NOT AVAILABLE
DATA NOT AVAILABLE
DATA NOT AVAILABLE
DATA NOT AVAILABLE
SNOW
0 20 40 80 120 160
Kilometers

10 DAILY SNOW COVER MAP : RAVI BASIN

DATA USED
10 FEBRUARY 2010

DATA USED
DATA NOT AVAILABLE

DATA USED
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SNOW

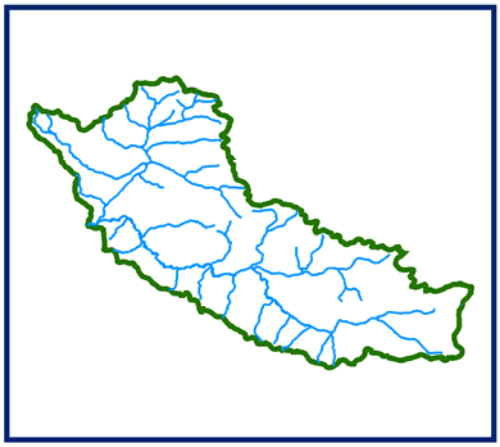
0 20 40 80 120 160
Kilometers

SNOW COVER MAP : RAVI BASIN

DATA NOT AVAILABLE

DATA NOT AVAILABLE

11 MARCH 2010



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DATA NOT AVAILABLE

SNOW

0 20 40 80 120 160

Kilometers

10 DAILY SNOW COVER MAP : RAVI BASIN

DATA USED
DATA NOT AVAILABLE

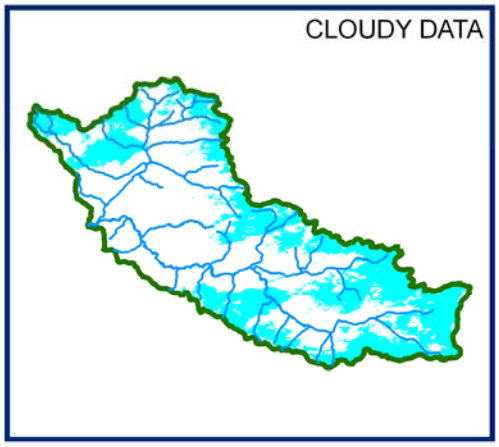
DATA USED
11 MARCH 2010

DATA USED
DATA NOT AVAILABLE

SNOW

0 20 40 80 120 160
Kilometers

SNOW COVER MAP : RAVI BASIN



04 APRIL 2010

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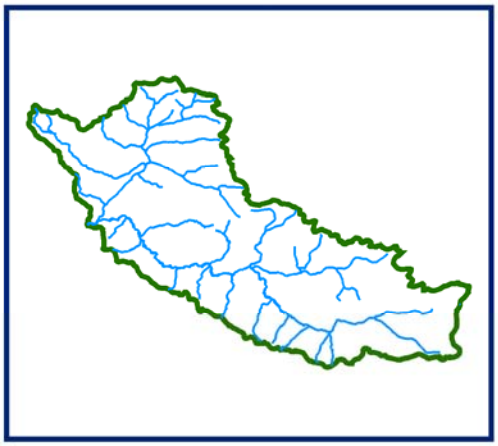

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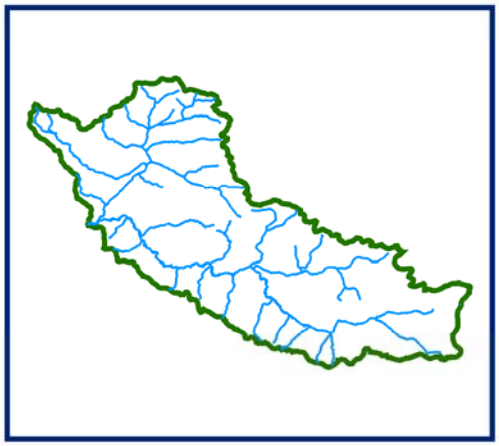

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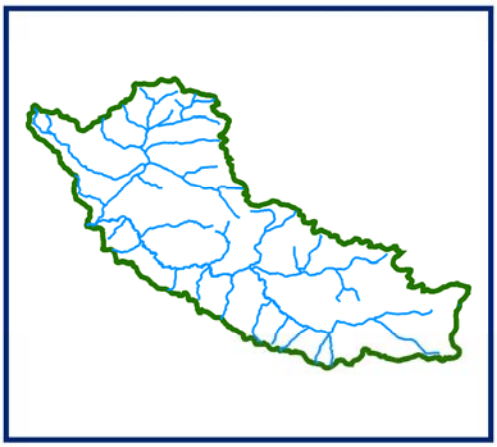

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SNOW

0 20 40 80 120 160

Kilometers

10 DAILY SNOW COVER MAP : RAVI BASIN

DATA USED
DATA NOT AVAILABLE

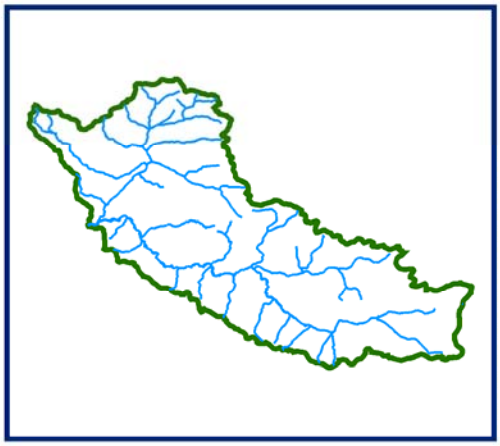
DATA USED
DATA NOT AVAILABLE

DATA USED
DATA NOT AVAILABLE

SNOW

0 20 40 80 120 160
Kilometers

SNOW COVER MAP : RAVI BASIN



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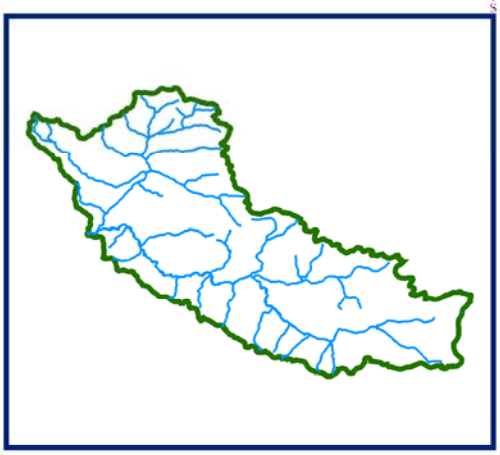

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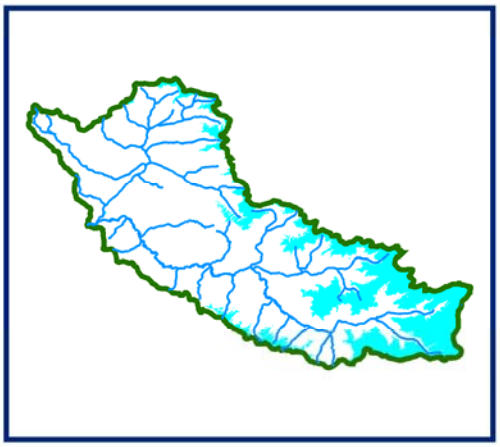
21 MAY 2010



31 MAY 2010

SNOW

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Kilometers

10 DAILY SNOW COVER MAP : RAVI BASIN

DATA USED
DATA NOT AVAILABLE

DATA USED
DATA NOT AVAILABLE

DATA USED
21 MAY 2010
26 MAY 2010
31 MAY 2010

SNOW

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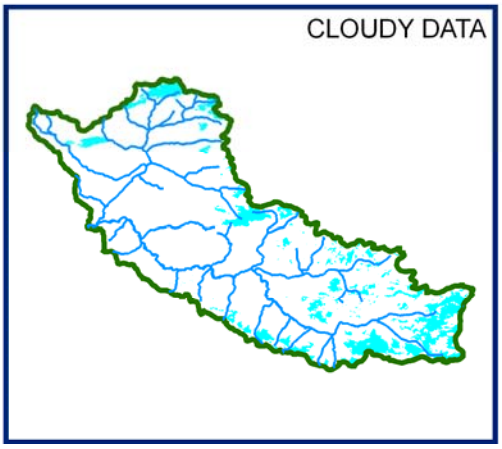
Kilometers

SNOW COVER MAP : RAVI BASIN



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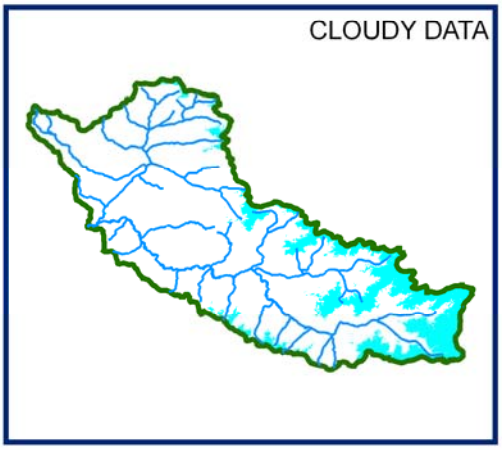
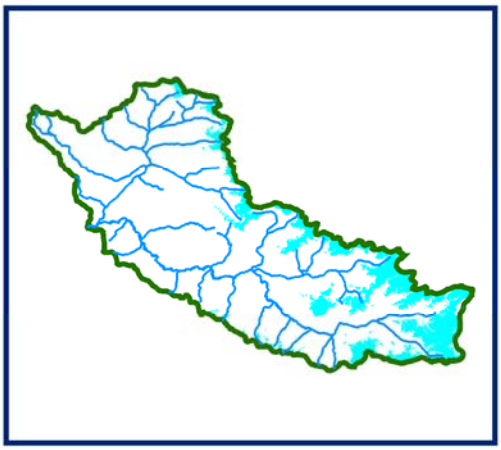


19 JUNE 2010



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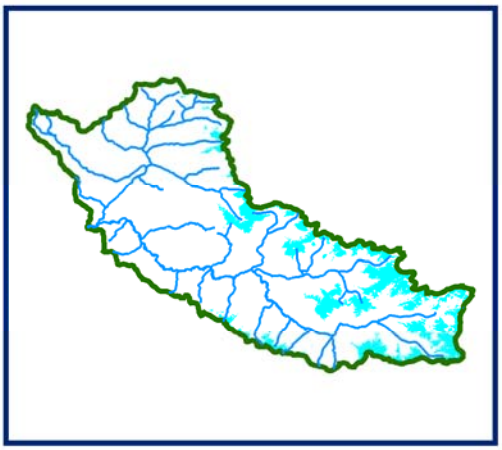
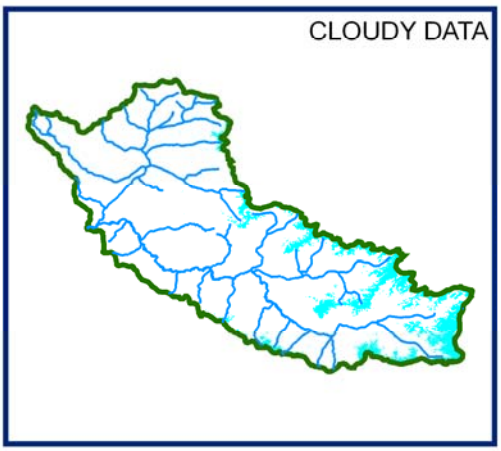


24 JUNE 2010



29 JUNE 2010

SNOW

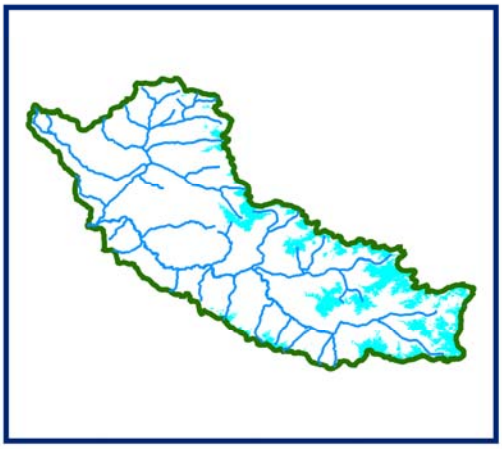
0 20 40 80 120 160

Kilometers

10 DAILY SNOW COVER MAP : RAVI BASIN

DATA USED
DATA NOT AVAILABLE

DATA USED
20 JUNE 2010



DATA USED
24 JUNE 2010

SNOW

0 20 40 80 120 160
Kilometers

CHANDRA BASIN

AREAL EXTENT OF SNOW (5 DAILY)

BASIN NAME: CHANDRA **BASIN AREA: 2433 sq km**

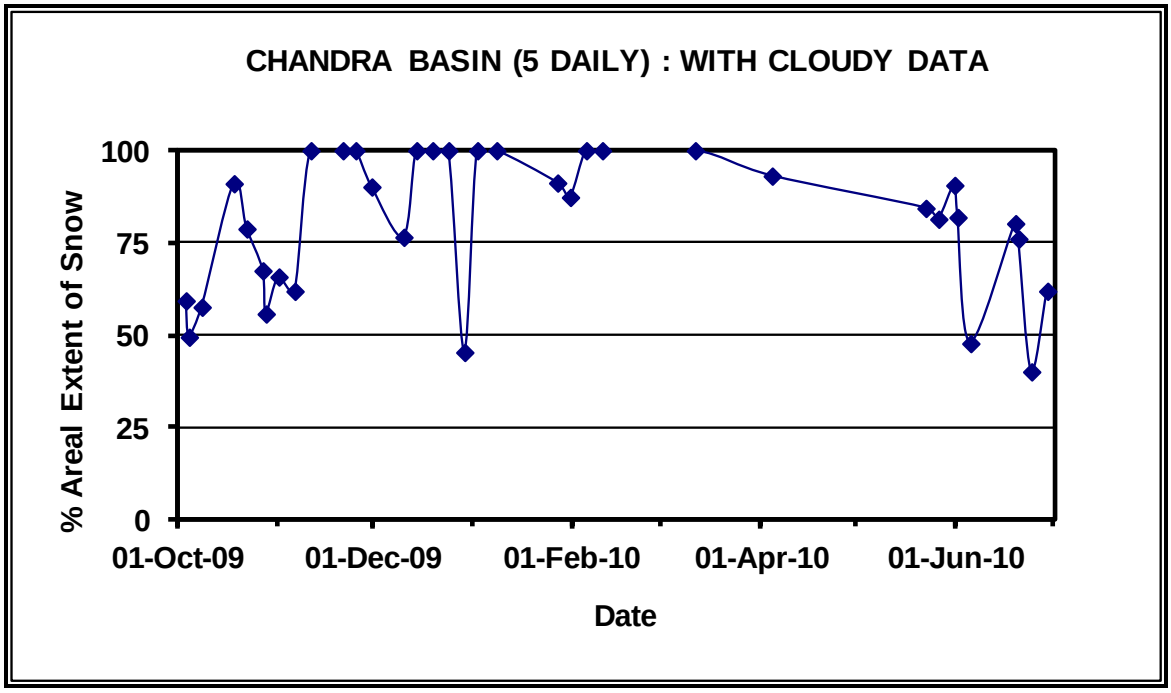
S No	Date	Snow cover (sq km)	Snow cover (%)	S No	Date	Snow cover (sq km)	Snow cover (%)
October 2009							
1	3-Oct-09	1443.6	59	2	4-Oct-09	1204.2	49
3	8-Oct-09	1401.8	58	4	18-Oct-09	2215.5	91
5	22-Oct-09	1917.5	79	6	27-Oct-09	1641.6	67
7	28-Oct-09	1357.1	56				
November 2009							
8	1-Nov-09	1600.9	66	9	6-Nov-09	1506.5	62
10	11-Nov-09	2433.0	100	11	21-Nov-09	2433.0	100
12	25-Nov-09	2433.0	100	13	30-Nov-09	2193.9	90
December 2009							
14	10-Dec-09	1862.5	77	15	14-Dec-09	2433.0	100
16	19-Dec-09	2433.0	100	17	24-Dec-09	2433.0	100
18	29-Dec-09	1104.0	45				
January 2010							
19	2-Jan-10	2433.0	100	20	8-Jan-10	2433.0	100
21	27-Jan-10	2220.1	91	22	31-Jan-10	2125.4	87
February 2010							
23	5-Feb-10	2433.0	100	24	10-Feb-10	2433.0	100
March 2010							
25	11-Mar-10	2433.0	100				
April 2010							
26	4-Apr-10	2265.7	93				
May 2010							
27	22-May-10	2053.0	84	28	26-May-10	1981.5	81
29	31-May-10	2204.3	91				
June 2010							
30	1-Jun-10	1993.1	82	31	5-Jun-10	1162.5	48
32	19-Jun-10	1952.4	80	33	20-Jun-10	1851.1	76
34	24-Jun-10	976.0	40	35	29-Jun-10	1506.8	62
July 2010							
36	14-Jul-10	1474.1	61				

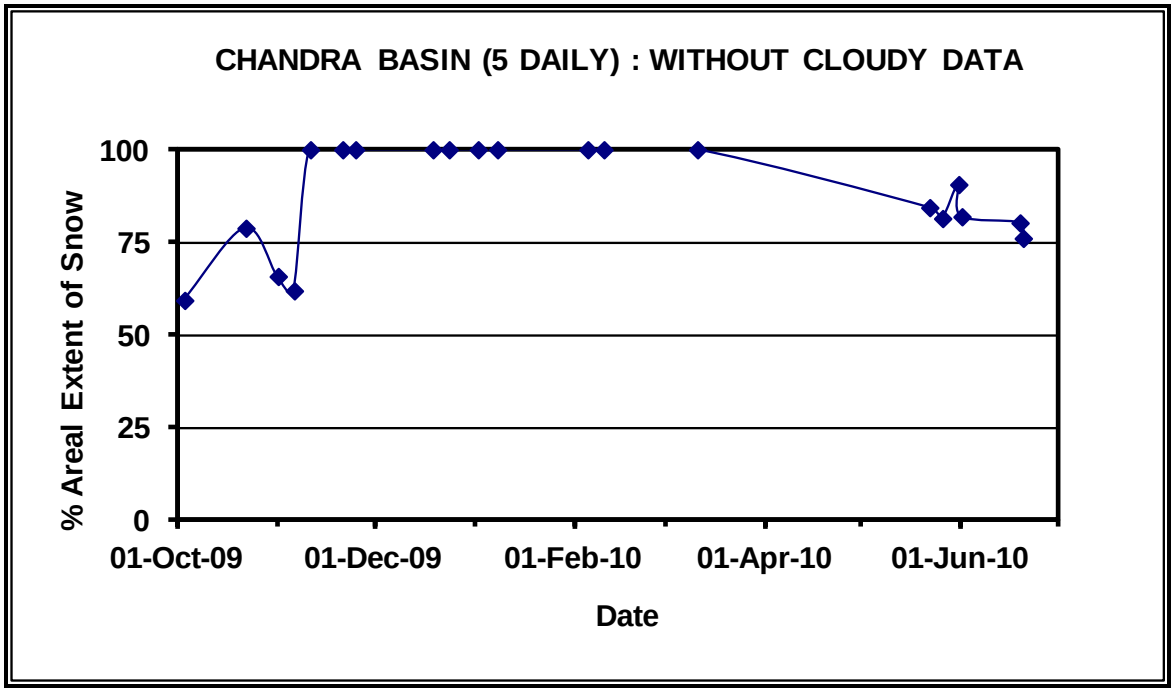
AREAL EXTENT OF SNOW (10 DAILY)

BASIN NAME: CHANDRA **BASIN AREA: 2433 sq km**

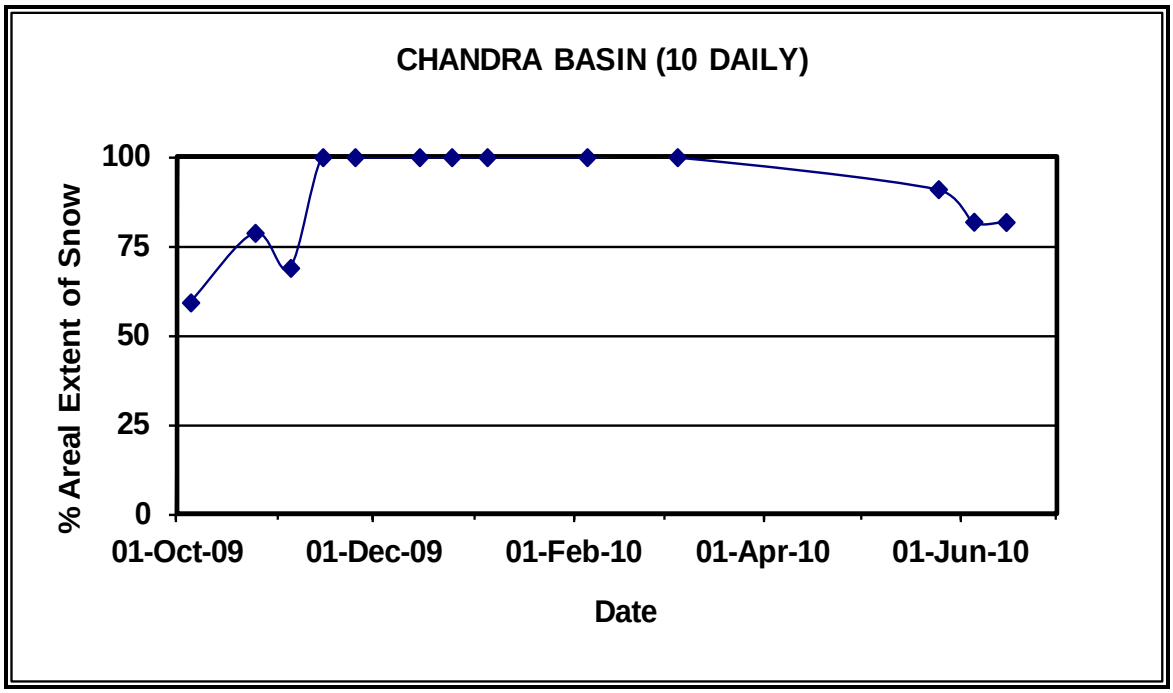
S No	Date	Snow cover (sq km)	Snow cover (%)	S No	Date	Snow cover (sq km)	Snow cover (%)
October 2009				**November 2009**			
1	3-Oct-09	1443.6	59	3	1-Nov-09	1679.0	69
2	22-Oct-09	1917.5	79	4	11-Nov-09	2433.0	100
				5	21-Nov-09	2433.0	100
December 2009				**January 2010**			
6	19-Dec-09	2433.0	100	8	2-Jan-10	2433.0	100
7	29-Dec-09	1104.0	45				
February 2010				**March 2010**			
9	10-Feb-10	2433.0	100	10	11-Mar-10	2433.0	100
April 2010				**May 2010**			
				11	26-May-10	2214.9	91
June 2010				**July2010**			
12	1-Jun-10	1993.1	82	14	14-Jul-10	1474.1	61
13	19-Jun-10	1991.1	82				

Snow cover depletion curve



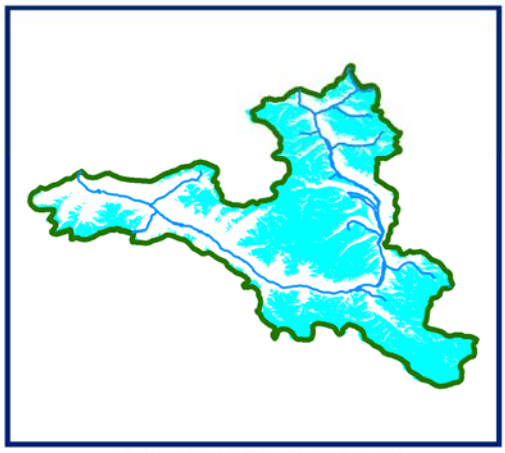


Snow cover depletion curve

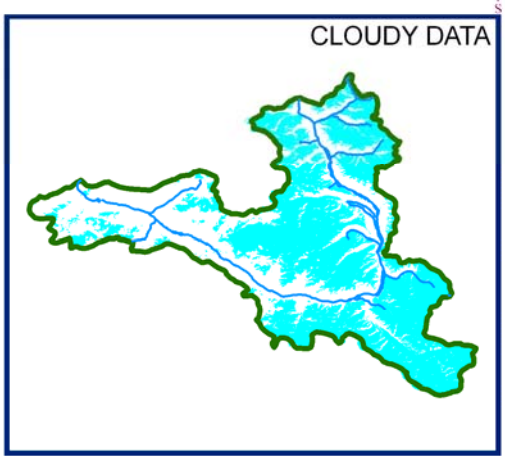


SNOW COVER MAP

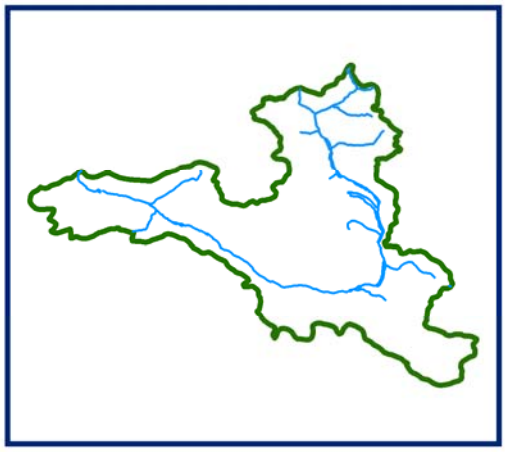
SNOW COVER MAP : CHANDRA BASIN



03 OCTOBER 2009



08 OCTOBER 2009



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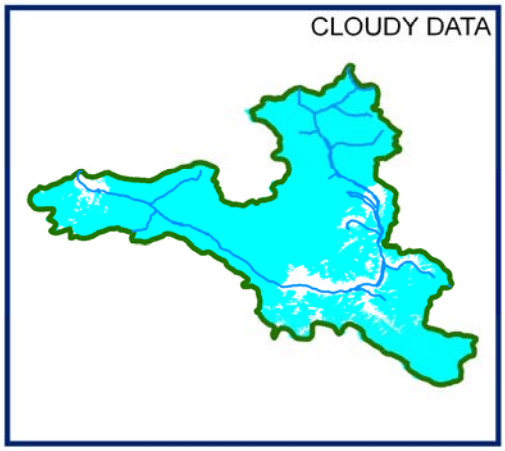
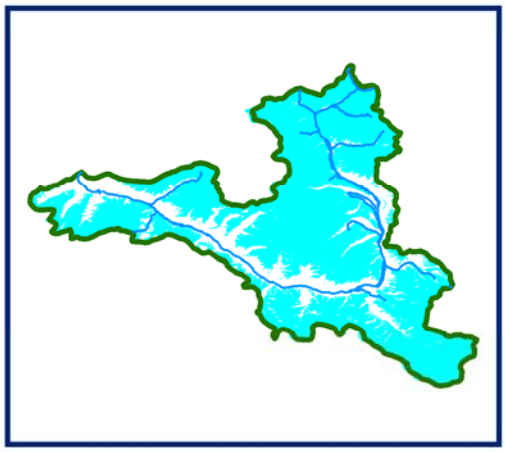


18 OCTOBER 2009



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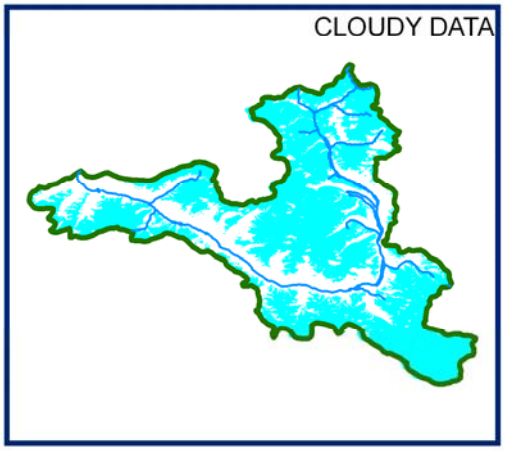


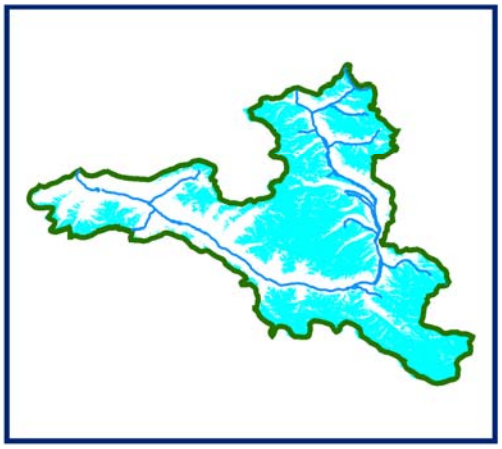
27 OCTOBER 2009

SNOW

0 10 20 40 60 80

Kilometers

10 DAILY SNOW COVER MAP : CHANDRA BASIN



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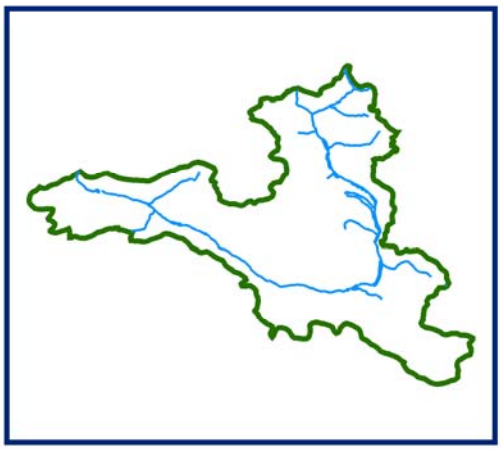

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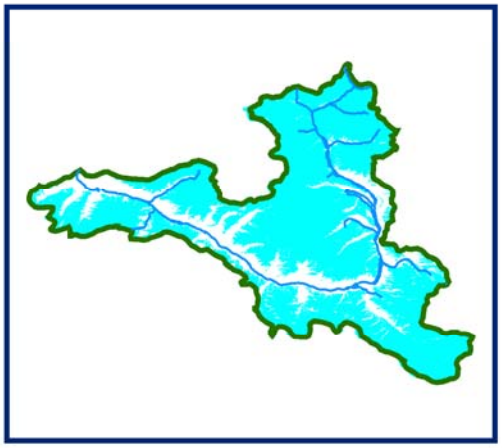

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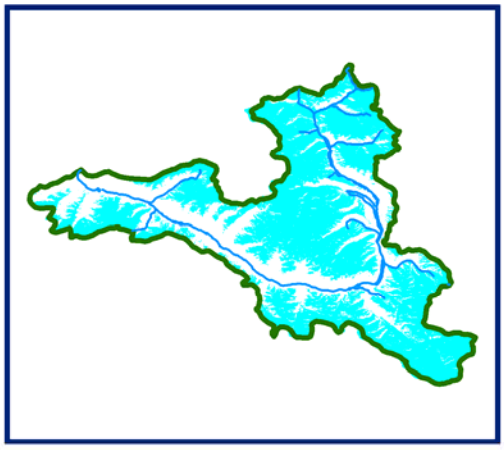
22 OCTOBER 2009

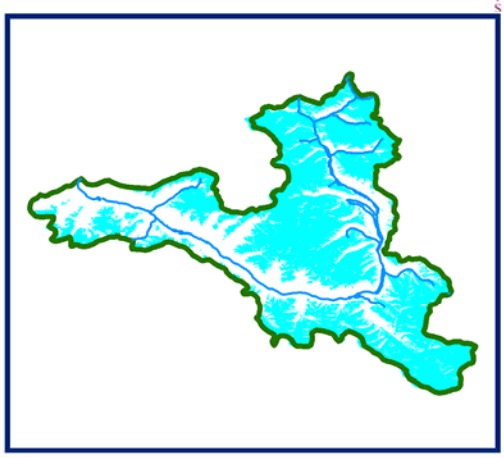
SNOW

0 10 20 40 60 80
Kilometers

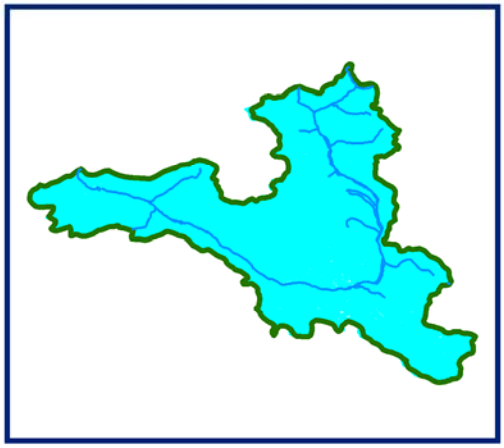
SNOW COVER MAP : CHANDRA BASIN



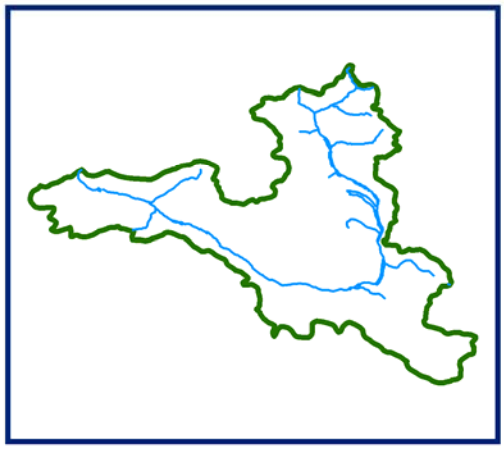
01 NOVEMBER 2009



06 NOVEMBER 2009



11 NOVEMBER 2009



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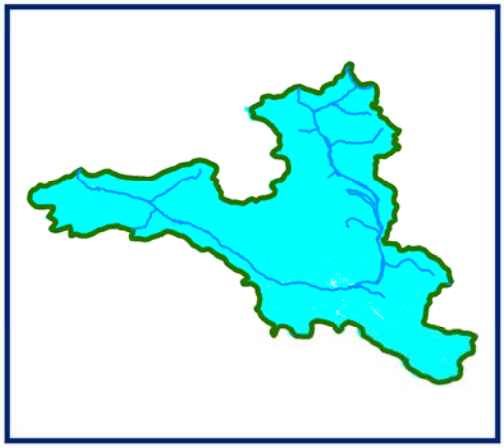
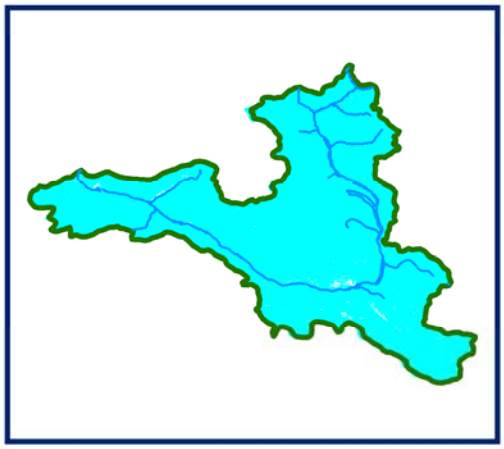


21 NOVEMBER 2009



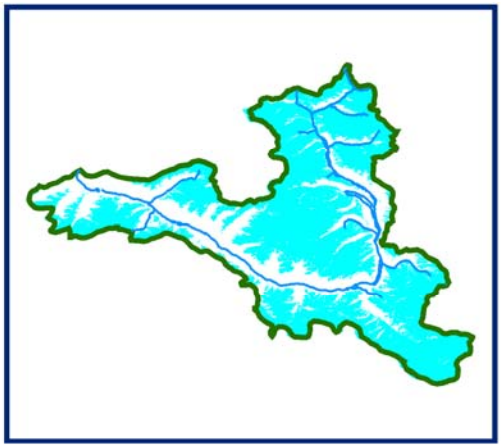
25 NOVEMBER 2009

SNOW

0 10 20 40 60 80

Kilometers

10 DAILY SNOW COVER MAP : CHANDRA BASIN



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01 NOVEMBER 2009
06 NOVEMBER 2009

DATA USED
11 NOVEMBER 2009

DATA USED
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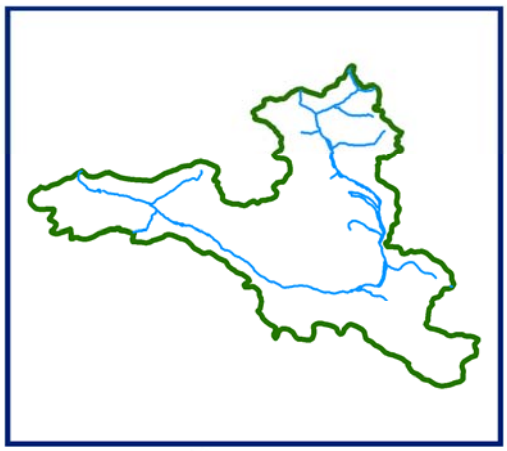
25 NOVEMBER 2009

SNOW

0 10 20 40 60 80
Kilometers

SNOW COVER MAP : CHANDRA BASIN



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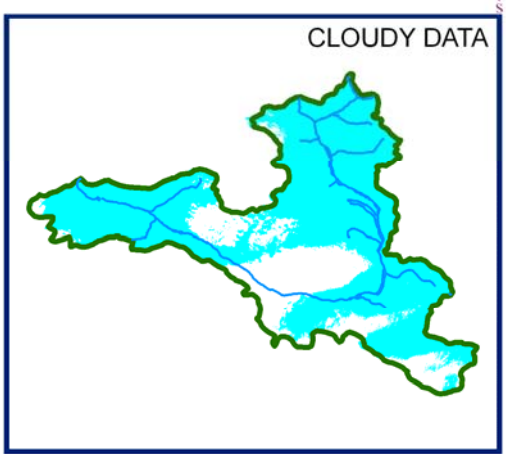
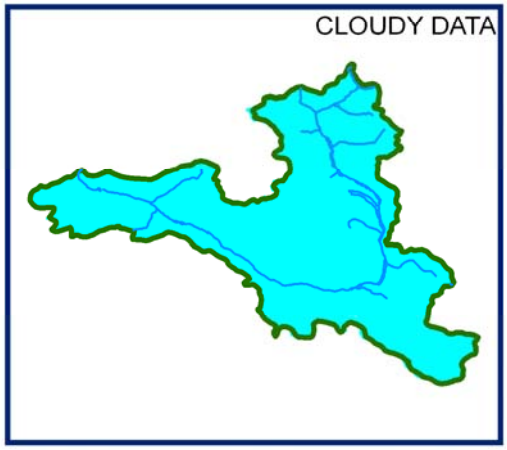
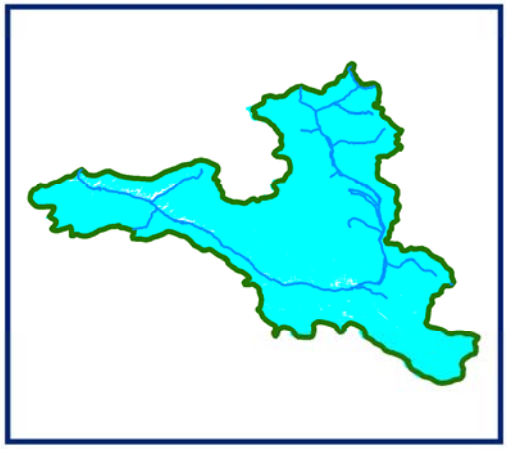


10 DECEMBER 2009

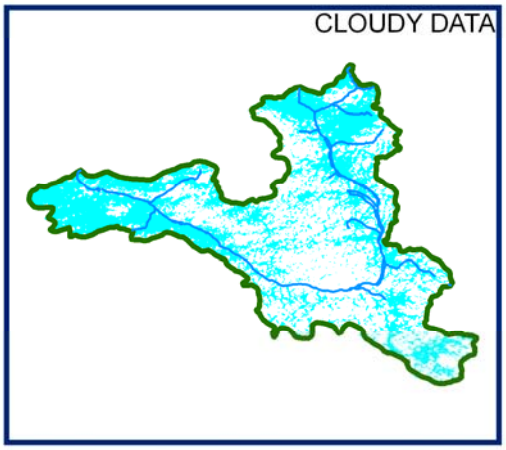


14 DECEMBER 2009

19 DECEMBER 2009



24 DECEMBER 2009



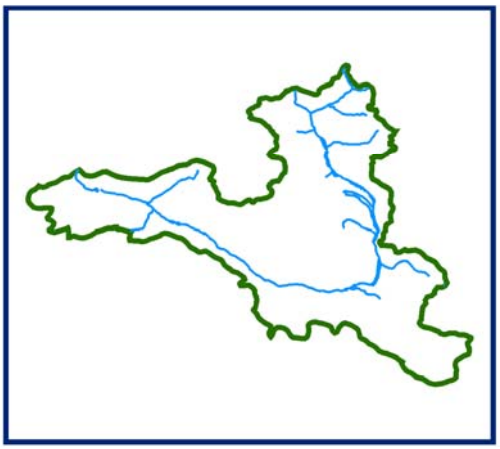
29 DECEMBER 2009

SNOW

0 10 20 40 60 80

Kilometers

10 DAILY SNOW COVER MAP : CHANDRA BASIN



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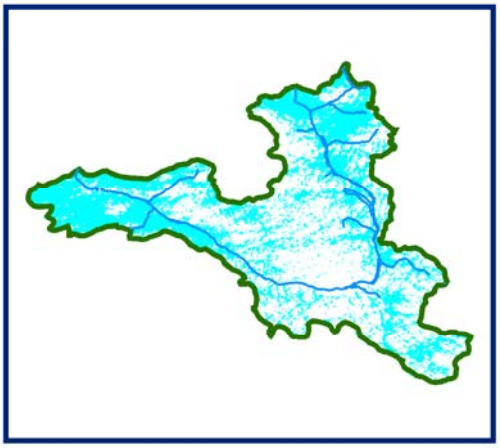
19 DECEMBER 2009



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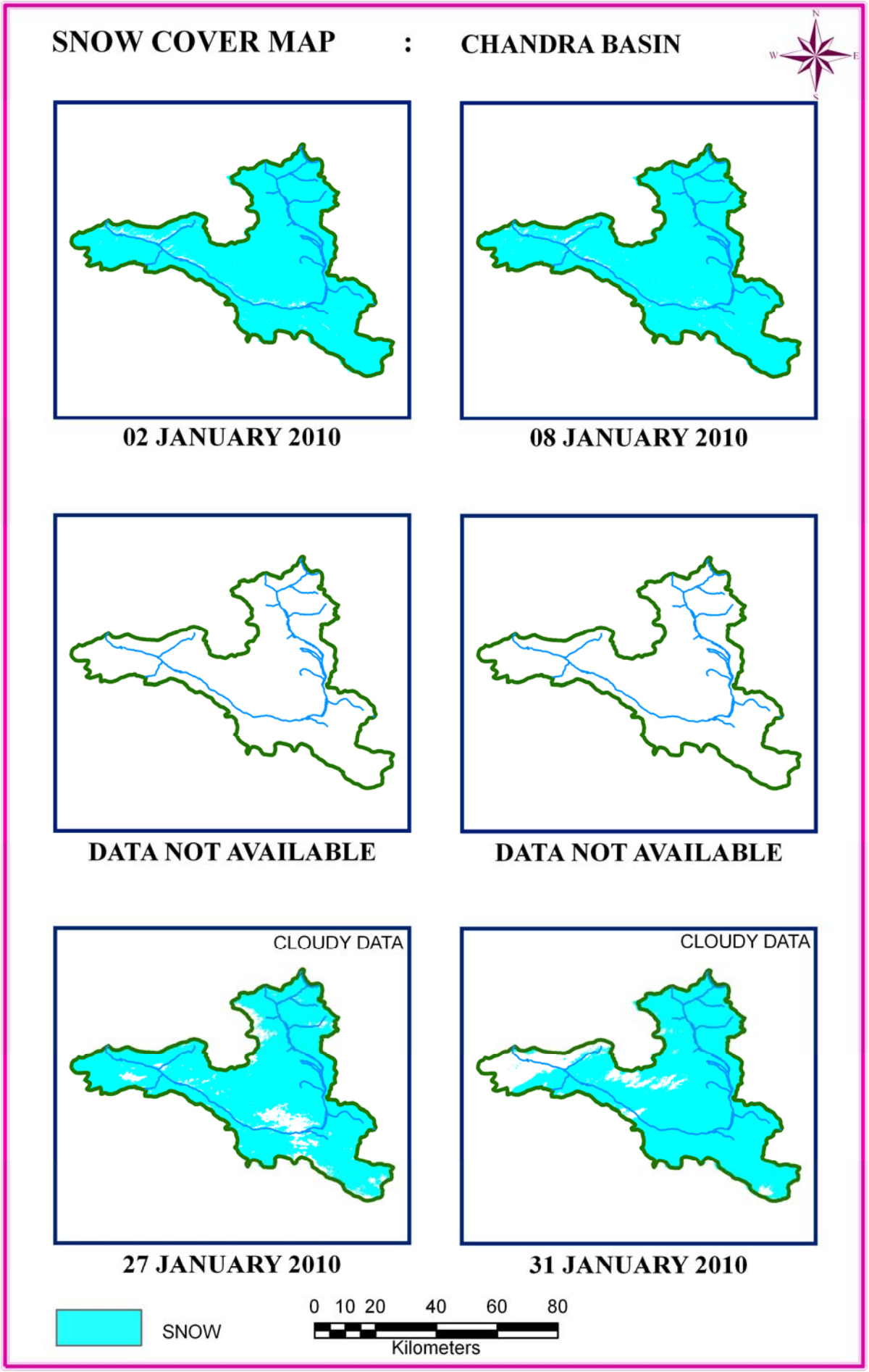
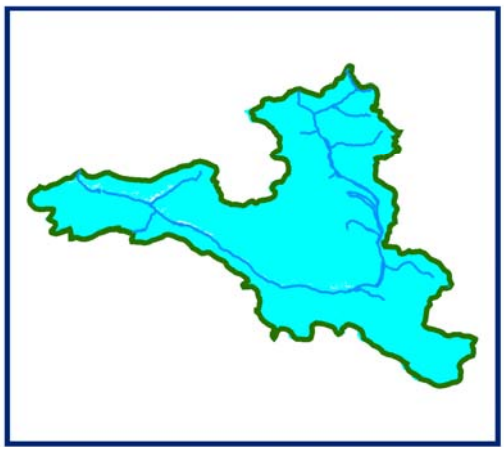
29 DECEMBER 2009

SNOW

0 10 20 40 60 80
Kilometers


SNOW COVER MAP : CHANDRA BASIN
N
W
E
S
02 JANUARY 2010
08 JANUARY 2010
DATA NOT AVAILABLE
DATA NOT AVAILABLE
CLOUDY DATA
CLOUDY DATA
27 JANUARY 2010
31 JANUARY 2010
SNOW
0 10 20 40 60 80
Kilometers

10 DAILY SNOW COVER MAP : CHANDRA BASIN



DATA USED
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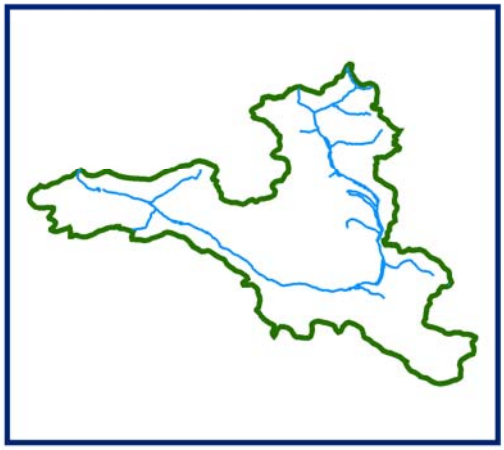
08 JANUARY 2010



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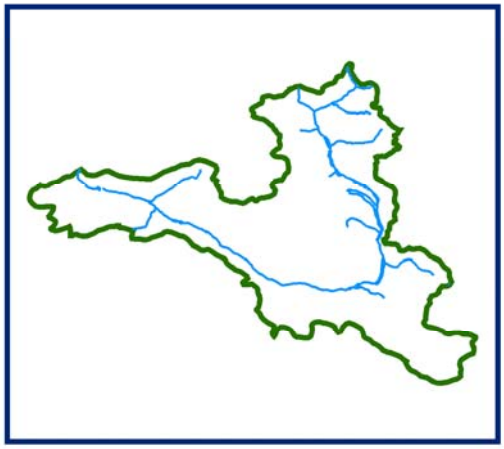

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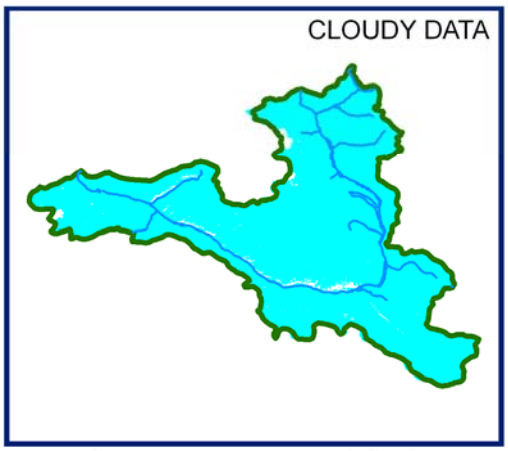
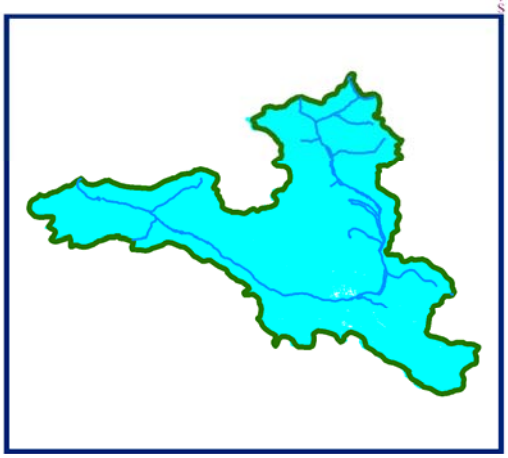
SNOW

0 10 20 40 60 80
Kilometers

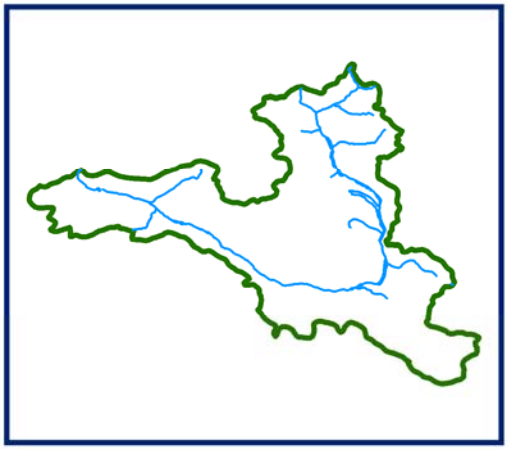
SNOW COVER MAP : CHANDRA BASIN



05 FEBRUARY 2010



10 FEBRUARY 2010



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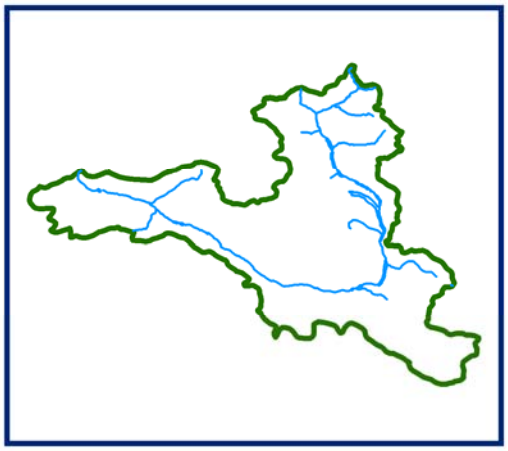

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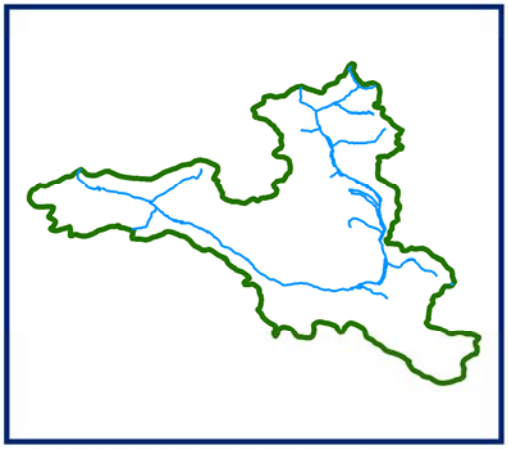

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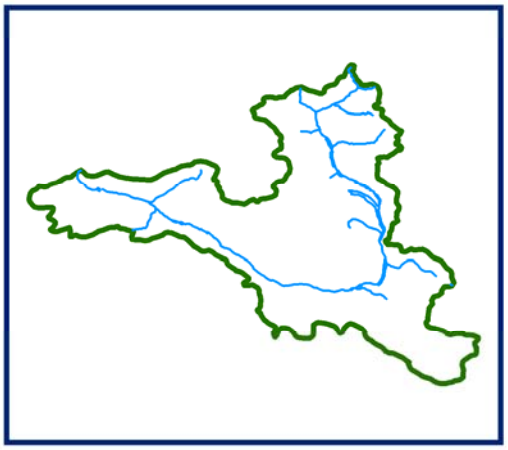


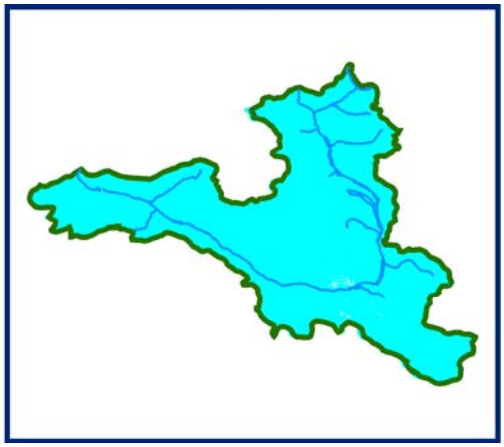
DATA NOT AVAILABLE

SNOW

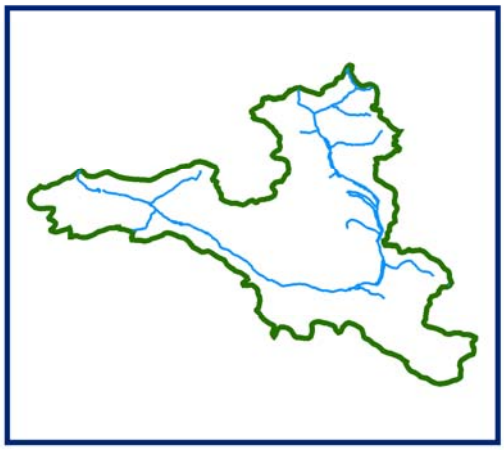
0 10 20 40 60 80

Kilometers

10 DAILY SNOW COVER MAP : CHANDRA BASIN



DATA USED
10 FEBRUARY 2010



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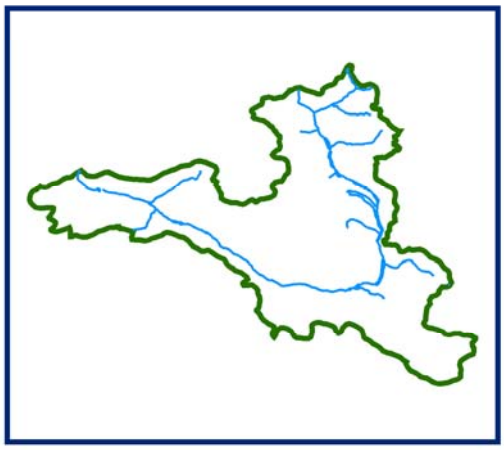
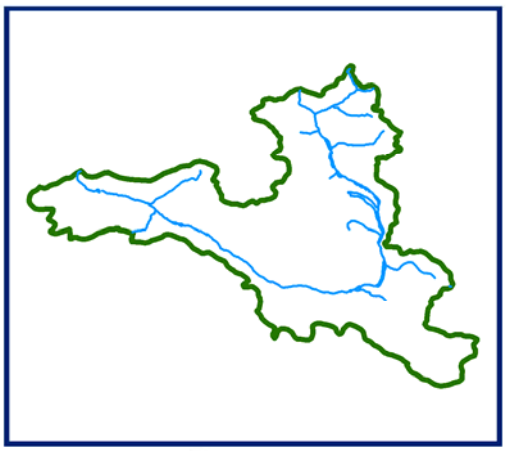


DATA USED
DATA NOT AVAILABLE

SNOW

0 10 20 40 60 80
Kilometers

SNOW COVER MAP : CHANDRA BASIN



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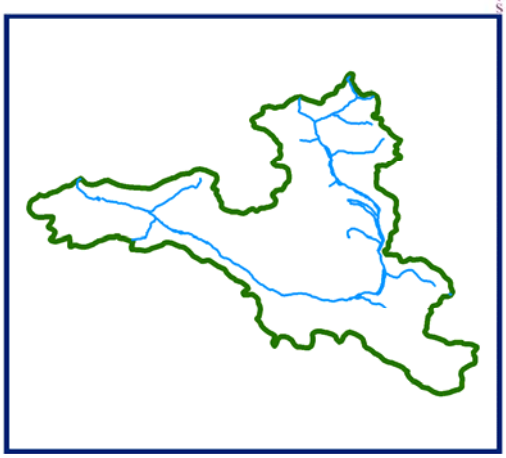

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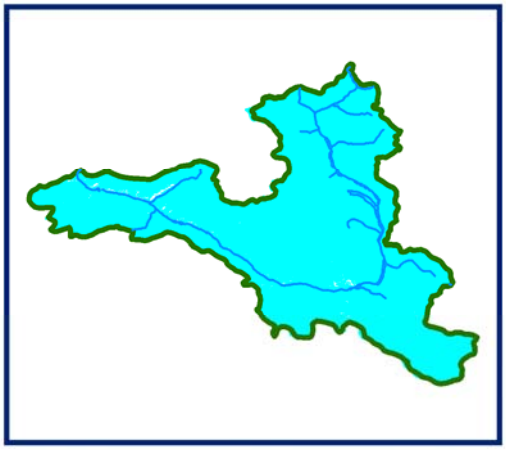
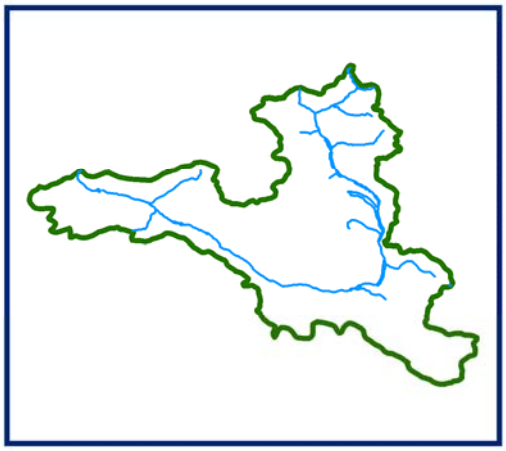


11 MARCH 2010



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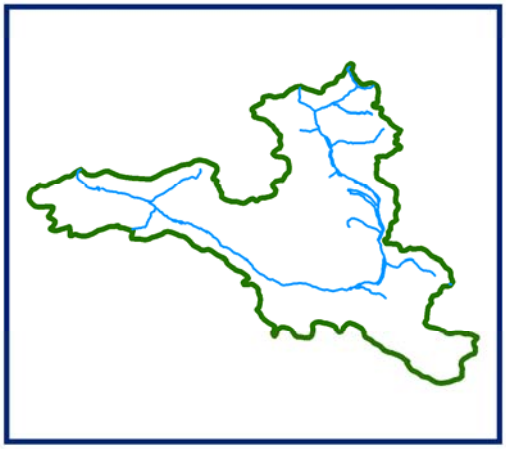

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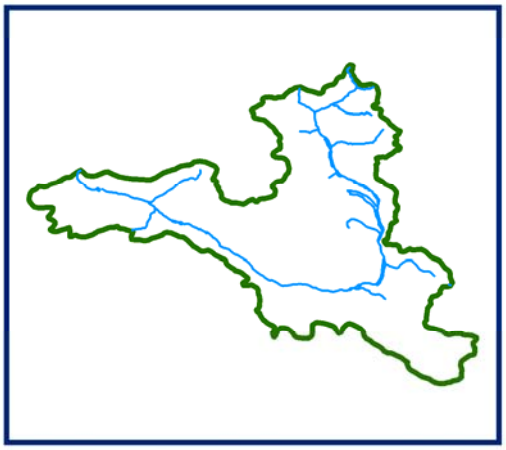


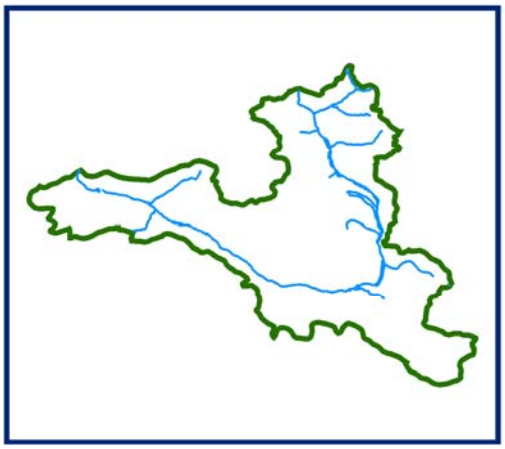
DATA NOT AVAILABLE

SNOW

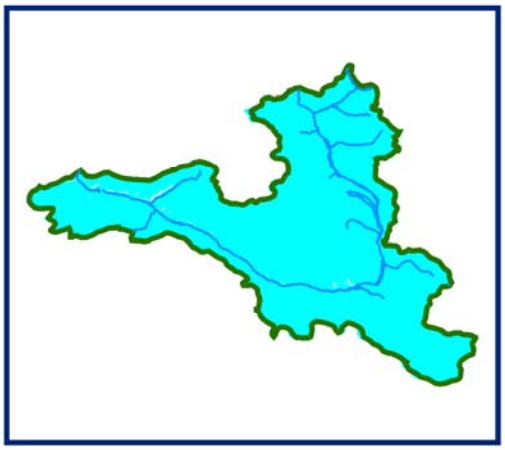
0 10 20 40 60 80

Kilometers

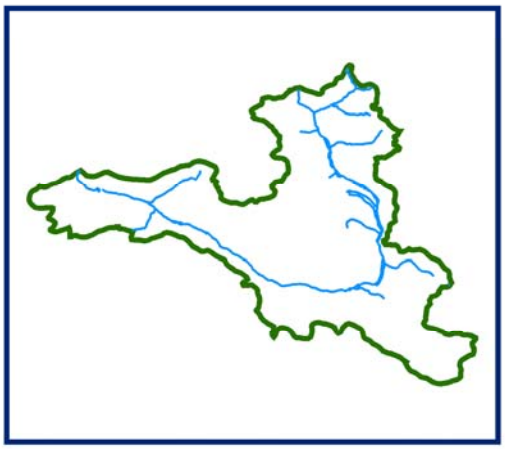
10 DAILY SNOW COVER MAP : CHANDRA BASIN



DATA USED
DATA NOT AVAILABLE



DATA USED
11 MARCH 2010



DATA USED
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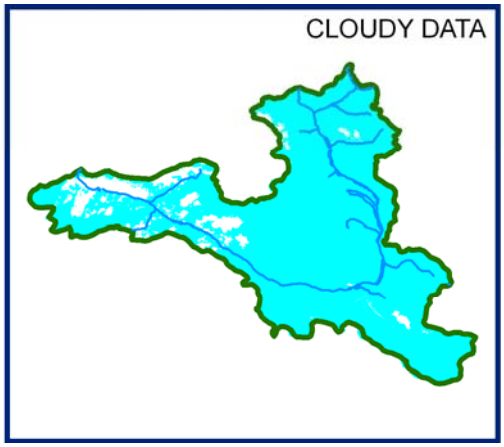
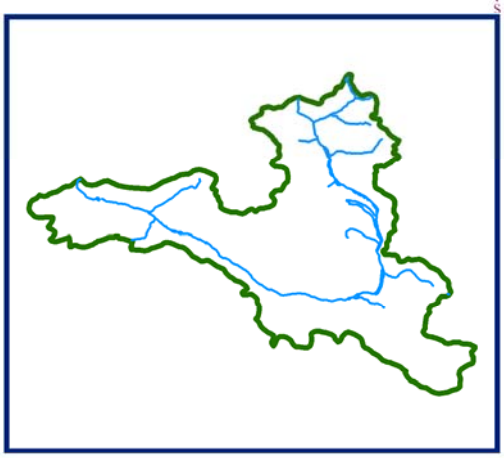
SNOW

0 10 20 40 60 80
Kilometers

SNOW COVER MAP : CHANDRA BASIN



04 APRIL 2010



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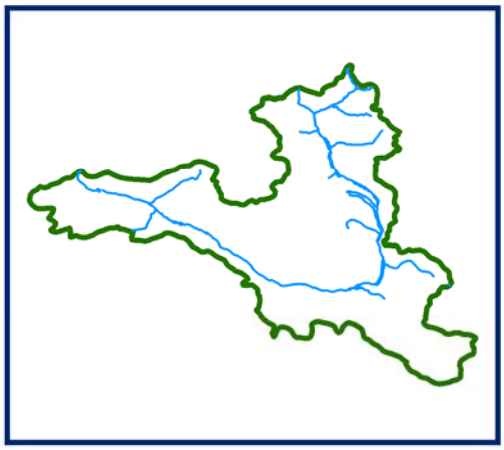

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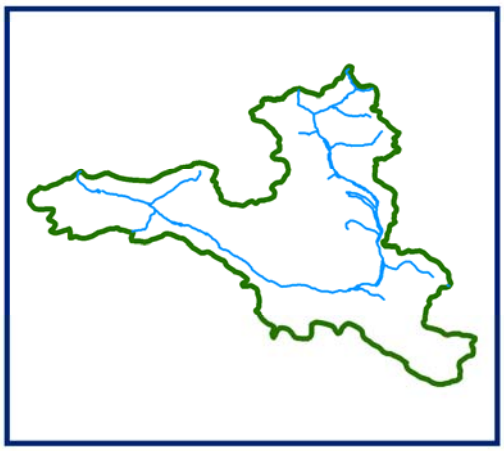

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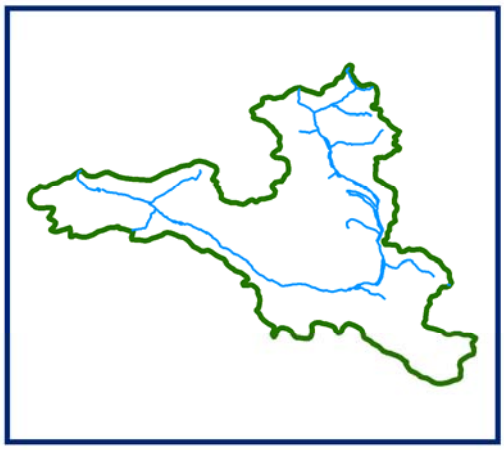

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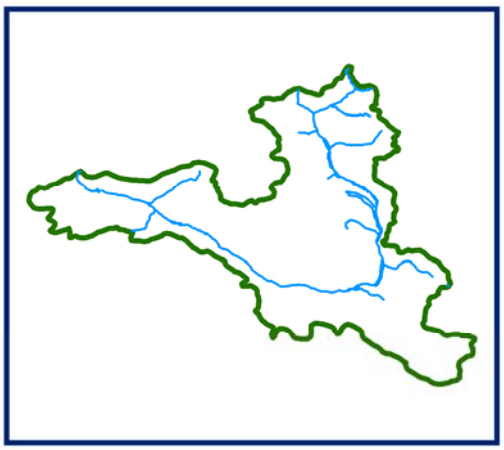


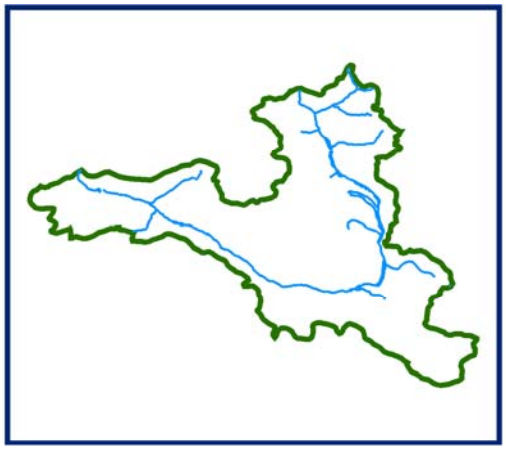
DATA NOT AVAILABLE

SNOW

0 10 20 40 60 80

Kilometers

10 DAILY SNOW COVER MAP : CHANDRA BASIN



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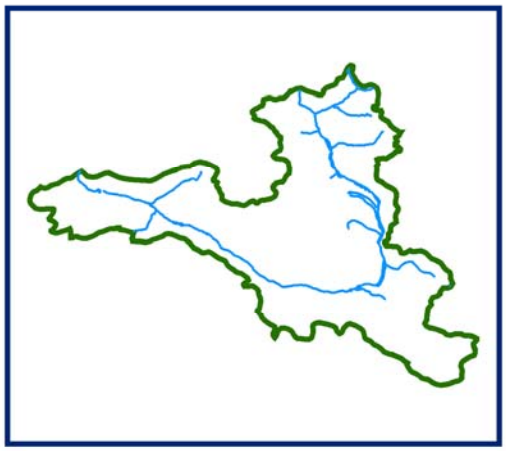

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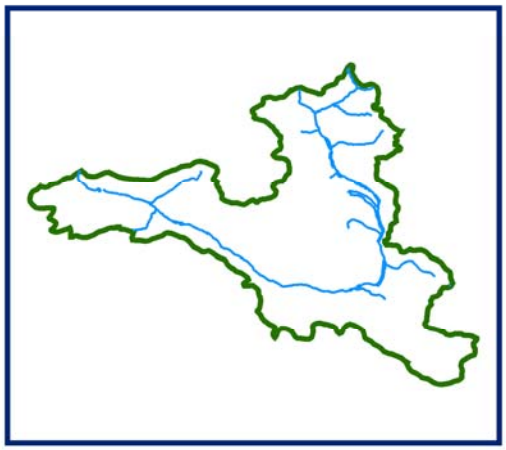

DATA USED
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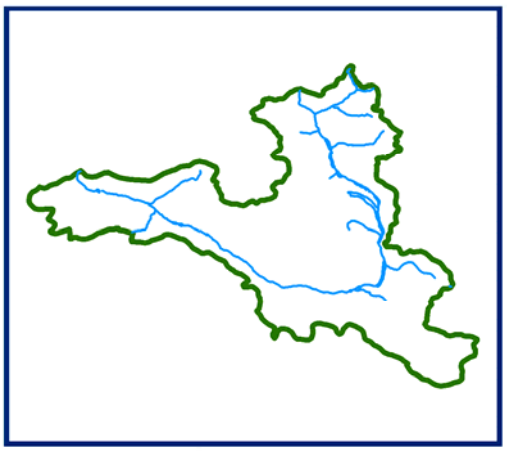
SNOW

0 10 20 40 60 80
Kilometers

SNOW COVER MAP : CHANDRA BASIN



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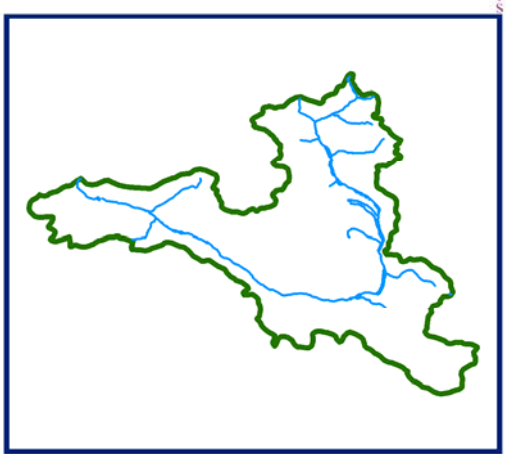

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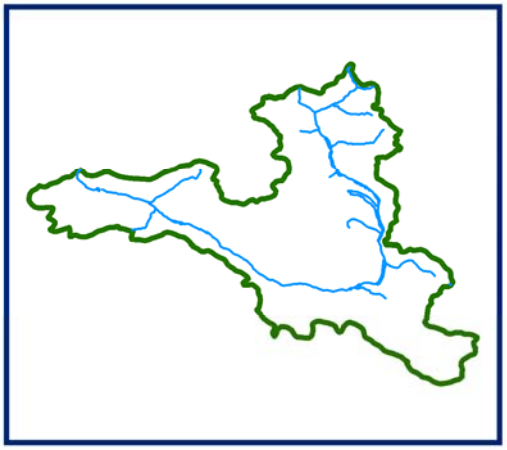

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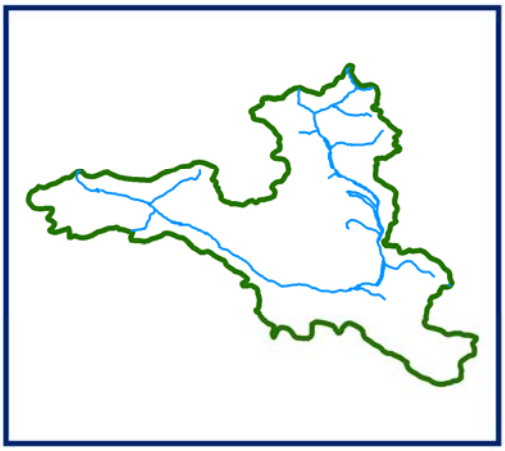

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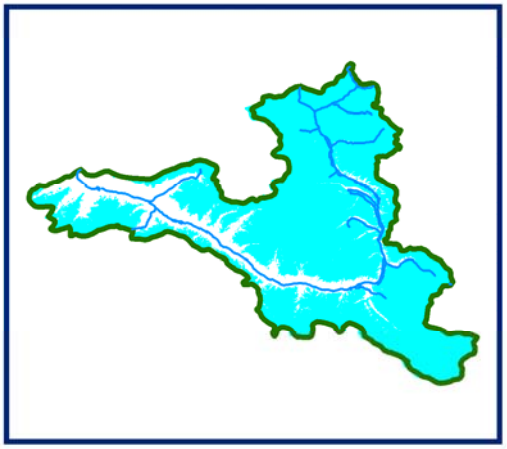
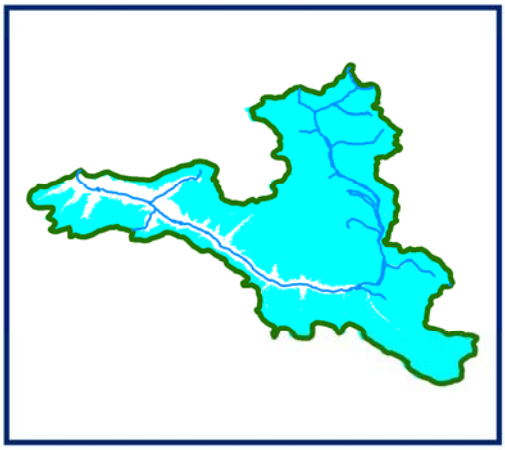


22 MAY 2010



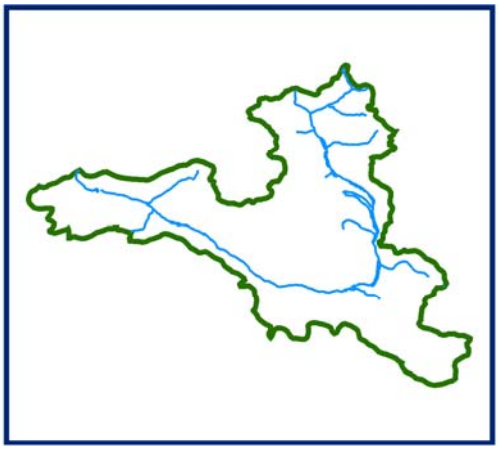
31 MAY 2010

SNOW

0 10 20 40 60 80

Kilometers

10 DAILY SNOW COVER MAP : CHANDRA BASIN



DATA USED
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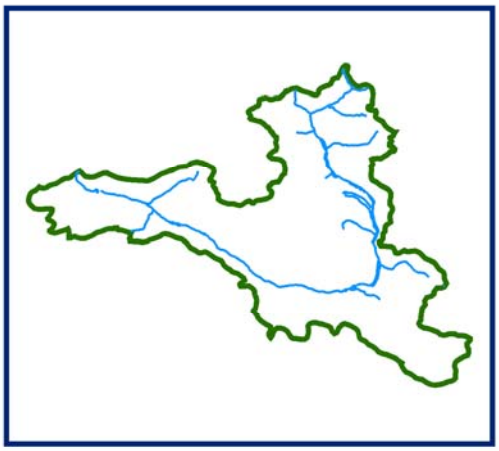

DATA USED
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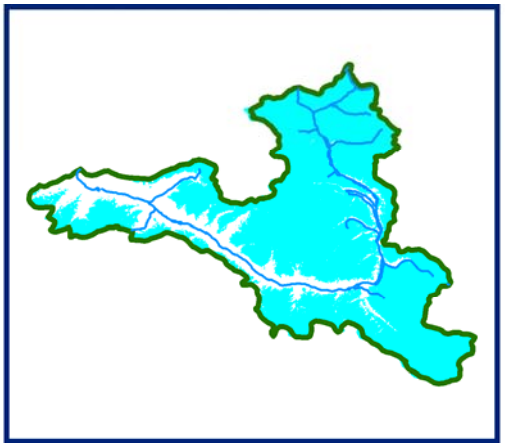
DATA USED
22 MAY 2010
26 MAY 2010
31 MAY 2010

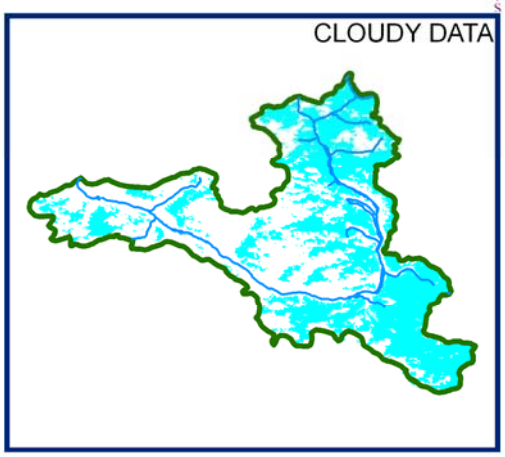
SNOW

0 10 20 40 60 80
Kilometers

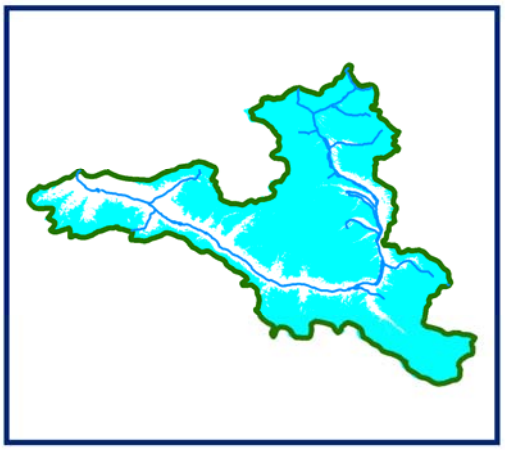
SNOW COVER MAP : CHANDRA BASIN



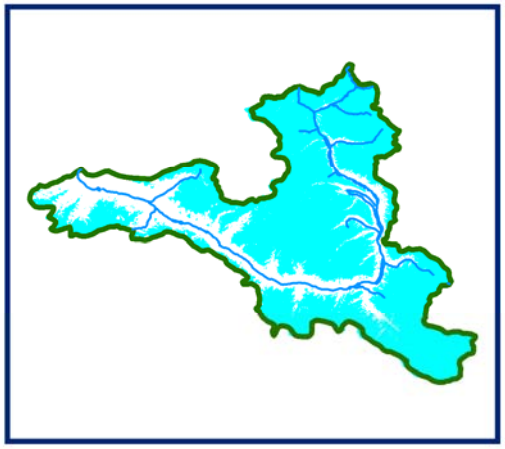
01 JUNE 2010



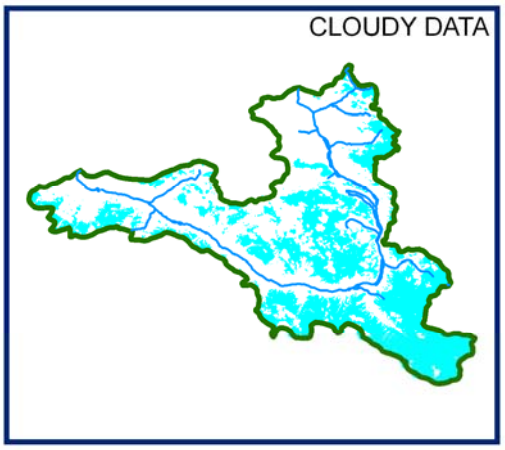
05 JUNE 2010



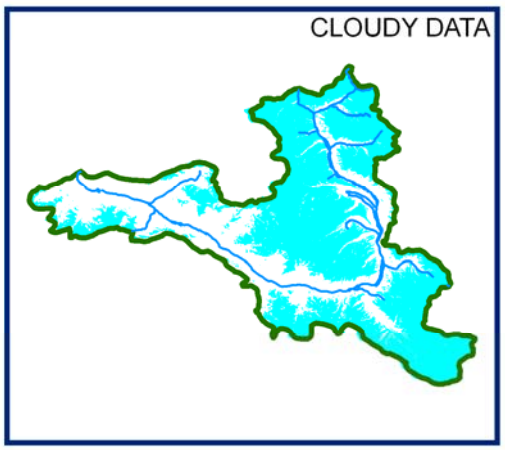
19 JUNE 2010



20 JUNE 2010



24 JUNE 2010



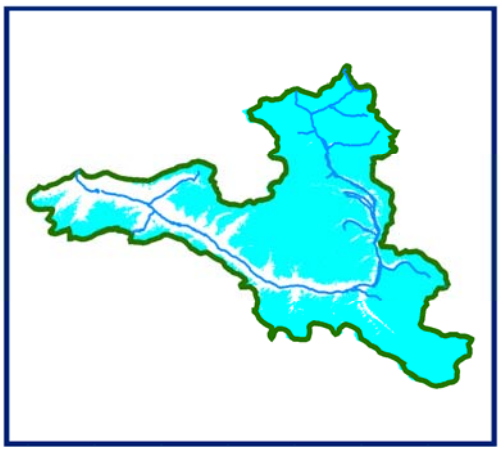
29 JUNE 2010

SNOW

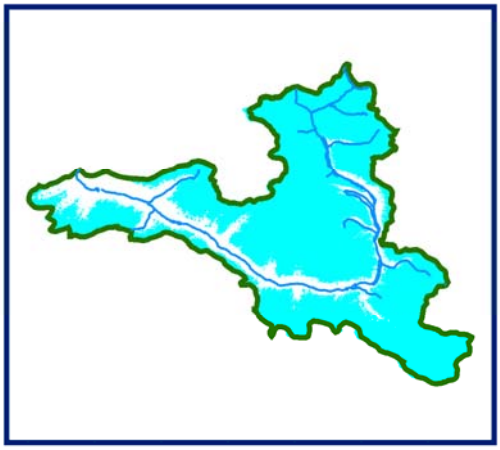
0 10 20 40 60 80

Kilometers

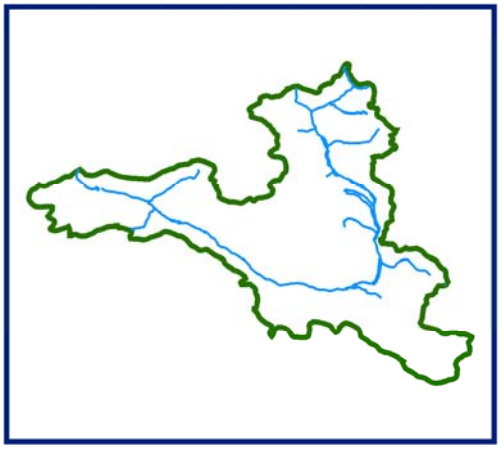
10 DAILY SNOW COVER MAP : CHANDRA BASIN



DATA USED
01 JUNE 2010



DATA USED
19 JUNE 2010
20 JUNE 2010



DATA USED
DATA NOT AVAILABLE

SNOW

0 10 20 40 60 80
Kilometers

BHAGA BASIN

AREAL EXTENT OF SNOW (5 DAILY)

BASIN NAME: BHAGA **BASIN AREA: 1680 sq km**

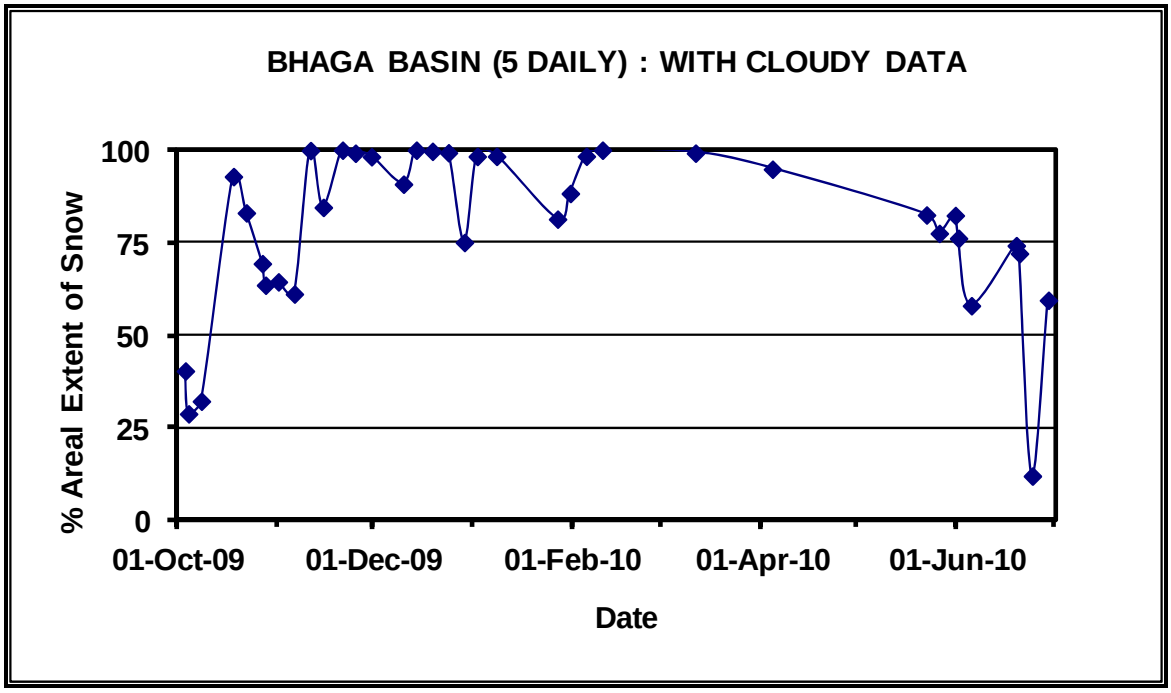
S No	Date	Snow cover (sq km)	Snow cover (%)	S No	Date	Snow cover (sq km)	Snow cover (%)
October 2009							
1	3-Oct-09	678.5	40	2	4-Oct-09	483.7	29
3	8-Oct-09	541.0	32	4	18-Oct-09	1560.6	93
5	22-Oct-09	1395.9	83	6	27-Oct-09	1165.3	69
7	28-Oct-09	1067.8	64				
November 2009							
8	1-Nov-09	1082.5	64	9	6-Nov-09	1027.5	61
10	11-Nov-09	1678.4	100	11	15-Nov-09	1420.7	85
12	21-Nov-09	1680.0	100	13	25-Nov-09	1666.5	99
14	30-Nov-09	1650.2	98				
December 2009							
15	10-Dec-09	1525.9	91	16	14-Dec-09	1680.0	100
17	19-Dec-09	1675.3	100	18	24-Dec-09	1668.8	99
19	29-Dec-09	1261.6	75				
January 2010							
20	2-Jan-10	1651.8	98	21	8-Jan-10	1652.3	98
22	27-Jan-10	1367.3	81	23	31-Jan-10	1483.9	88
February 2010							
24	5-Feb-10	1652.4	98	25	10-Feb-10	1680.0	100
March 2010							
26	11-Mar-10	1666.8	99				
April 2010							
27	4-Apr-10	1594.0	95				
May 2010							
28	22-May-10	1386.3	83	29	26-May-10	1302.5	78
30	31-May-10	1384.2	82				
June 2010							
31	1-Jun-10	1280.0	76	32	5-Jun-10	974.7	58
33	19-Jun-10	1247.1	74	34	20-Jun-10	1211.1	72
35	24-Jun-10	201.8	12	36	29-Jun-10	999.1	59
July 2010							
37	14-Jul-10	890.5	53				

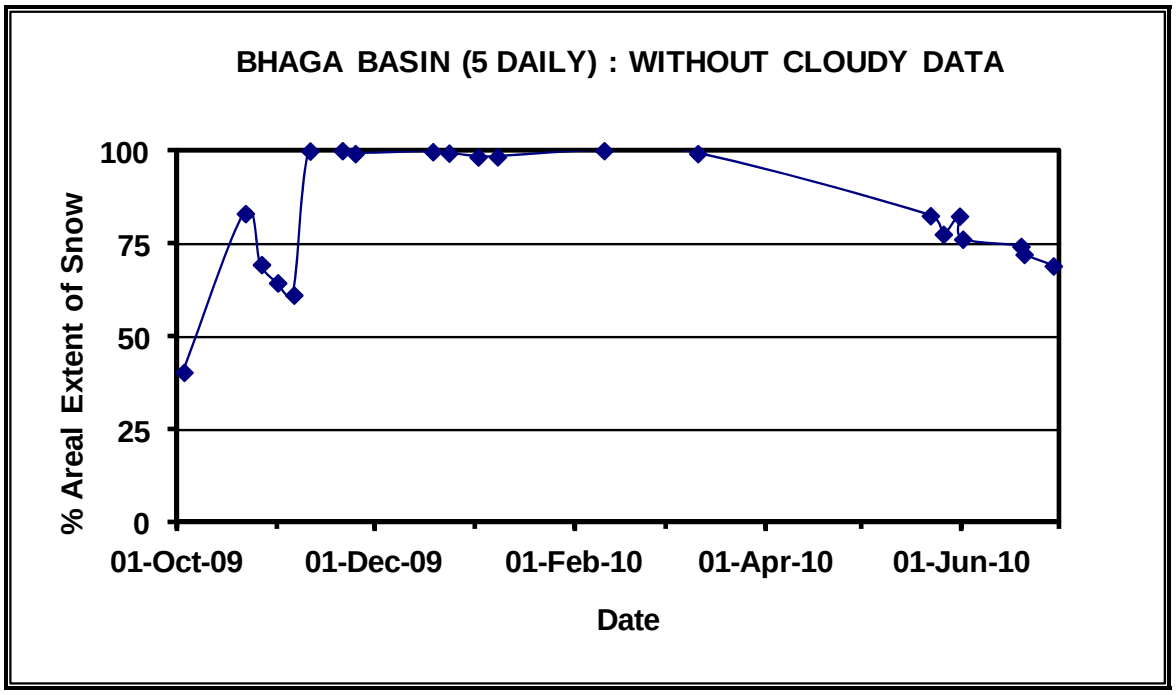
AREAL EXTENT OF SNOW (10 DAILY)

BASIN NAME: BHAGA **BASIN AREA: 1680 sq km**

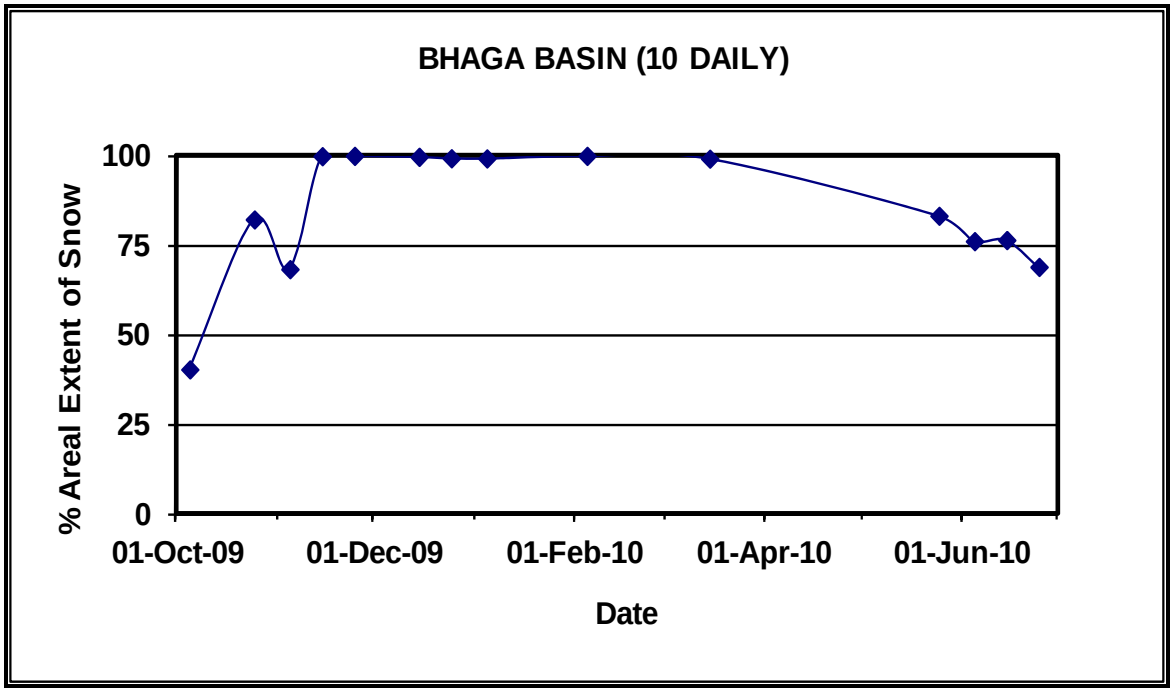
S No	Date	Snow cover (sq km)	Snow cover (%)	S No	Date	Snow cover (sq km)	Snow cover (%)
October 2009				**November 2009**			
1	3-Oct-09	678.5	40	3	1-Nov-09	1148.7	68
2	22-Oct-09	1381.7	82	4	11-Nov-09	1678.4	100
				5	21-Nov-09	1680.0	100
December 2009				**January 2010**			
6	19-Dec-09	1675.3	100	8	2-Jan-10	1667.7	99
7	24-Dec-09	1668.8	99				
February 2010				**March 2010**			
9	10-Feb-10	1680.0	100	10	11-Mar-10	1666.8	99
April 2010				**May 2010**			
				11	26-May-10	1398.9	83
June 2010				**July2010**			
12	1-Jun-10	1280.0	76	15	14-Jul-10	890.5	53
13	19-Jun-10	1285.0	76				
14	29-Jun-10	999.1	59				

Snow cover depletion curve



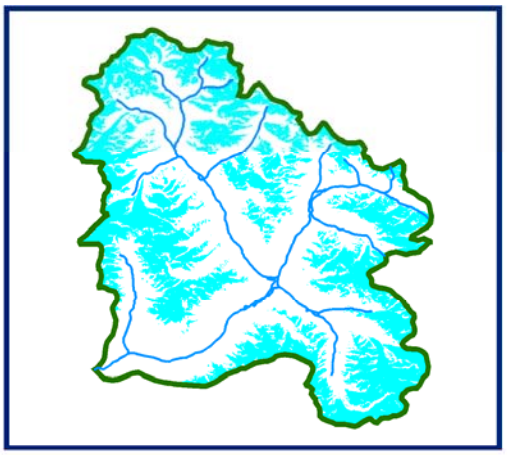


Snow cover depletion curve

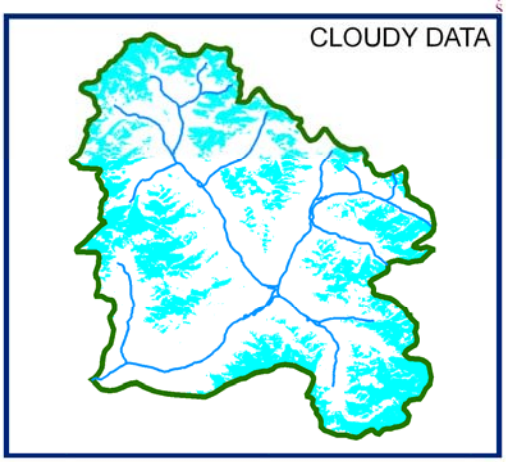


SNOW COVER MAP

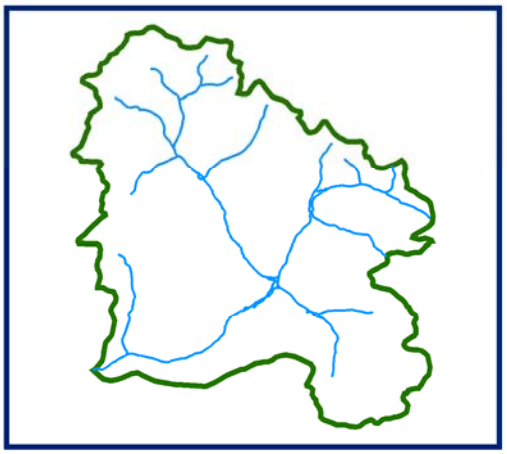
SNOW COVER MAP : BHAGA BASIN



03 OCTOBER 2009



08 OCTOBER 2009



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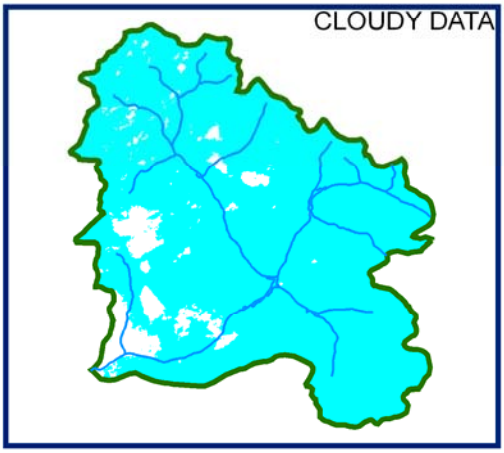
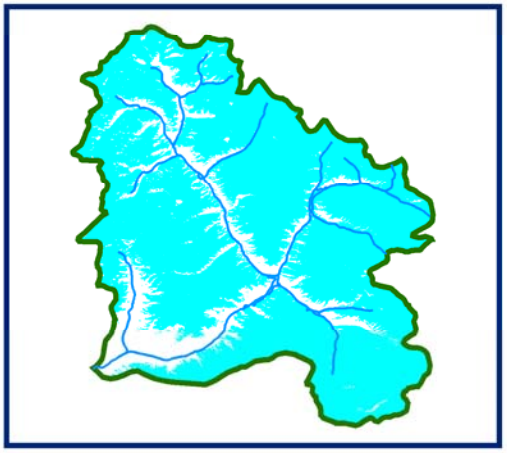
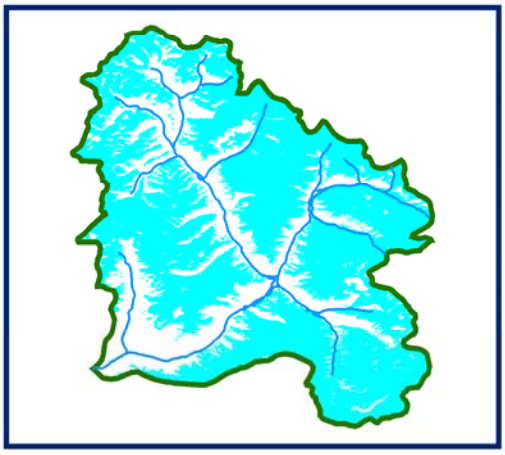


18 OCTOBER 2009



22 OCTOBER 2009



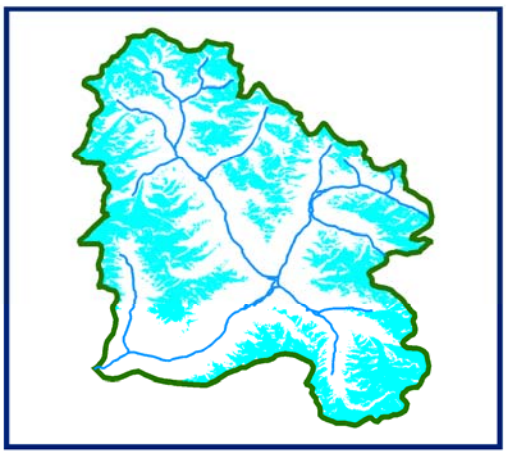
27 OCTOBER 2009

SNOW

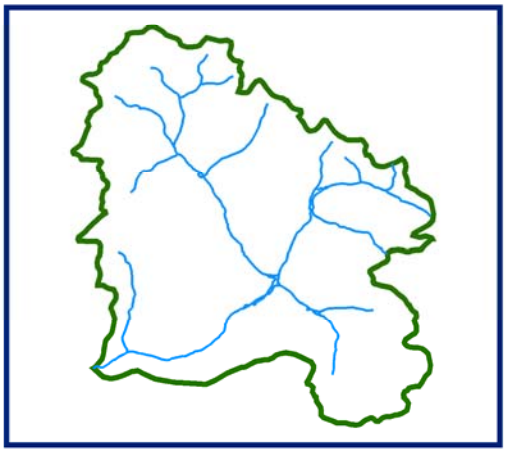
0 5 10 20 30 40

Kilometers

10 DAILY SNOW COVER MAP : BHAGA BASIN



DATA USED
03 OCTOBER 2009



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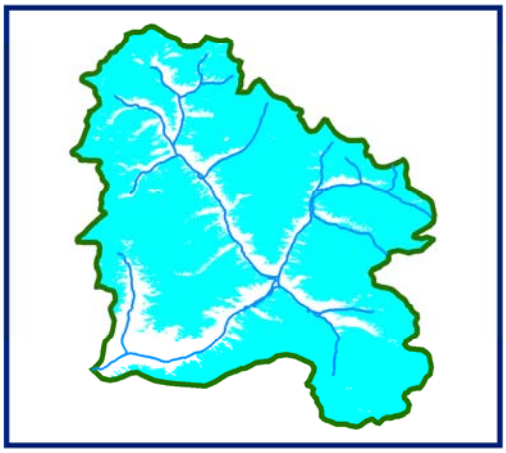
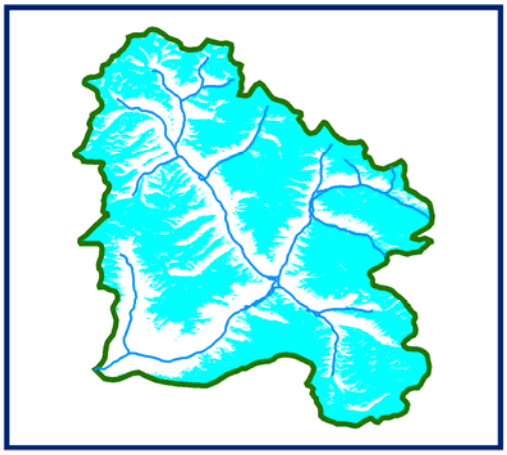


DATA USED
22 OCTOBER 2009
27 OCTOBER 2009

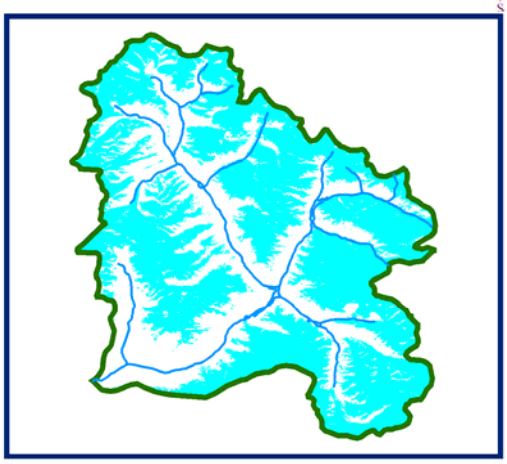
SNOW

0 5 10 20 30 40
Kilometers

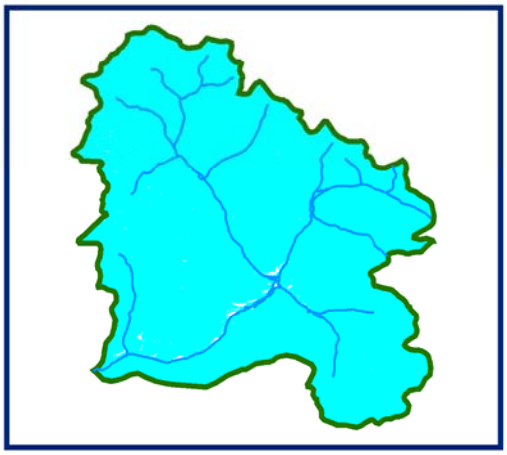
SNOW COVER MAP : BHAGA BASIN



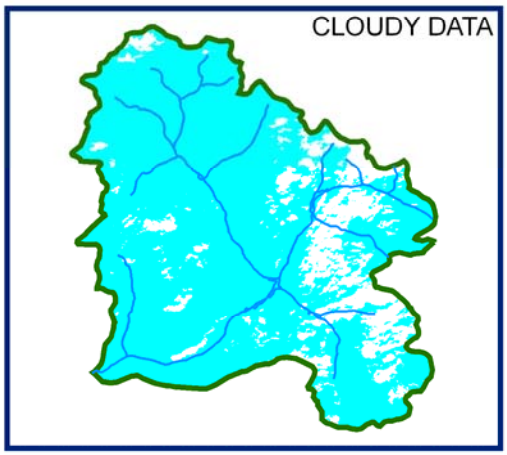
01 NOVEMBER 2009



06 NOVEMBER 2009



11 NOVEMBER 2009



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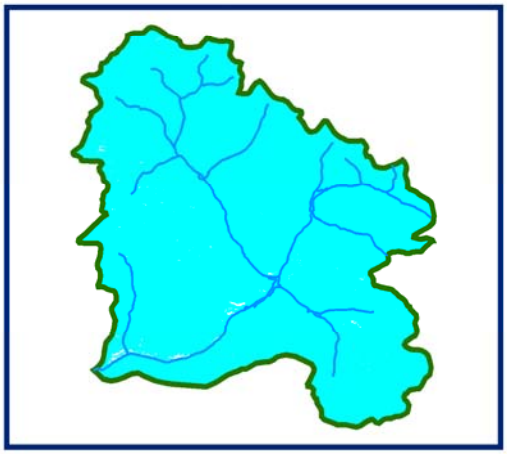
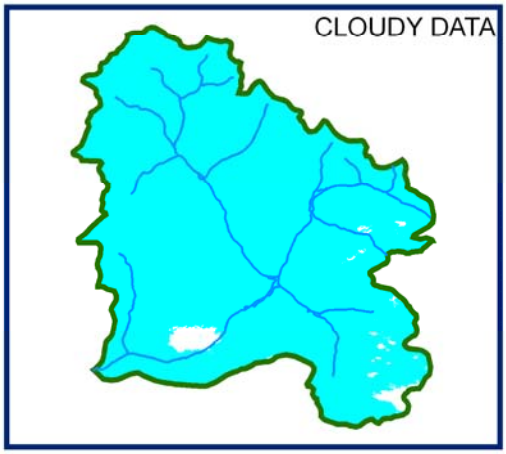


21 NOVEMBER 2009

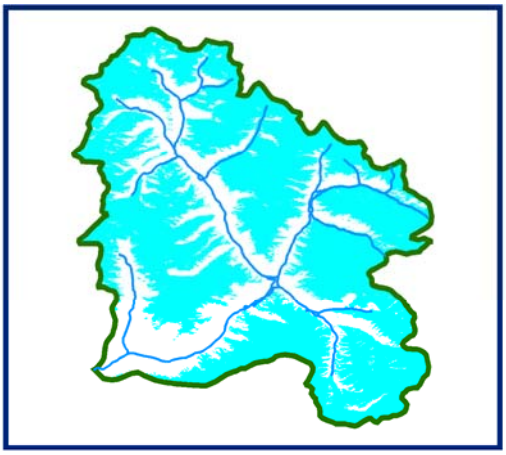


30 NOVEMBER 2009

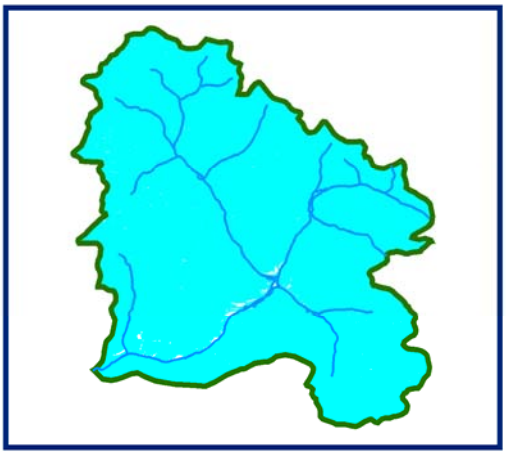
SNOW

0 5 10 20 30 40
Kilometers

10 DAILY SNOW COVER MAP : BHAGA BASIN



DATA USED
01 NOVEMBER 2009
06 NOVEMBER 2009



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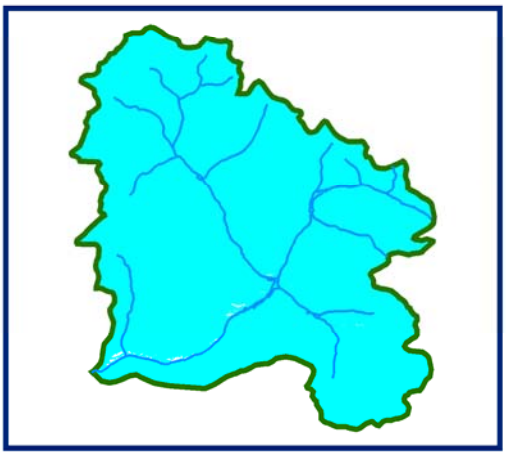
11 NOVEMBER 2009

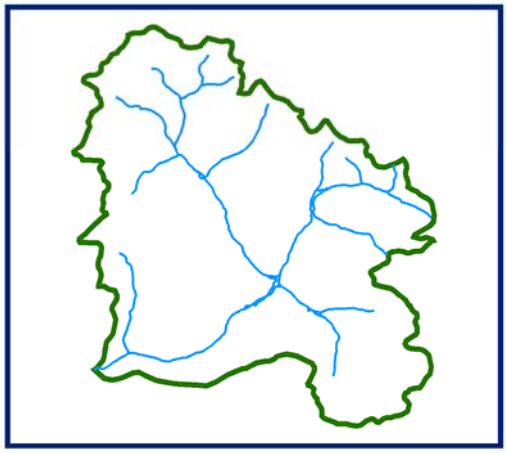


DATA USED
21 NOVEMBER 2009
25 NOVEMBER 2009

SNOW

0 5 10 20 30 40
Kilometers

SNOW COVER MAP : BHAGA BASIN



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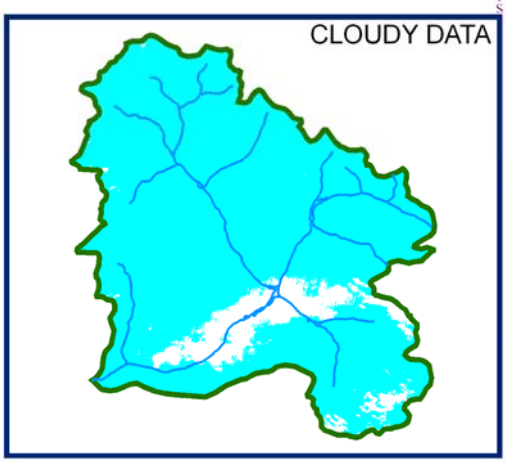
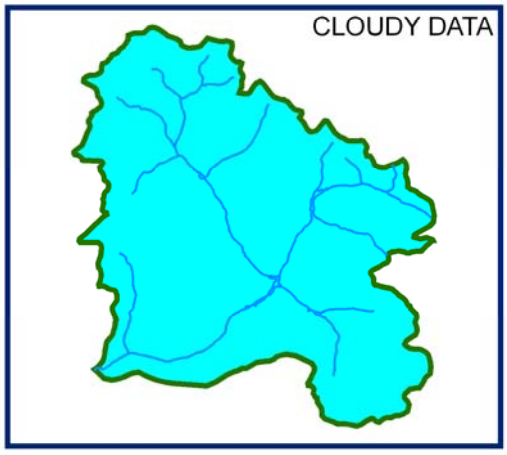
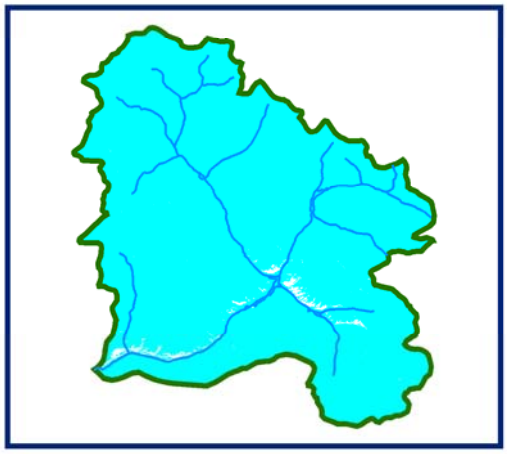


10 DECEMBER 2009

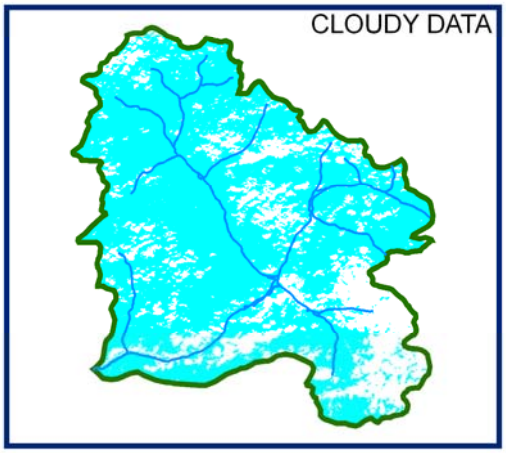


14 DECEMBER 2009

19 DECEMBER 2009



24 DECEMBER 2009

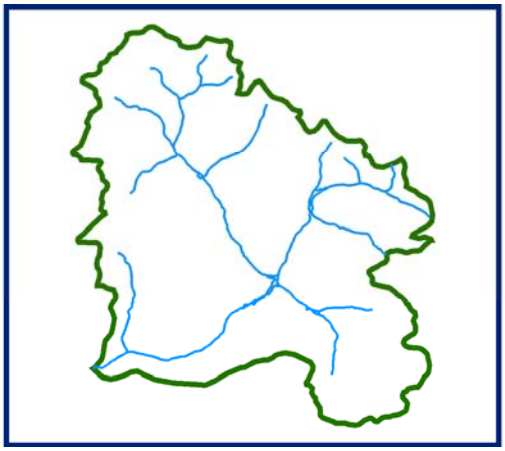


29 DECEMBER 2009

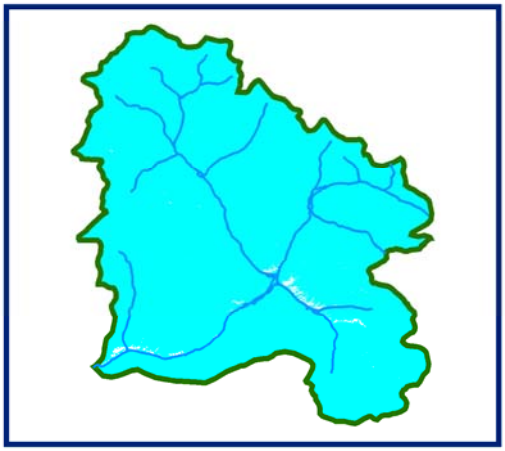
SNOW

0 5 10 20 30 40
Kilometers

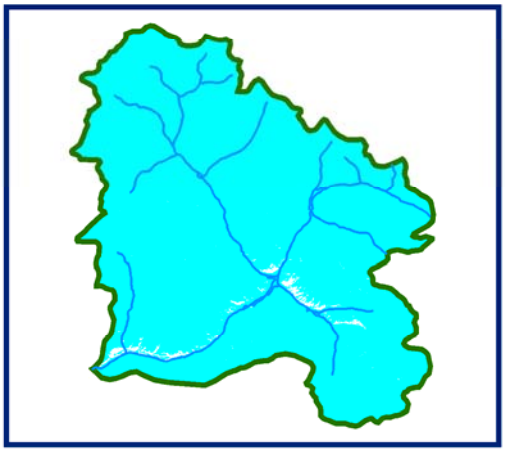
10 DAILY SNOW COVER MAP : BHAGA BASIN



DATA USED
DATA NOT AVAILABLE



DATA USED
19 DECEMBER 2009



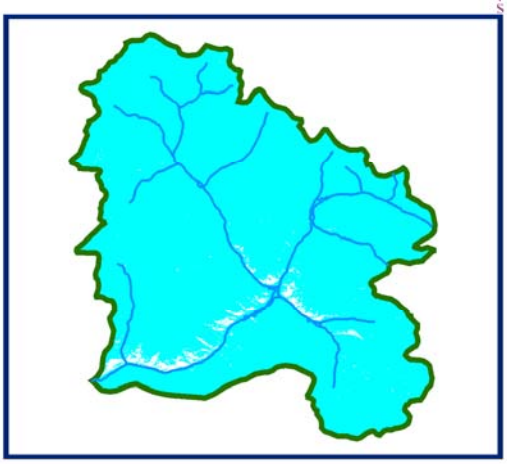
DATA USED
24 DECEMBER 2009

SNOW

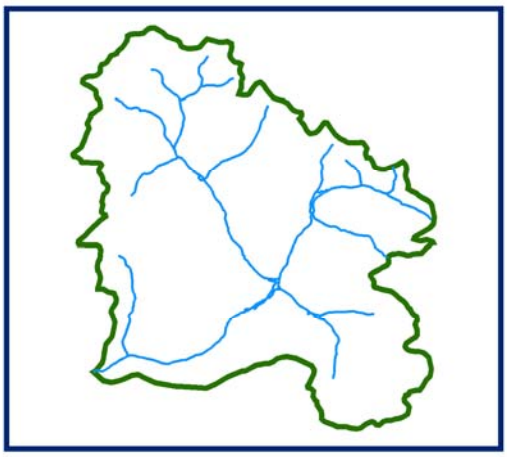
0 5 10 20 30 40
Kilometers

SNOW COVER MAP : BHAGA BASIN

02 JANUARY 2010



08 JANUARY 2010



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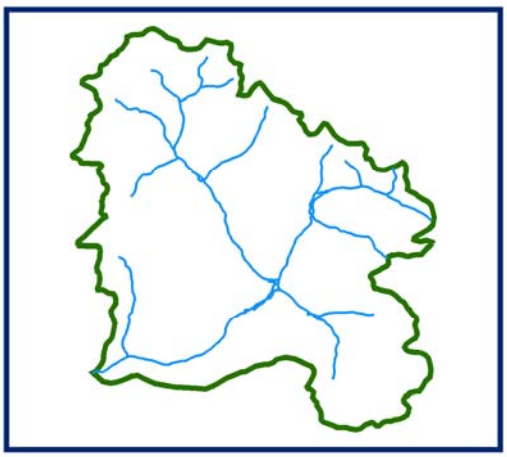

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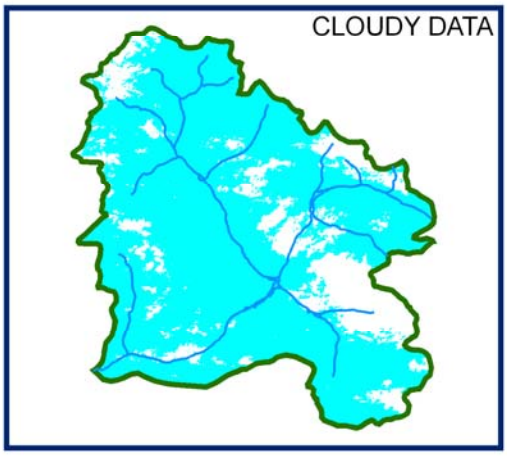
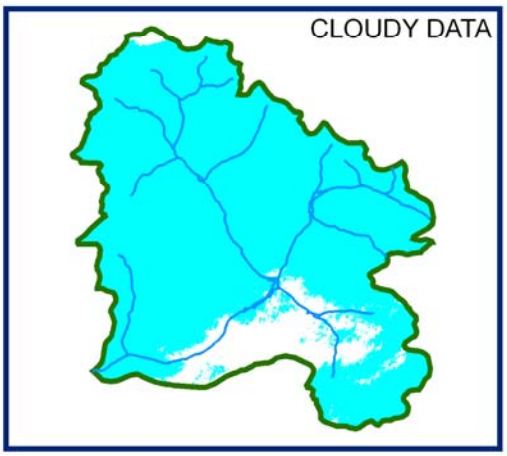


27 JANUARY 2010

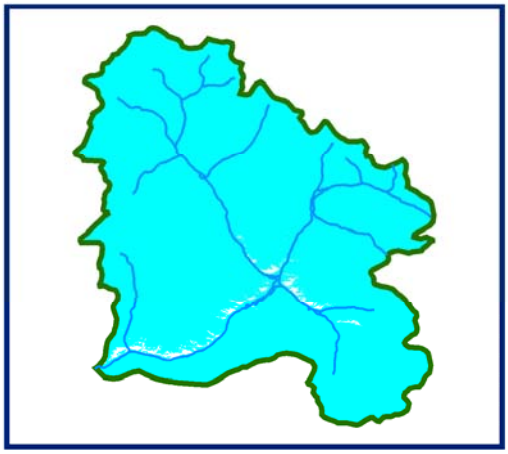


31 JANUARY 2010

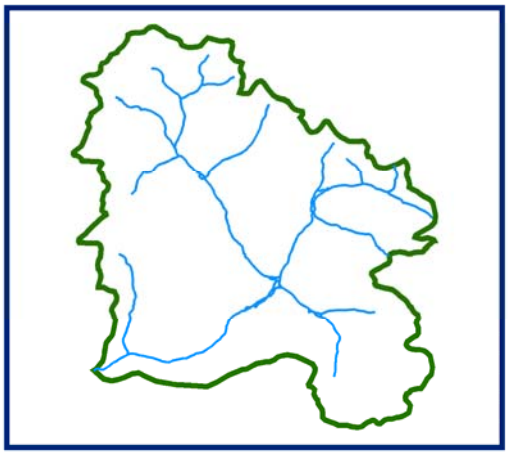
SNOW

0 5 10 20 30 40
Kilometers

10 DAILY SNOW COVER MAP : BHAGA BASIN



DATA USED
02 JANUARY 2010
08 JANUARY 2010



DATA USED
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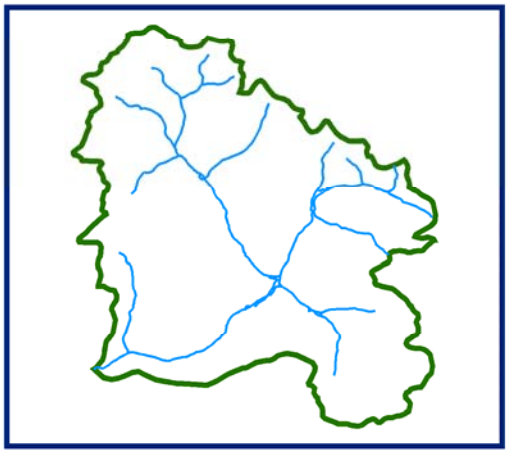
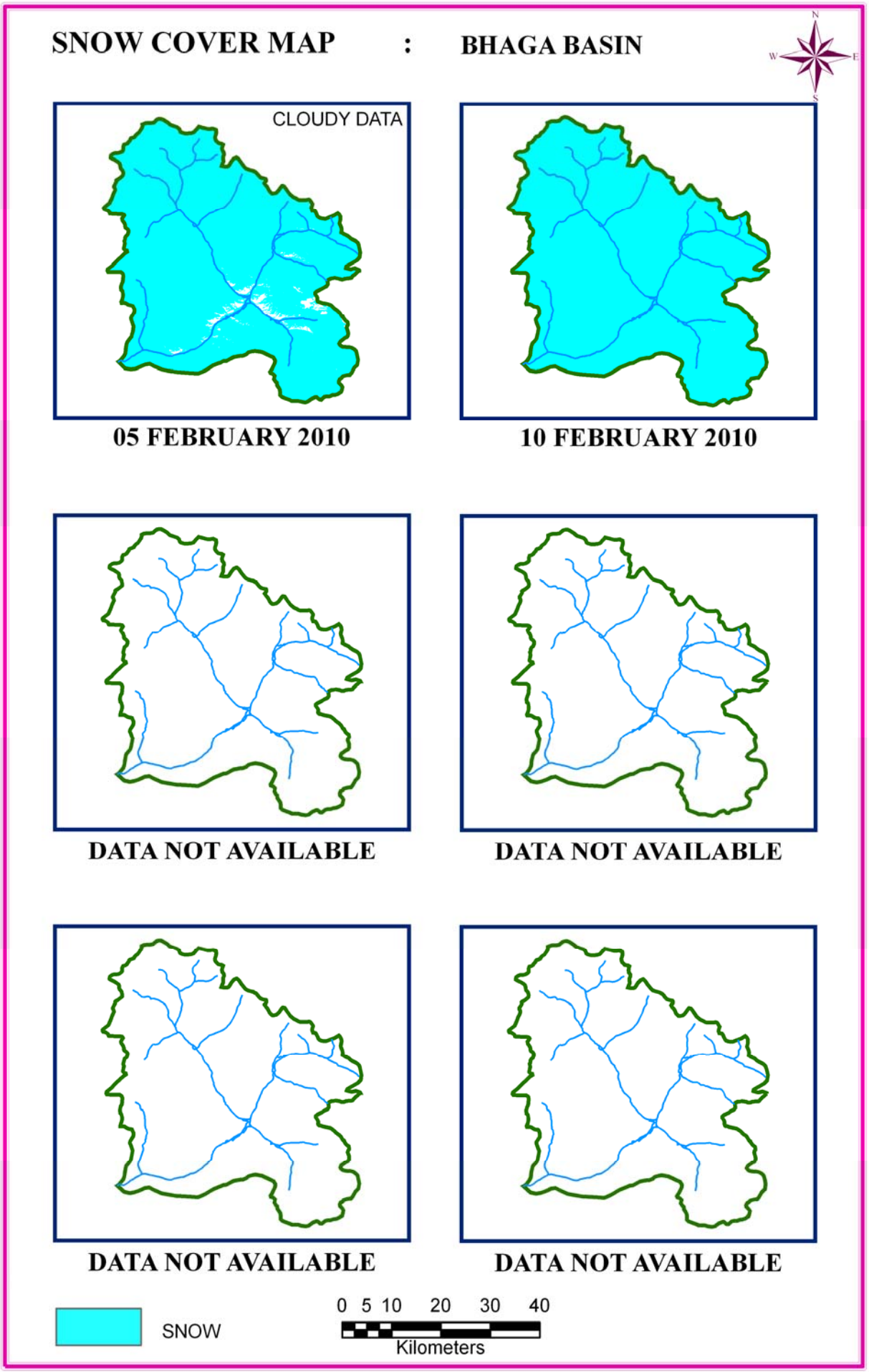


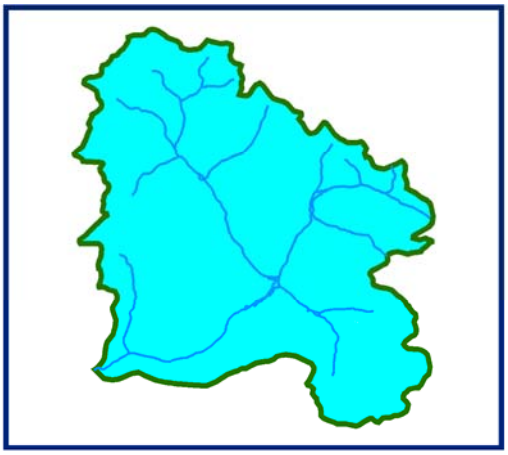
DATA USED
DATA NOT AVAILABLE

SNOW

0 5 10 20 30 40
Kilometers


SNOW COVER MAP : BHAGA BASIN
N
W
E
S
CLOUDY DATA
05 FEBRUARY 2010
10 FEBRUARY 2010
DATA NOT AVAILABLE
DATA NOT AVAILABLE
DATA NOT AVAILABLE
DATA NOT AVAILABLE
SNOW
0 5 10 20 30 40
Kilometers

10 DAILY SNOW COVER MAP : BHAGA BASIN



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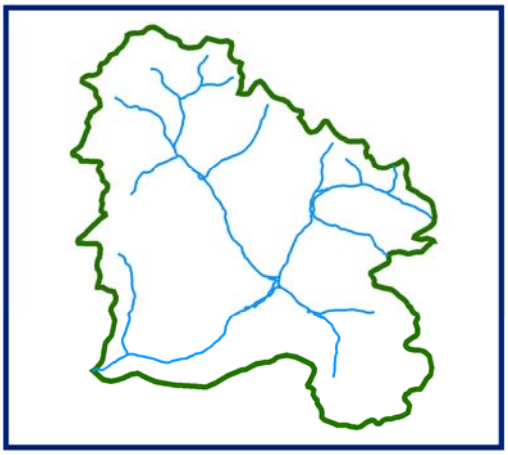

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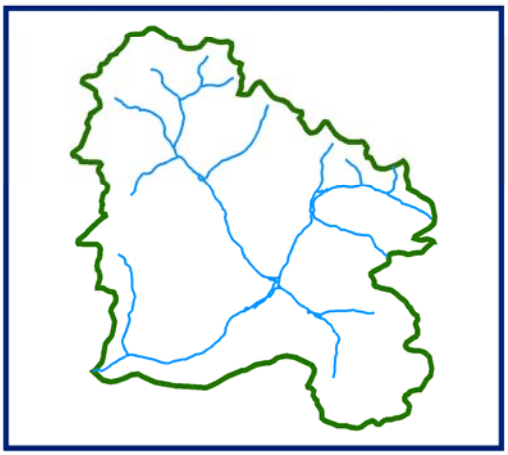
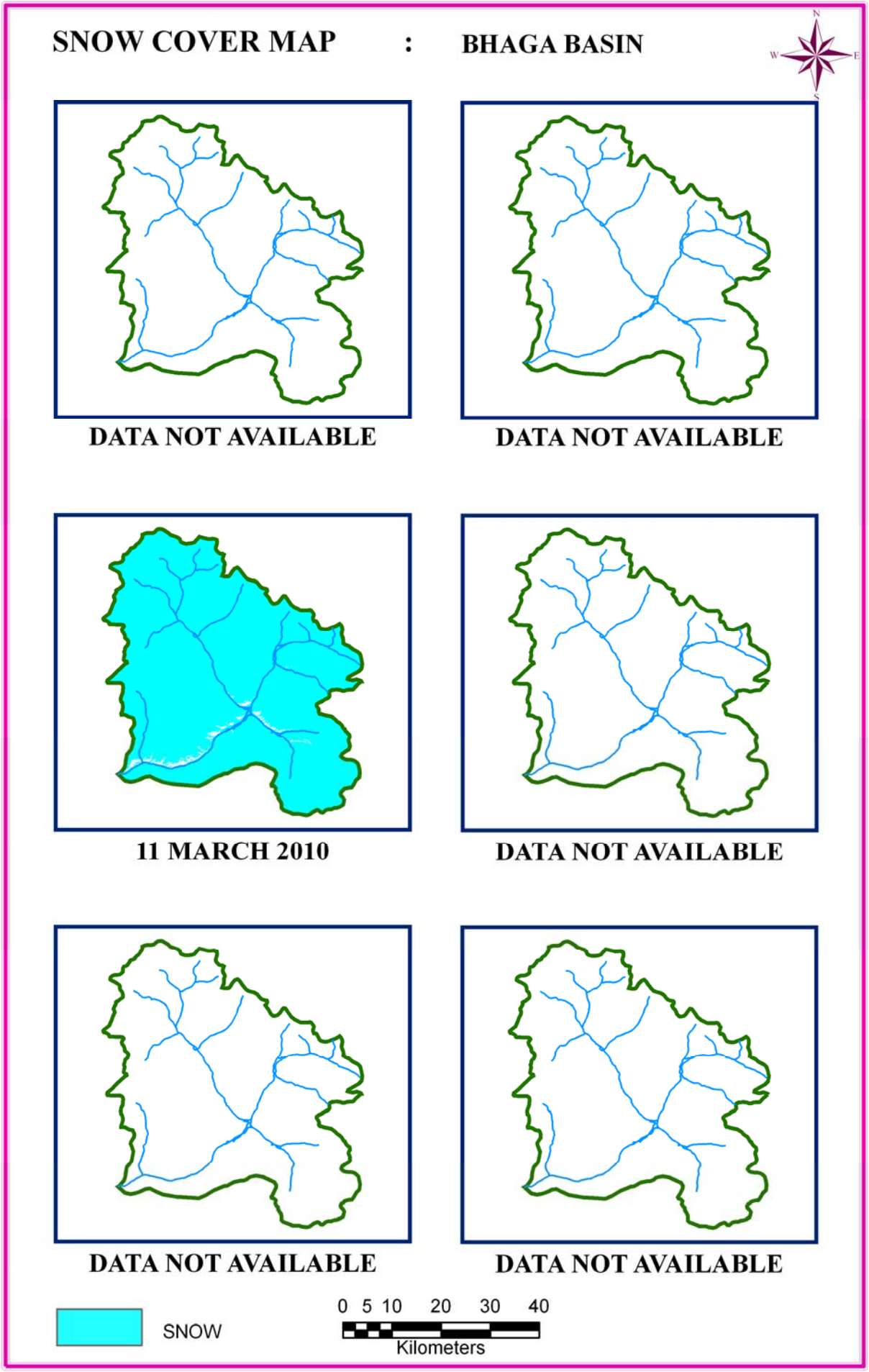


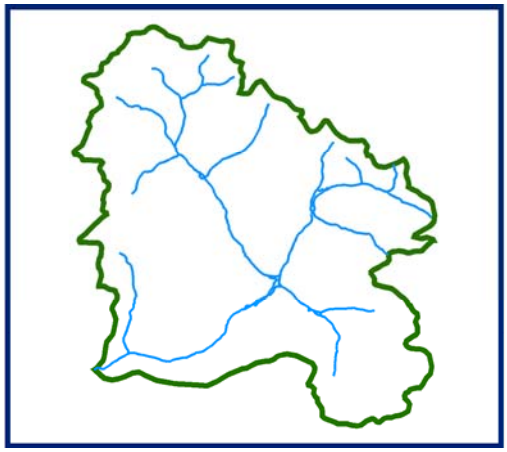
DATA USED
DATA NOT AVAILABLE

SNOW

0 5 10 20 30 40
Kilometers

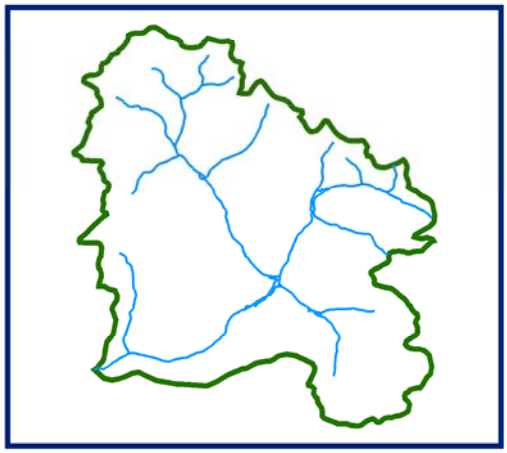

SNOW COVER MAP : BHAGA BASIN
N
W
E
S
DATA NOT AVAILABLE
DATA NOT AVAILABLE
11 MARCH 2010
DATA NOT AVAILABLE
DATA NOT AVAILABLE
DATA NOT AVAILABLE
SNOW
0 5 10 20 30 40
Kilometers

10 DAILY SNOW COVER MAP : BHAGA BASIN



DATA USED
DATA NOT AVAILABLE

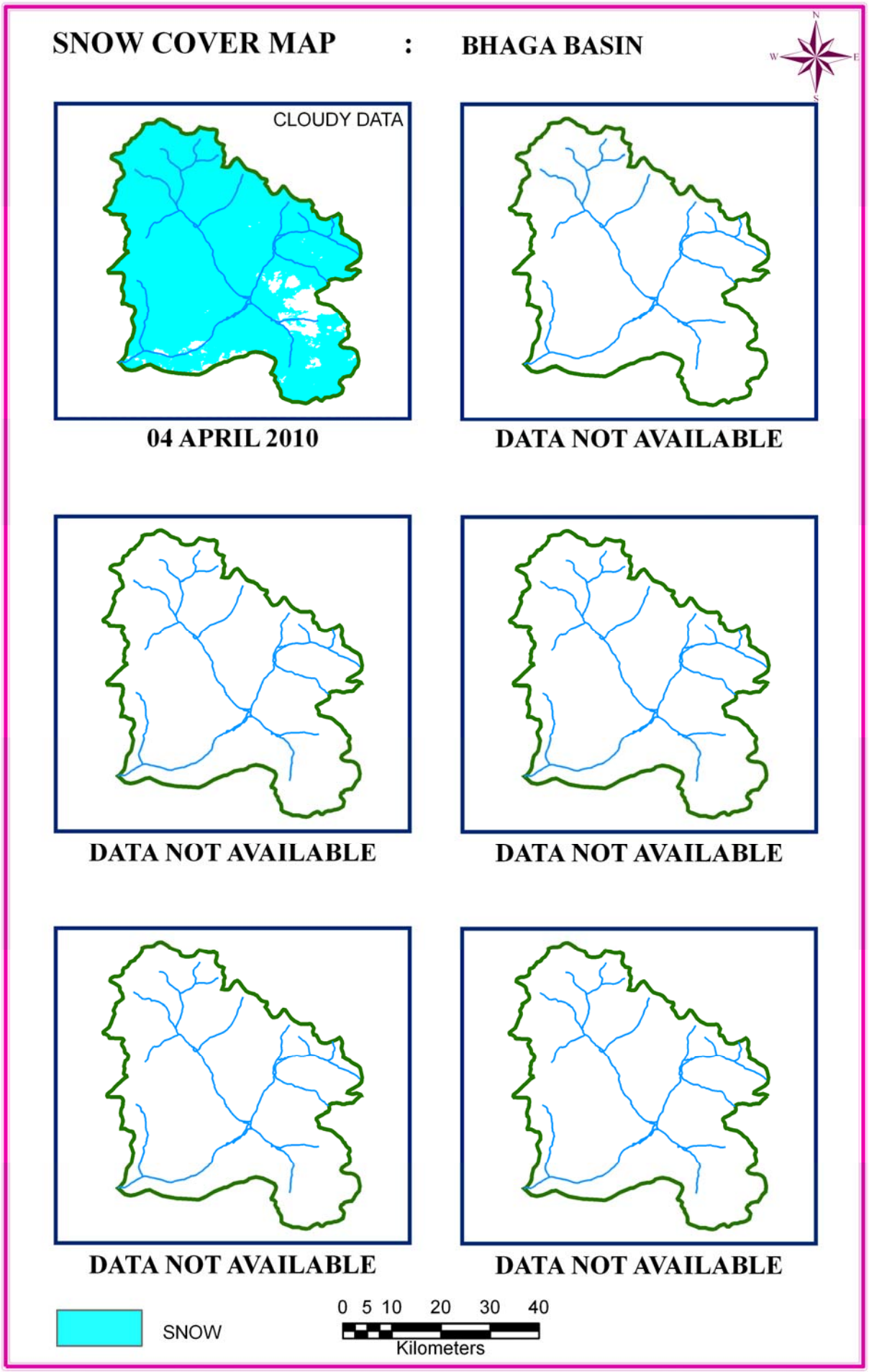
DATA USED
11 MARCH 2010



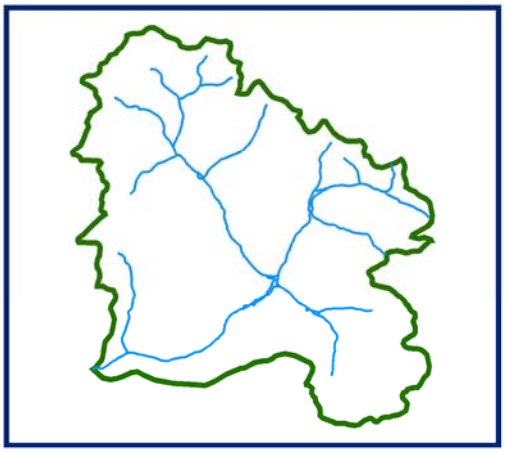
DATA USED
DATA NOT AVAILABLE

SNOW

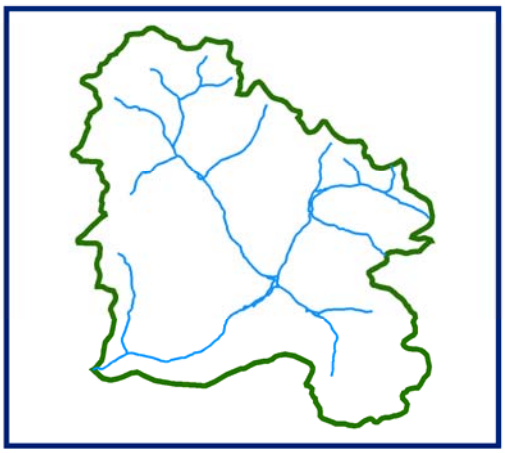
0 5 10 20 30 40
Kilometers


SNOW COVER MAP : BHAGA BASIN
N
W
E
S
CLOUDY DATA
04 APRIL 2010
DATA NOT AVAILABLE
DATA NOT AVAILABLE
DATA NOT AVAILABLE
DATA NOT AVAILABLE
DATA NOT AVAILABLE
DATA NOT AVAILABLE
SNOW
0 5 10 20 30 40
Kilometers

10 DAILY SNOW COVER MAP : BHAGA BASIN



DATA USED
DATA NOT AVAILABLE



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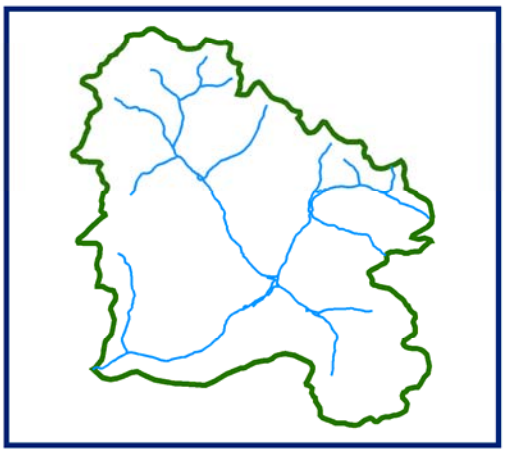
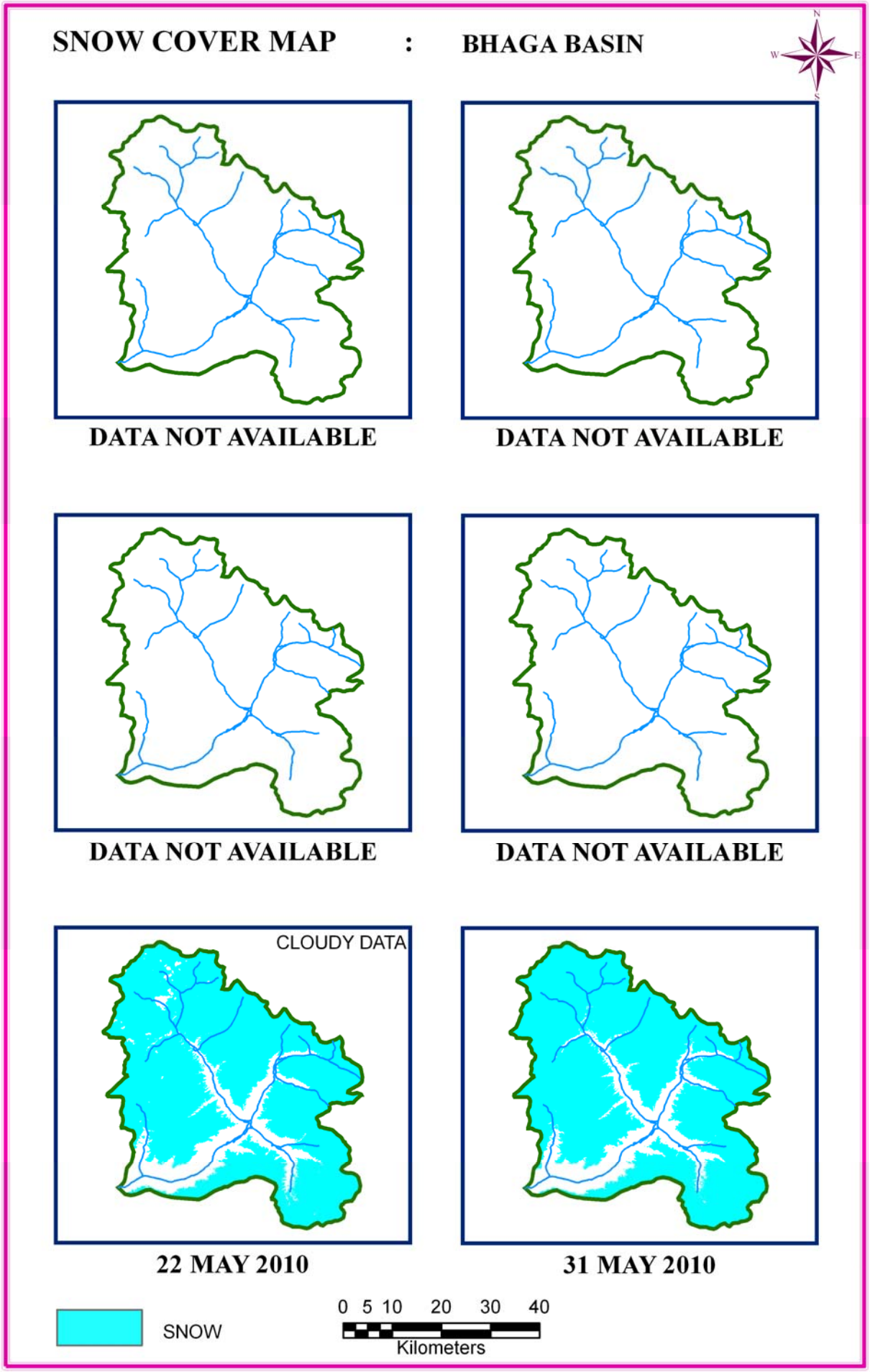


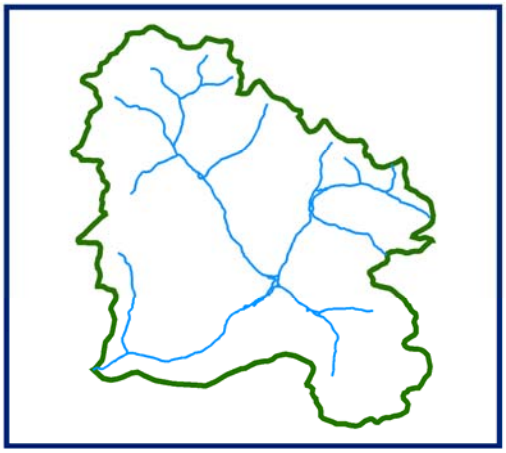
DATA USED
DATA NOT AVAILABLE

SNOW

0 5 10 20 30 40
Kilometers


SNOW COVER MAP : BHAGA BASIN
N
W
E
S
DATA NOT AVAILABLE
DATA NOT AVAILABLE
DATA NOT AVAILABLE
DATA NOT AVAILABLE
CLOUDY DATA
22 MAY 2010
31 MAY 2010
SNOW
0 5 10 20 30 40
Kilometers

10 DAILY SNOW COVER MAP : BHAGA BASIN



DATA USED
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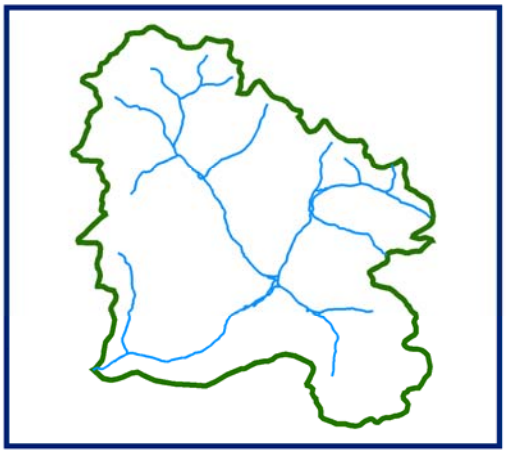

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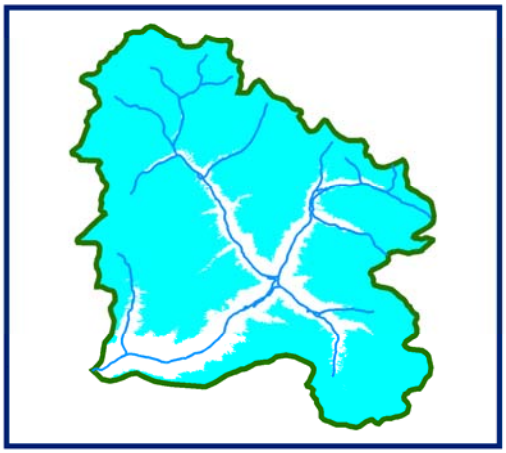
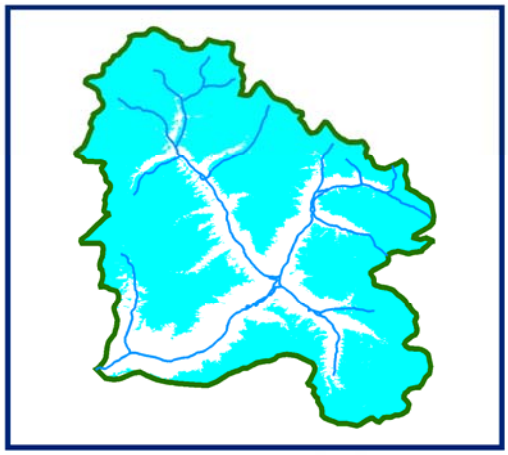


DATA USED
26 MAY 2010
31 MAY 2010

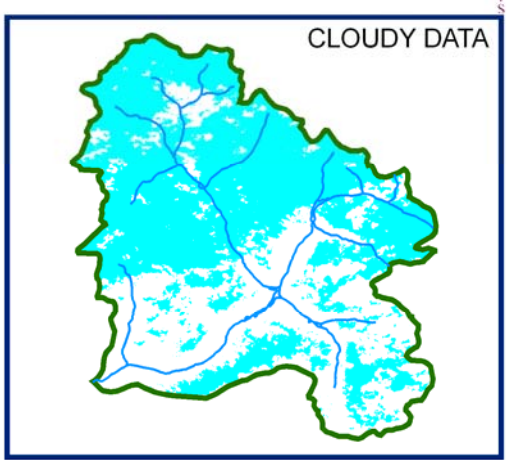
SNOW

0 5 10 20 30 40
Kilometers

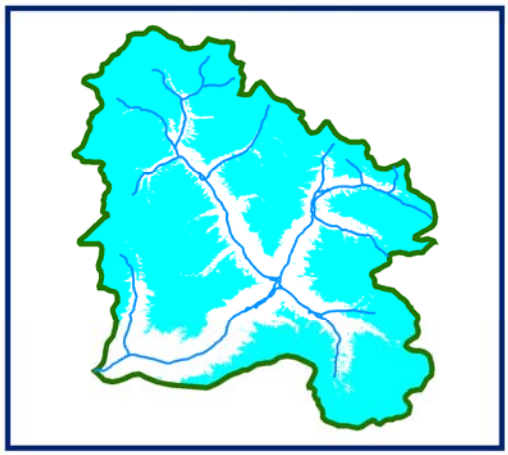
SNOW COVER MAP : BHAGA BASIN



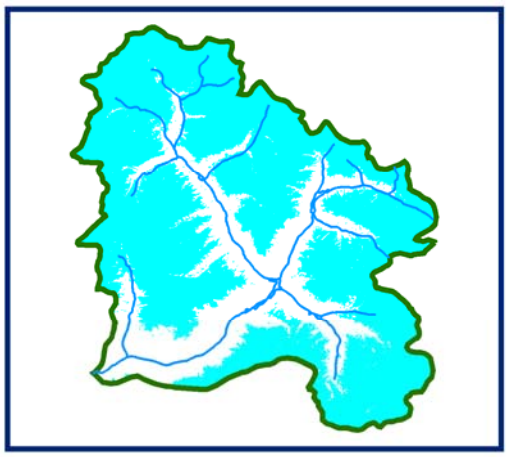
01 JUNE 2010



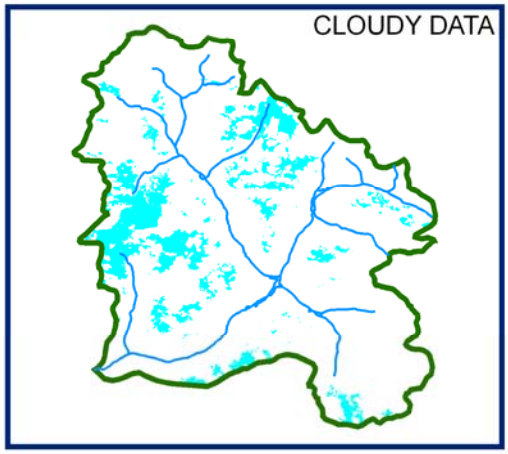
05 JUNE 2010



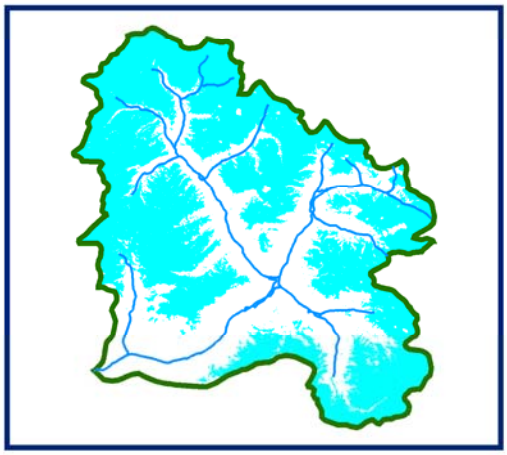
19 JUNE 2010



20 JUNE 2010

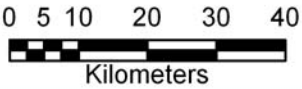


24 JUNE 2010

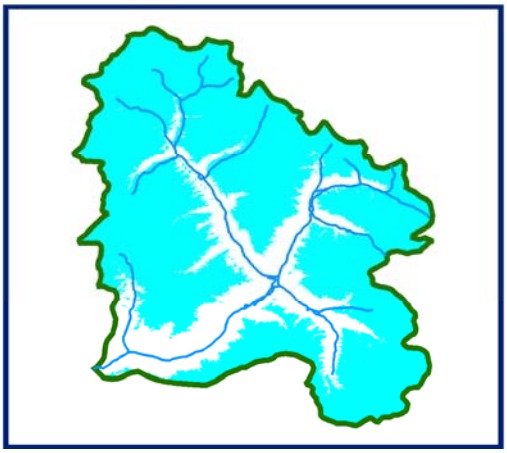


29 JUNE 2010

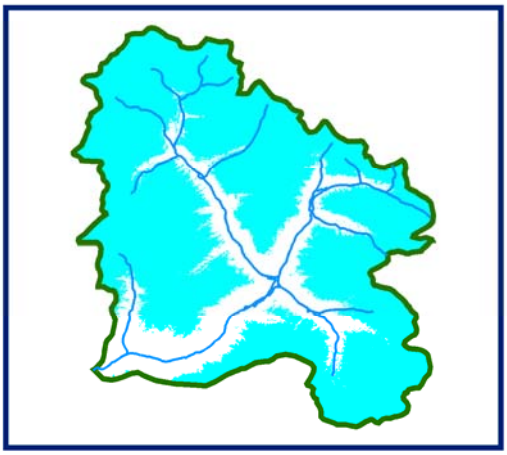
SNOW



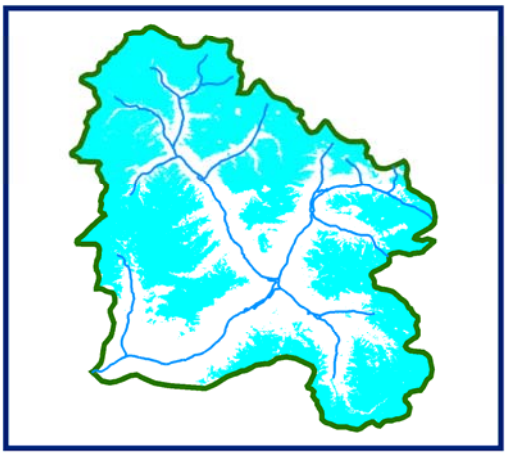
10 DAILY SNOW COVER MAP : BHAGA BASIN



DATA USED
01 JUNE 2010



DATA USED
19 JUNE 2010
20 JUNE 2010



DATA USED
29 JUNE 2010

SNOW

0 5 10 20 30 40
Kilometers

MIYAR BASIN

AREAL EXTENT OF SNOW (5 DAILY)

BASIN NAME: MIYAR **BASIN AREA: 4449 sq km**

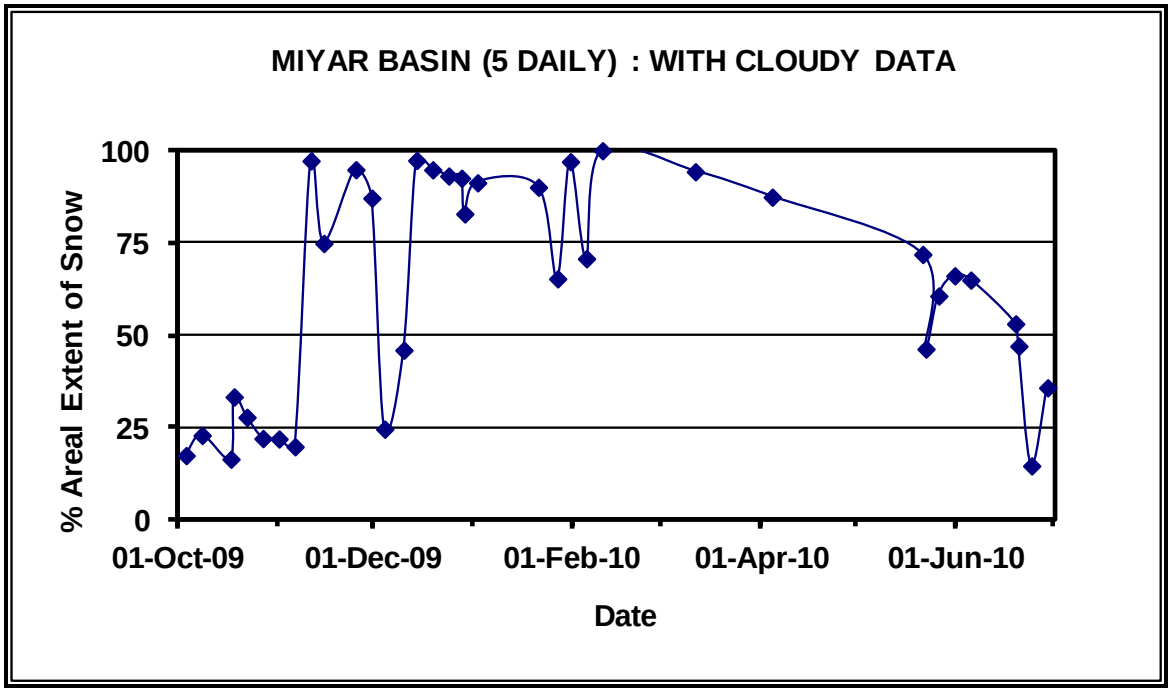
S No	Date	Snow cover (sq km)	Snow cover (%)	S No	Date	Snow cover (sq km)	Snow cover (%)
October 2009							
1	3-Oct-09	776.1	17	2	8-Oct-09	1019.4	23
3	17-Oct-09	732.6	16	4	18-Oct-09	1482.5	33
5	22-Oct-09	1237.1	28	6	27-Oct-09	981.2	22
November 2009							
7	1-Nov-09	976.2	22	8	6-Nov-09	882.9	20
9	11-Nov-09	4326.3	97	10	15-Nov-09	3331.6	75
11	25-Nov-09	4220.7	95	12	30-Nov-09	3877.0	87
December 2009							
13	4-Dec-09	1094.3	25	14	10-Dec-09	2045.7	46
15	14-Dec-09	4332.0	97	16	19-Dec-09	4218.8	95
17	24-Dec-09	4143.9	93	18	28-Dec-09	4117.0	93
19	29-Dec-09	3688.0	83				
January 2010							
20	2-Jan-10	4062.4	91	21	21-Jan-10	4008.6	90
22	27-Jan-10	2905.8	65	23	31-Jan-10	4316.3	97
February 2010							
24	5-Feb-10	3148.1	71	25	10-Feb-10	4449.0	100
March 2010							
26	11-Mar-10	4195.6	94				
April 2010							
27	4-Apr-10	3889.5	87				
May 2010							
28	21-May-10	3199.3	72	29	22-May-10	2059.8	46
30	26-May-10	2698.7	61	31	31-May-10	2942.0	66
June 2010							
32	5-Jun-10	2890.2	65	33	19-Jun-10	2363.2	53
34	20-Jun-10	2094.3	47	35	24-Jun-10	651.9	15
36	29-Jun-10	1592.5	36				
July 2010							
37	8-Jul-10	1899.6	43	38	14-Jul-10	1124.4	25

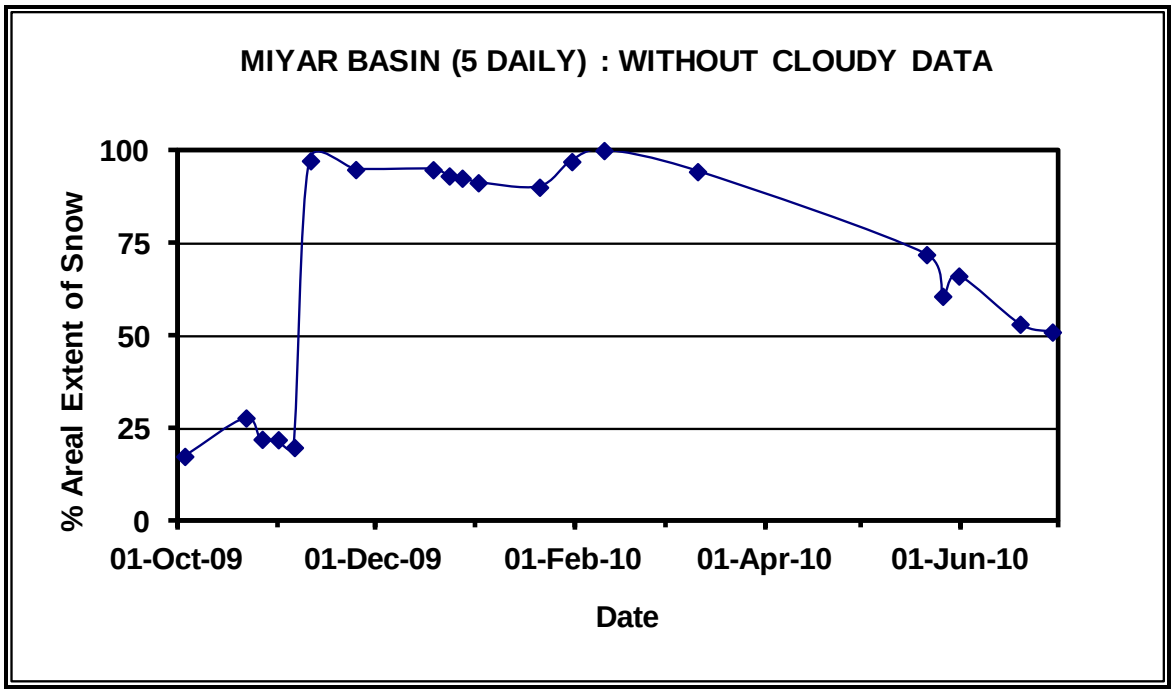
AREAL EXTENT OF SNOW (10 DAILY)

BASIN NAME: MIYAR **BASIN AREA: 4449 sq km**

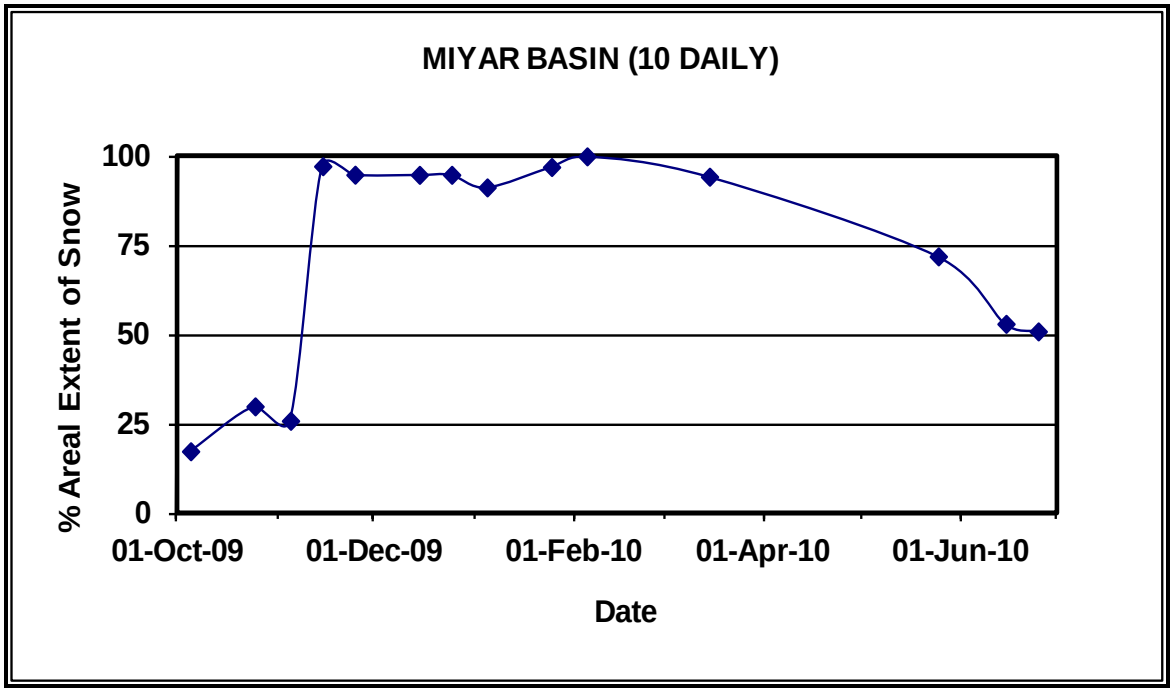
S No	Date	Snow cover (sq km)	Snow cover (%)	S No	Date	Snow cover (sq km)	Snow cover (%)
October 2009				**November 2009**			
1	3-Oct-09	776.1	17	3	1-Nov-09	1155.6	26
2	22-Oct-09	1335.4	30	4	11-Nov-09	4326.3	97
				5	25-Nov-09	4220.7	95
December 2009				**January 2010**			
6	19-Dec-09	4218.8	95	8	2-Jan-10	4062.4	91
7	24-Dec-09	4219.3	95				
February 2010				**March 2010**			
9	10-Feb-10	4449.0	100	10	11-Mar-10	4195.6	94
April 2010				**May 2010**			
				11	26-May-10	3009.2	68
June 2010				**July2010**			
12	19-Jun-10	2363.2	53	14	8-Jul-10	1899.6	43
13	29-Jun-10	1592.5	36				

Snow cover depletion curve



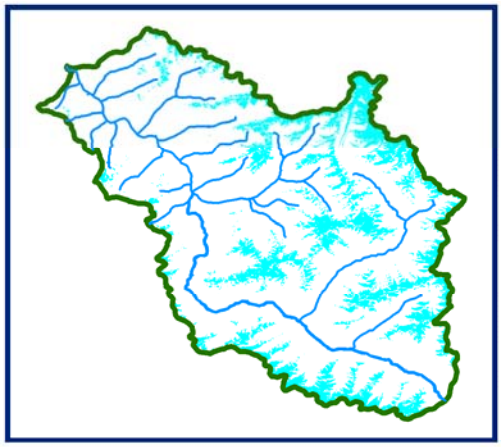


Snow cover depletion curve

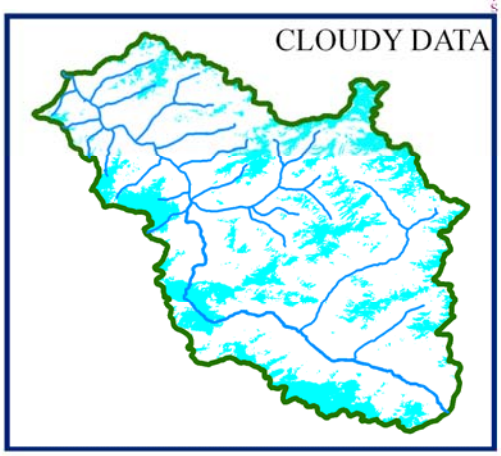


SNOW COVER MAP

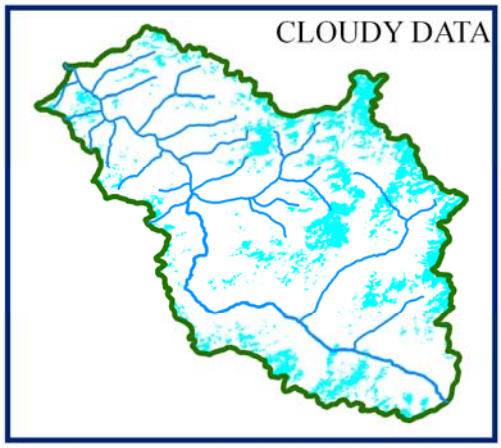
SNOW COVER MAP : MIYAR BASIN



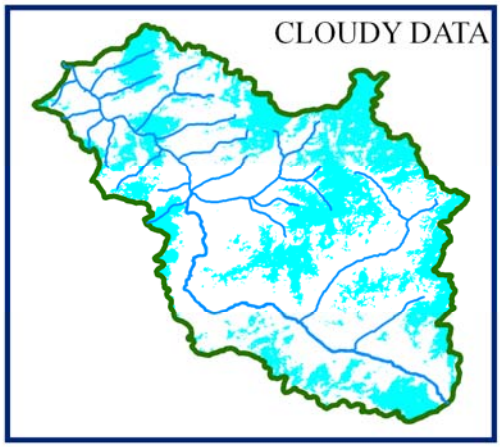
03 OCTOBER 2009



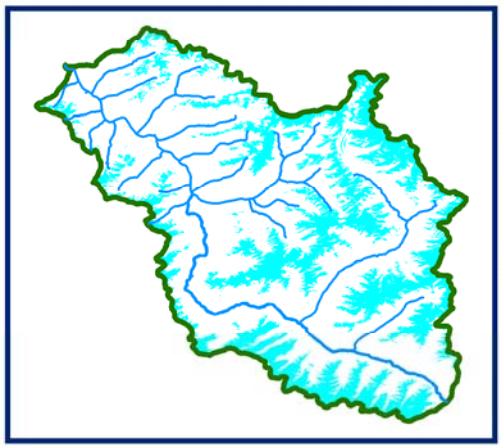
08 OCTOBER 2009



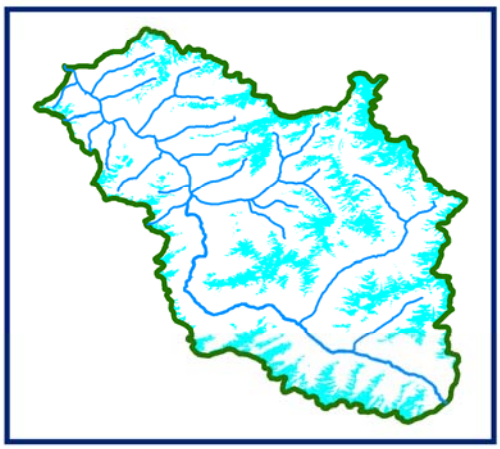
17 OCTOBER 2009



18 OCTOBER 2009



22 OCTOBER 2009



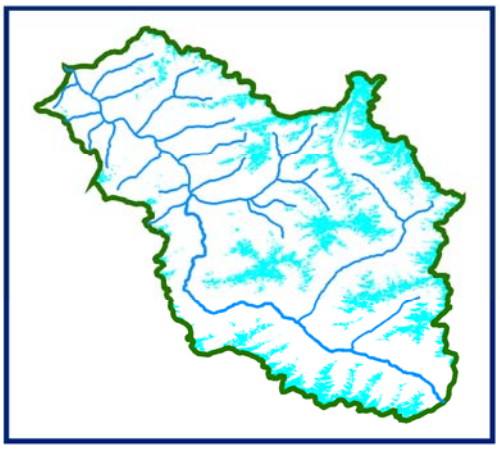
27 OCTOBER 2009

SNOW

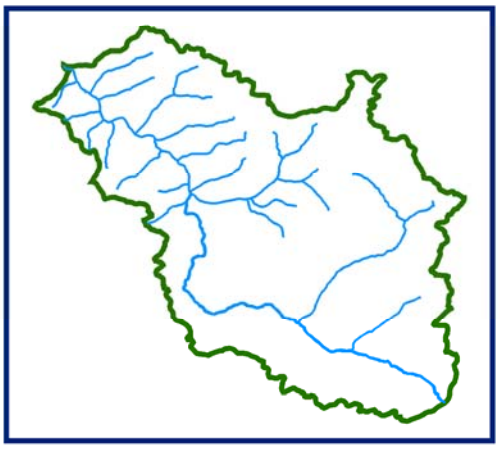
0 10 20 40 60 80

Kilometers

10 DAILY SNOW COVER MAP: MIYAR BASIN



DATA USED
03 OCTOBER 2009



DATA USED
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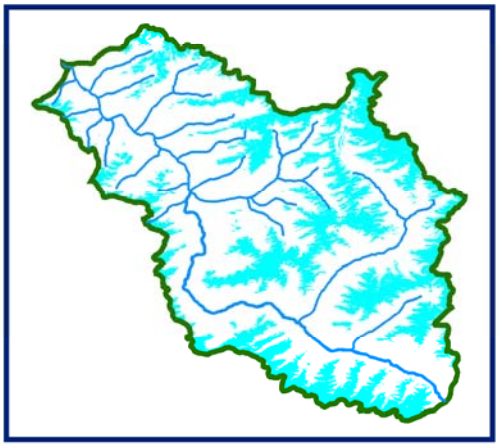
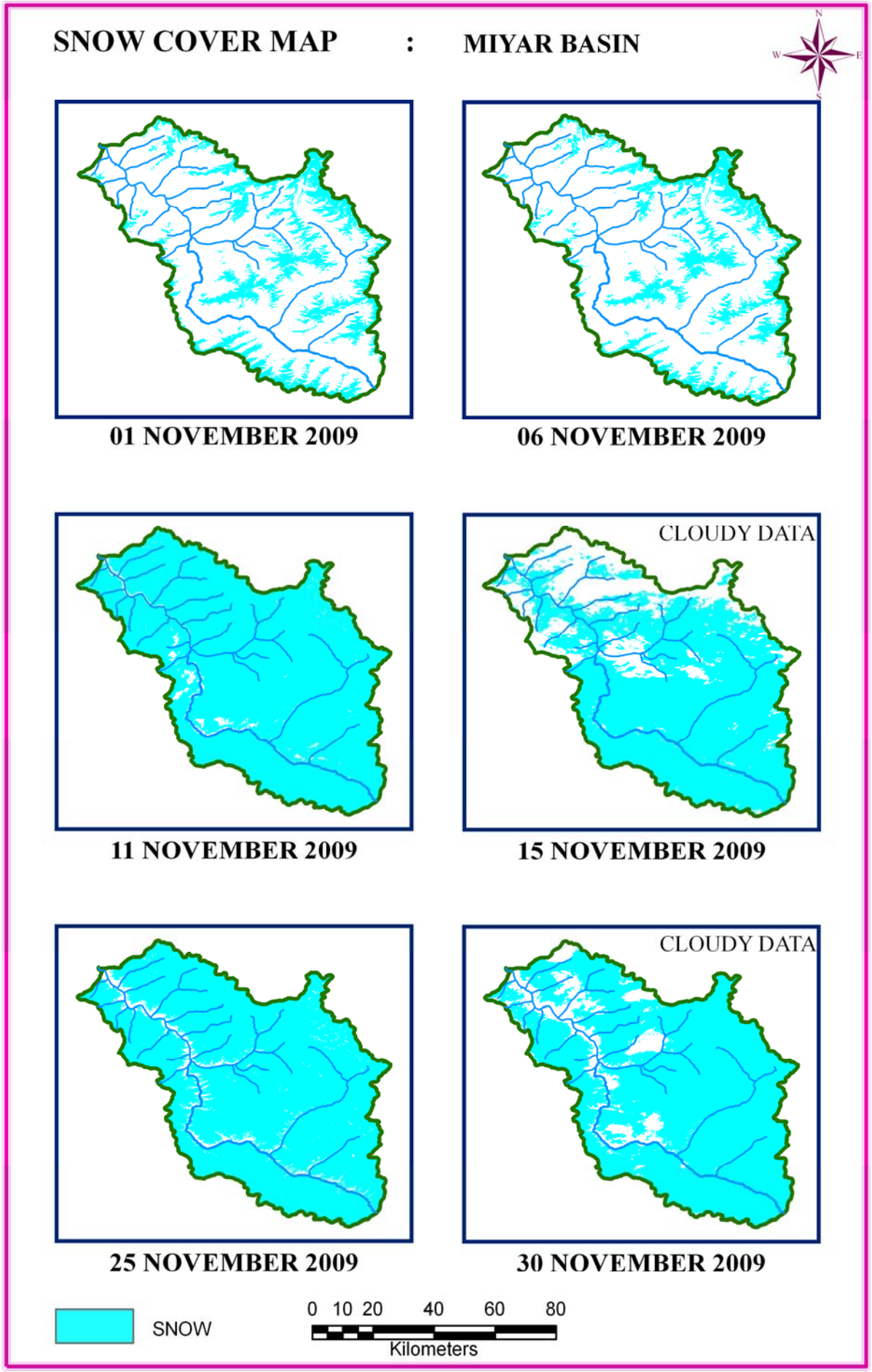


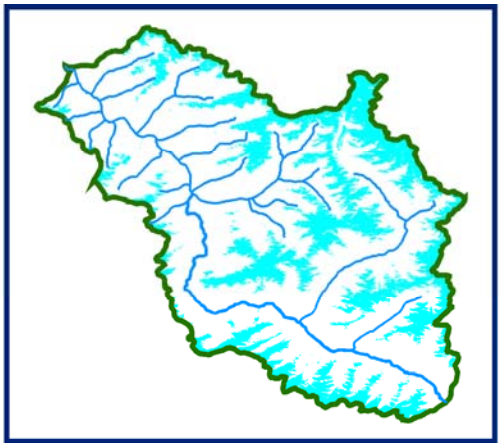
DATA USED
22 OCTOBER 2009
27 OCTOBER 2009

SNOW

0 10 20 40 60 80
Kilometers


SNOW COVER MAP : MIYAR BASIN
N
W
E
S
01 NOVEMBER 2009
06 NOVEMBER 2009
11 NOVEMBER 2009
CLOUDY DATA
15 NOVEMBER 2009
25 NOVEMBER 2009
CLOUDY DATA
30 NOVEMBER 2009
SNOW
0 10 20 40 60 80
Kilometers

10 DAILY SNOW COVER MAP: MIYAR BASIN



DATA USED
01 NOVEMBER 2009
06 NOVEMBER 2009

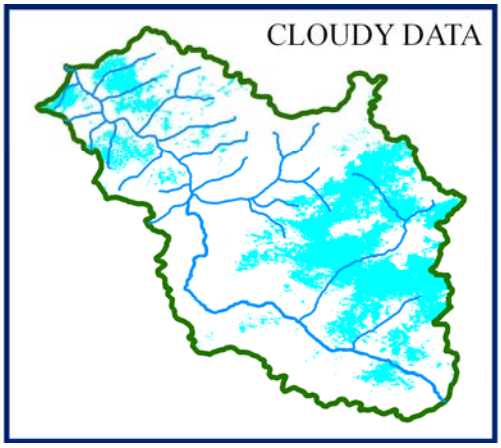
DATA USED
11 NOVEMBER 2009

DATA USED
25 NOVEMBER 2009

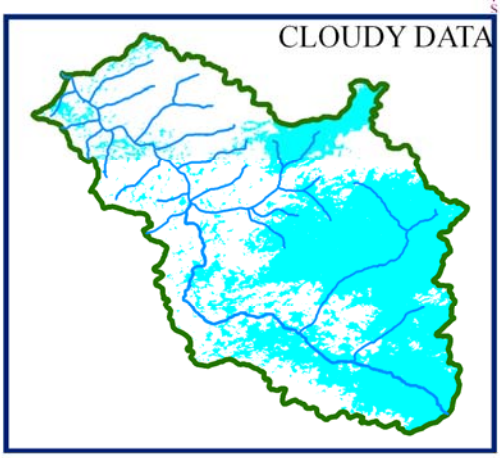
SNOW

0 10 20 40 60 80
Kilometers

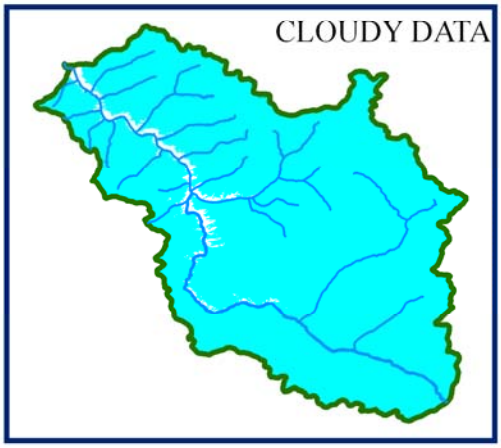
SNOW COVER MAP : MIYAR BASIN



04 DECEMBER 2009



10 DECEMBER 2009



14 DECEMBER 2009

19 DECEMBER 2009

24 DECEMBER 2009

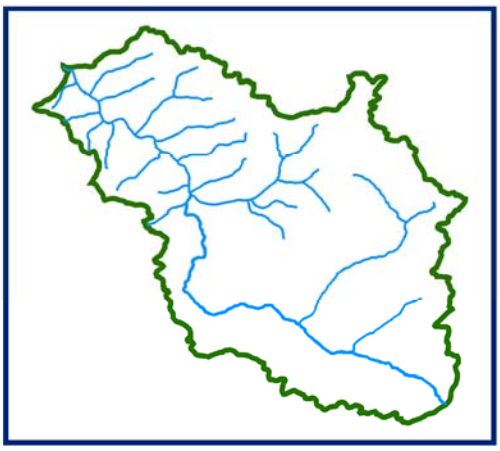
28 DECEMBER 2009

SNOW

0 10 20 40 60 80

Kilometers

10 DAILY SNOW COVER MAP: MIYAR BASIN



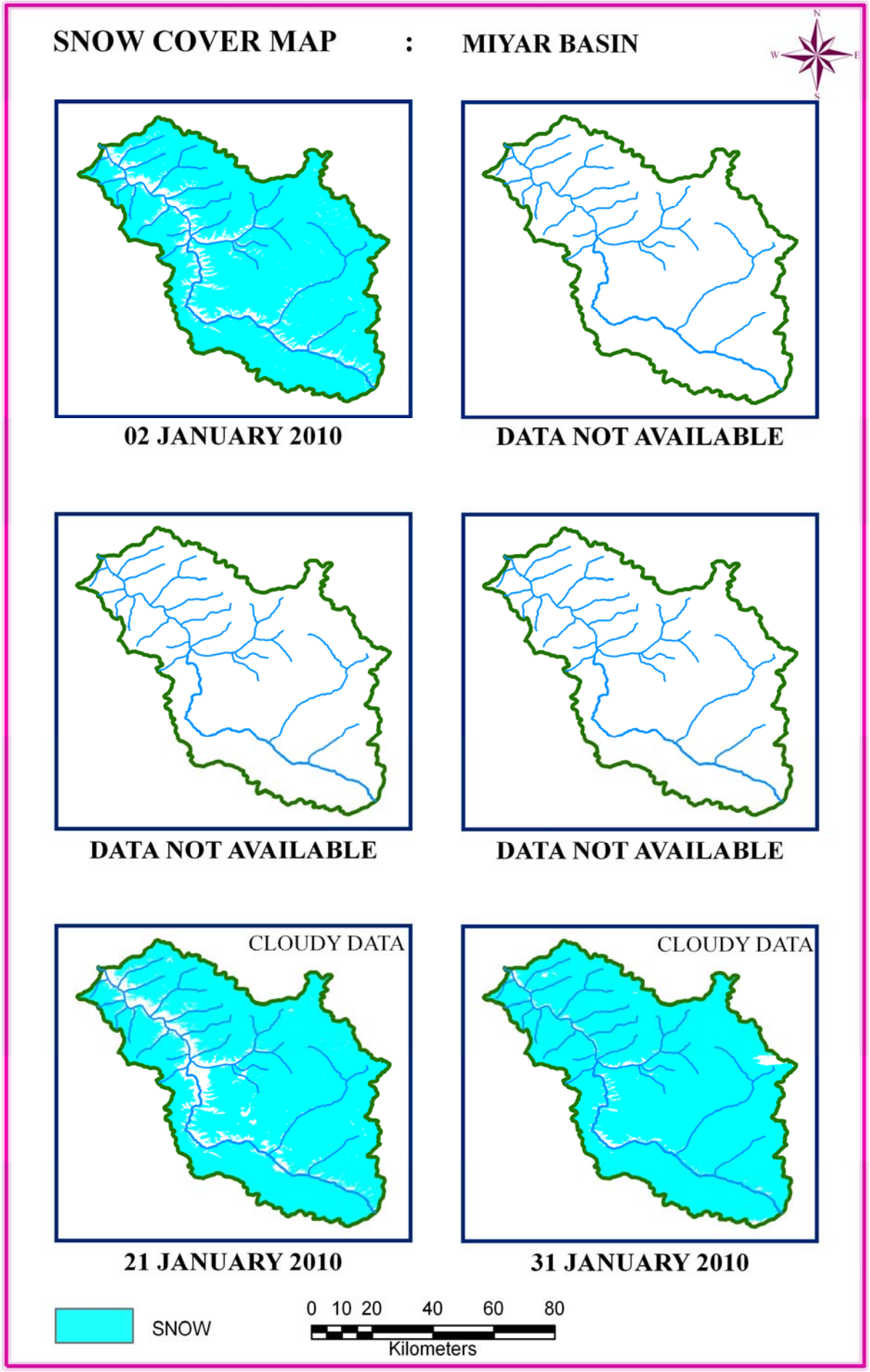
DATA USED
DATA NOT AVAILABLE

DATA USED
19 DECEMBER 2009

DATA USED
24 DECEMBER 2009
28 DECEMBER 2009

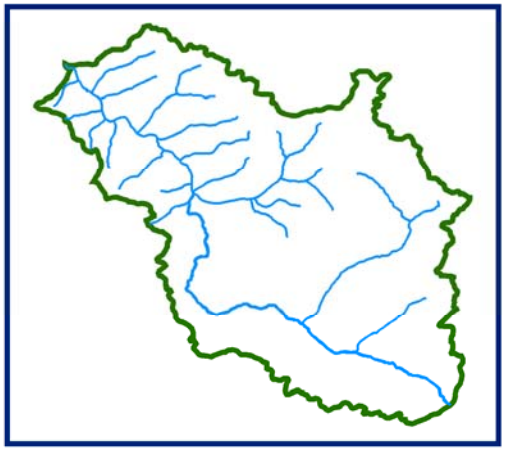
SNOW

0 10 20 40 60 80
Kilometers


SNOW COVER MAP : MIYAR BASIN
N
W
E
S
02 JANUARY 2010
DATA NOT AVAILABLE
DATA NOT AVAILABLE
DATA NOT AVAILABLE
CLOUDY DATA
21 JANUARY 2010
CLOUDY DATA
31 JANUARY 2010
SNOW
0 10 20 40 60 80
Kilometers

10 DAILY SNOW COVER MAP: MIYAR BASIN

DATA USED
02 JANUARY 2010



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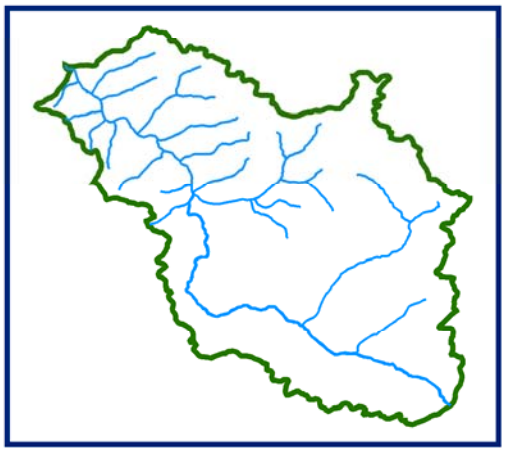
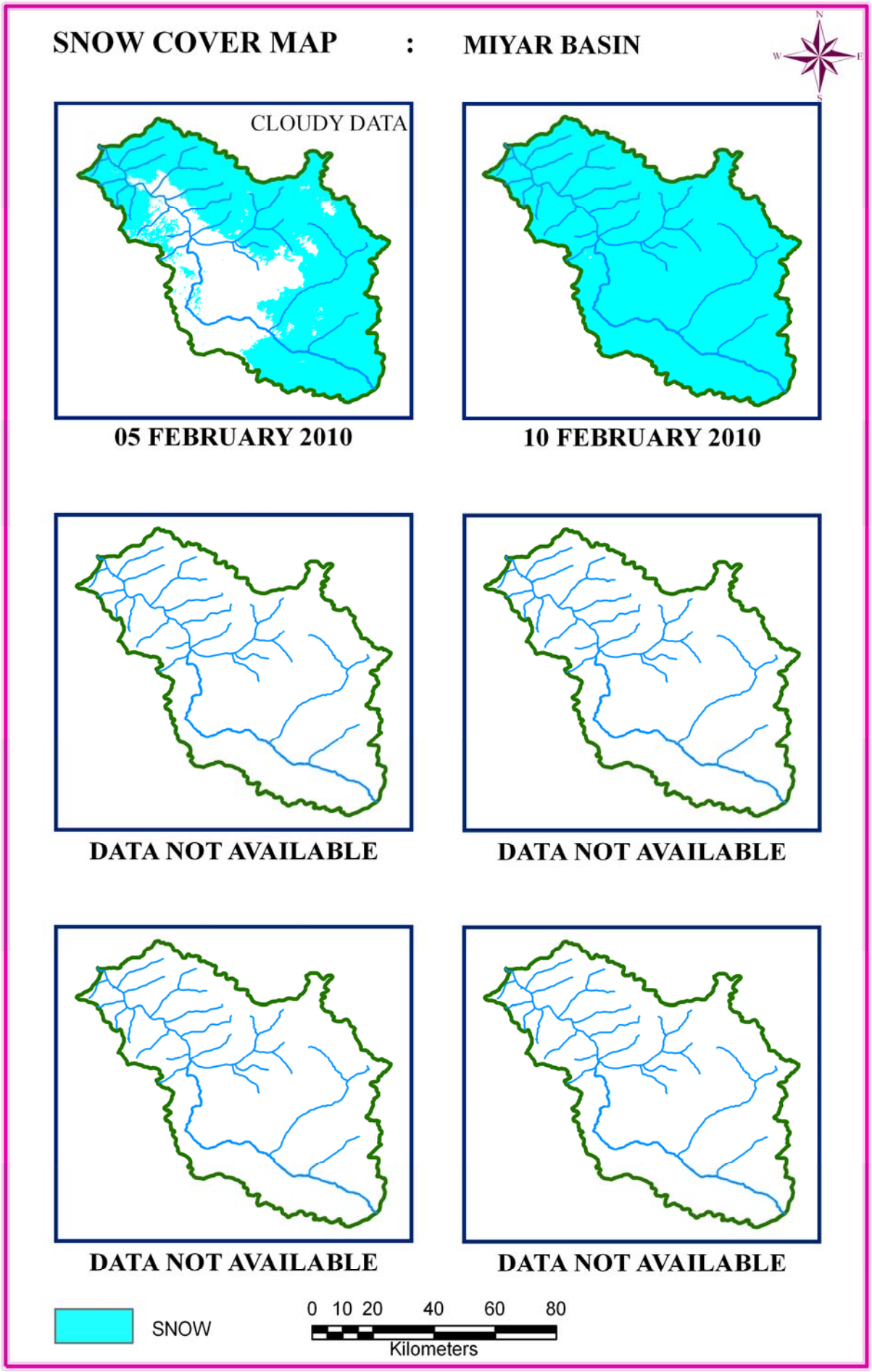
DATA NOT AVAILABLE



DATA USED
DATA NOT AVAILABLE

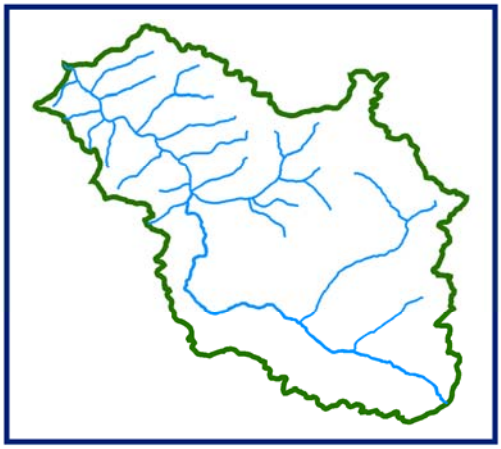
SNOW

0 10 20 40 60 80
Kilometers

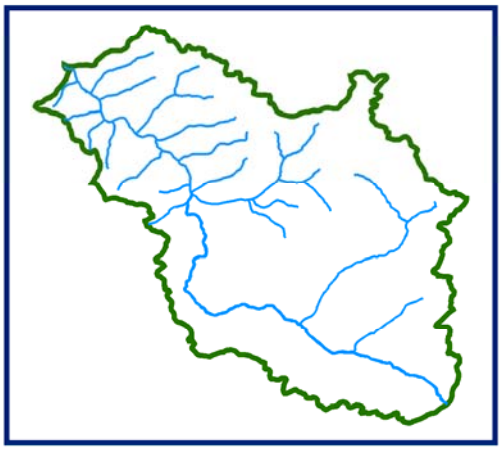

SNOW COVER MAP : MIYAR BASIN
CLOUDY DATA
05 FEBRUARY 2010
10 FEBRUARY 2010
DATA NOT AVAILABLE
DATA NOT AVAILABLE
DATA NOT AVAILABLE
DATA NOT AVAILABLE
SNOW
0 10 20 40 60 80
Kilometers

10 DAILY SNOW COVER MAP: MIYAR BASIN

DATA USED
10 FEBRUARY 2010



DATA USED
DATA NOT AVAILABLE

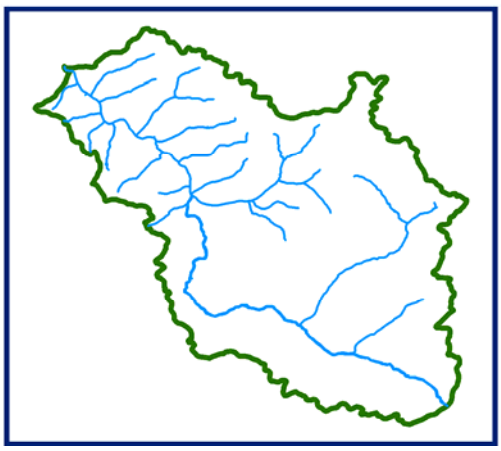


DATA USED
DATA NOT AVAILABLE

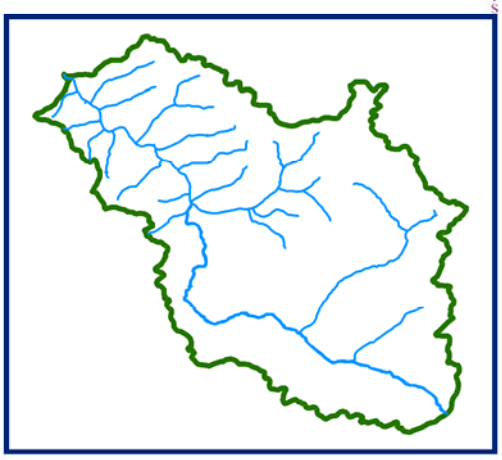
SNOW

0 10 20 40 60 80
Kilometers

SNOW COVER MAP : MIYAR BASIN

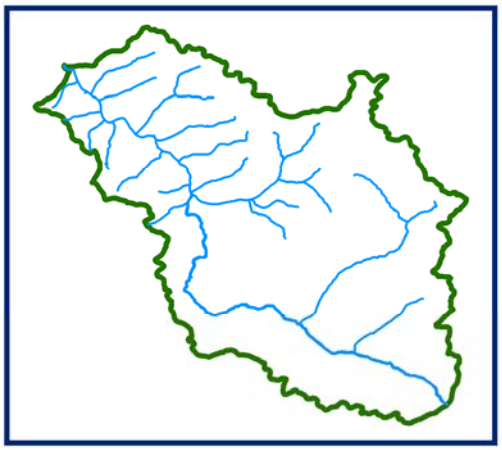


DATA NOT AVAILABLE



DATA NOT AVAILABLE

11 MARCH 2010



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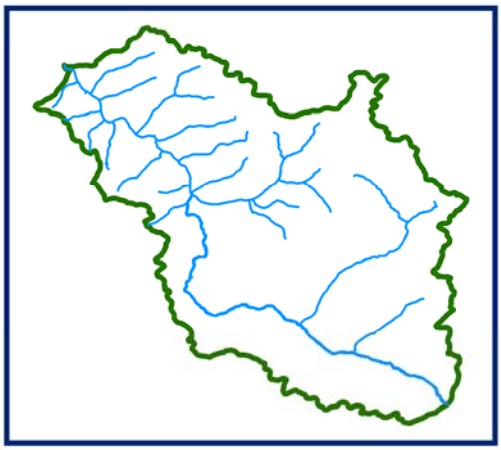

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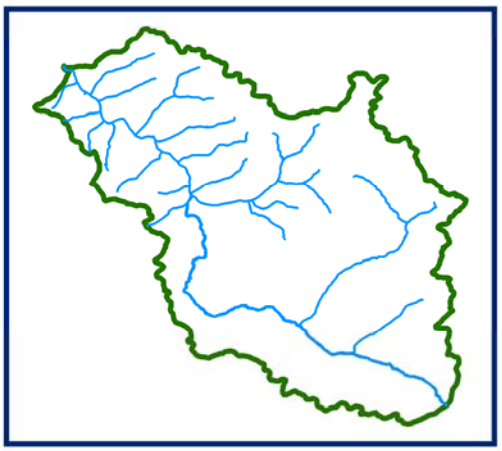


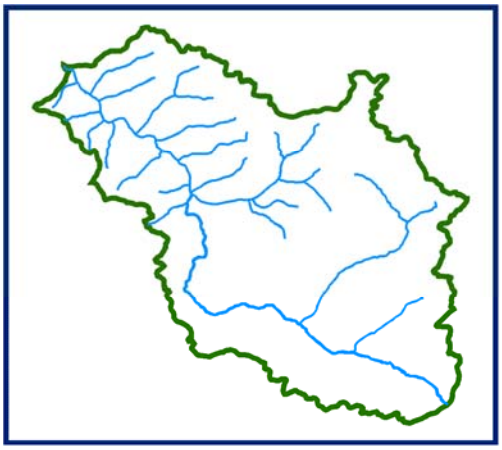
DATA NOT AVAILABLE

SNOW

0 10 20 40 60 80

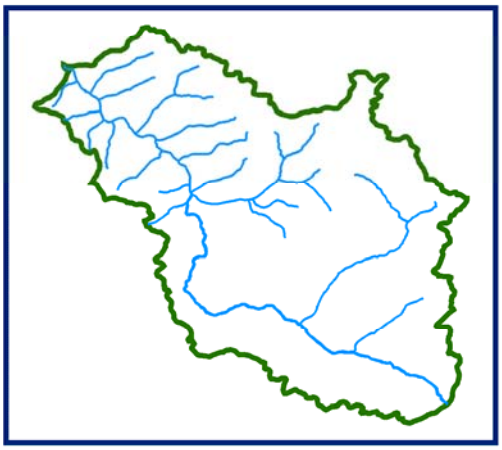
Kilometers

10 DAILY SNOW COVER MAP: MIYAR BASIN



DATA USED
DATA NOT AVAILABLE

DATA USED
11 MARCH 2010

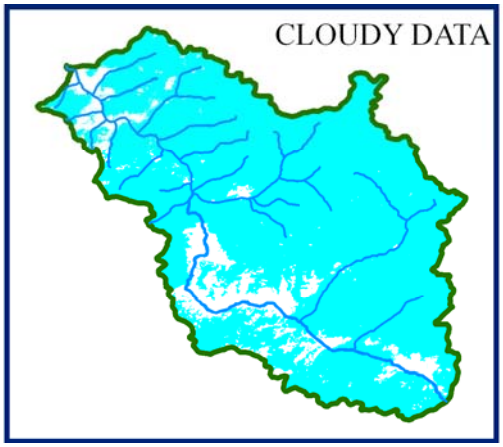


DATA USED
DATA NOT AVAILABLE

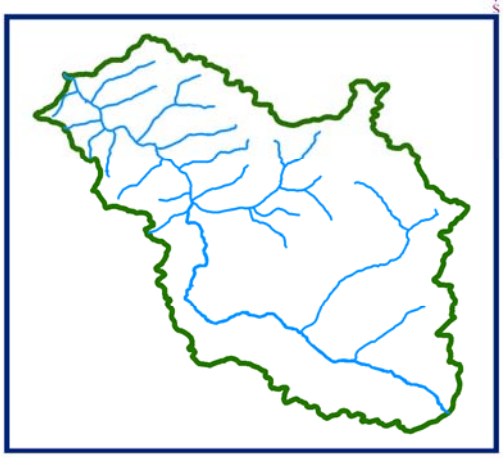
SNOW

0 10 20 40 60 80
Kilometers

SNOW COVER MAP : MIYAR BASIN



04 APRIL 2010



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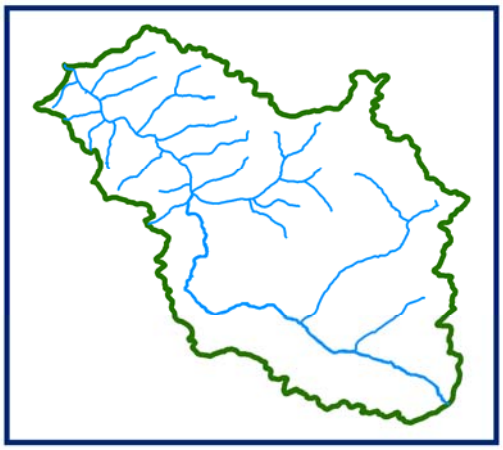

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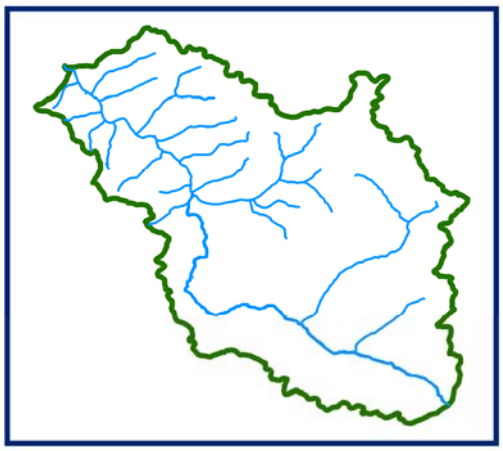

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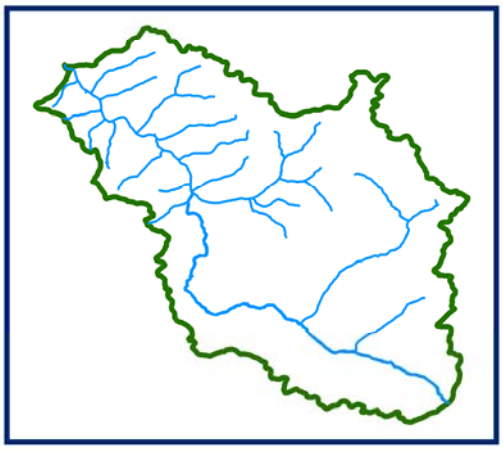

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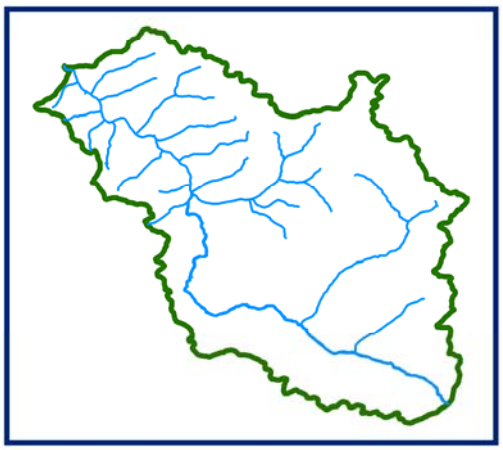


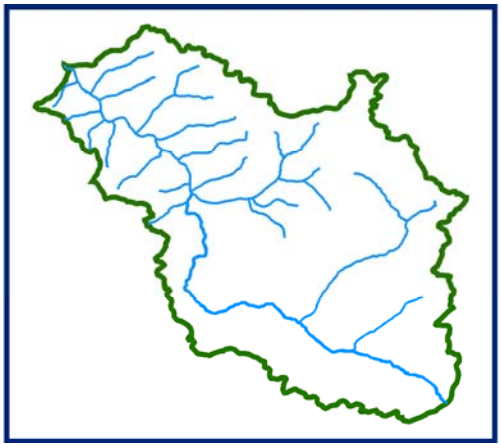
DATA NOT AVAILABLE

SNOW

0 10 20 40 60 80

Kilometers

10 DAILY SNOW COVER MAP: MIYAR BASIN



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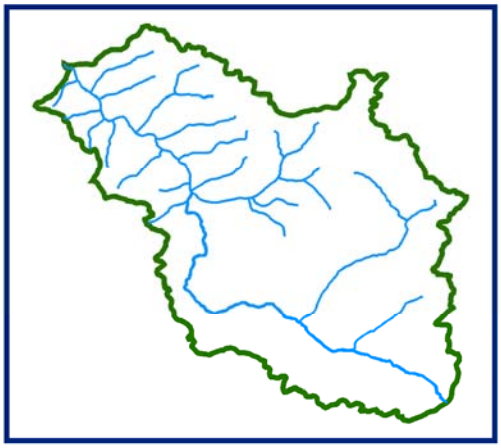

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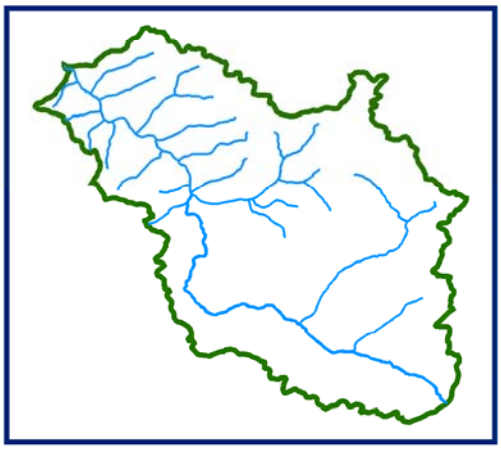

DATA USED
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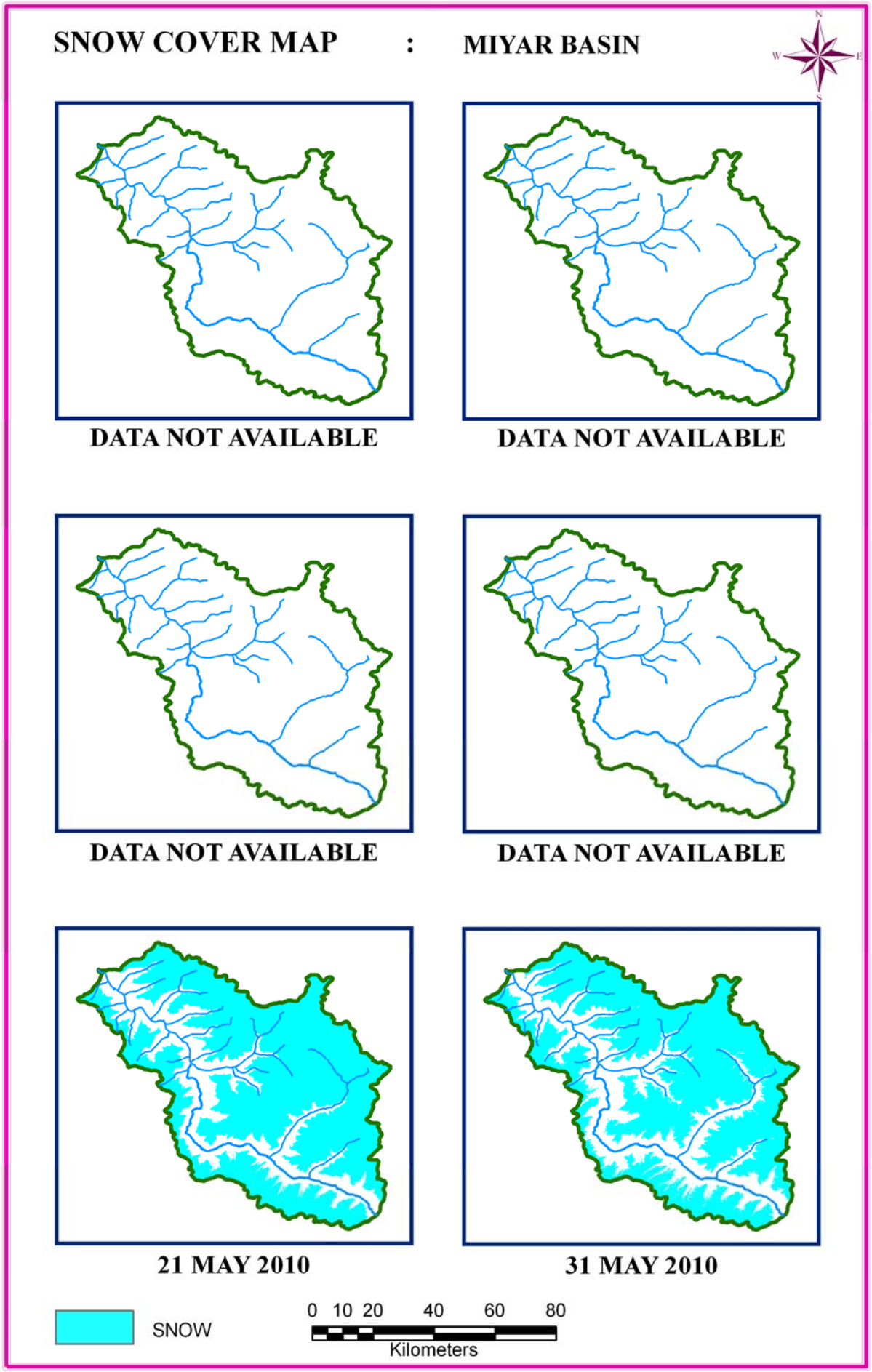
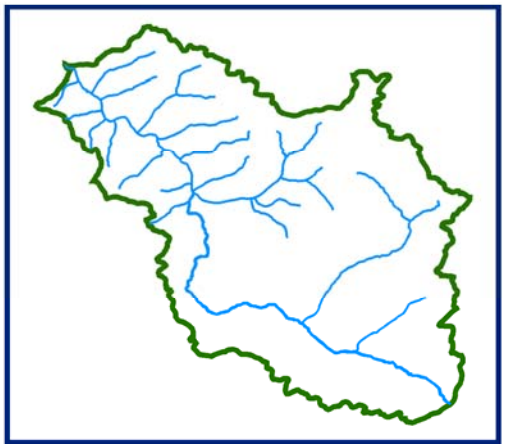
SNOW

0 10 20 40 60 80
Kilometers


SNOW COVER MAP : MIYAR BASIN
N
W
E
S
DATA NOT AVAILABLE
DATA NOT AVAILABLE
DATA NOT AVAILABLE
DATA NOT AVAILABLE
21 MAY 2010
31 MAY 2010
SNOW
0 10 20 40 60 80
Kilometers

10 DAILY SNOW COVER MAP: MIYAR BASIN



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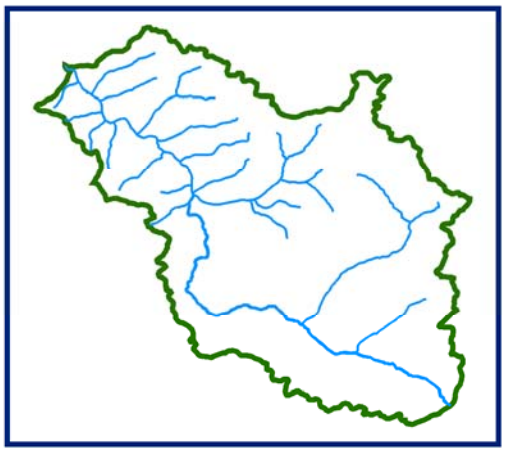

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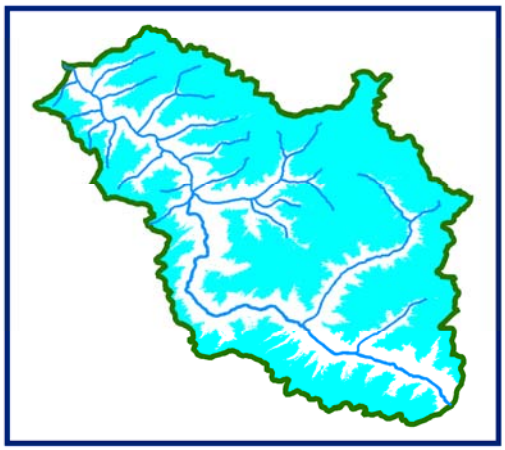
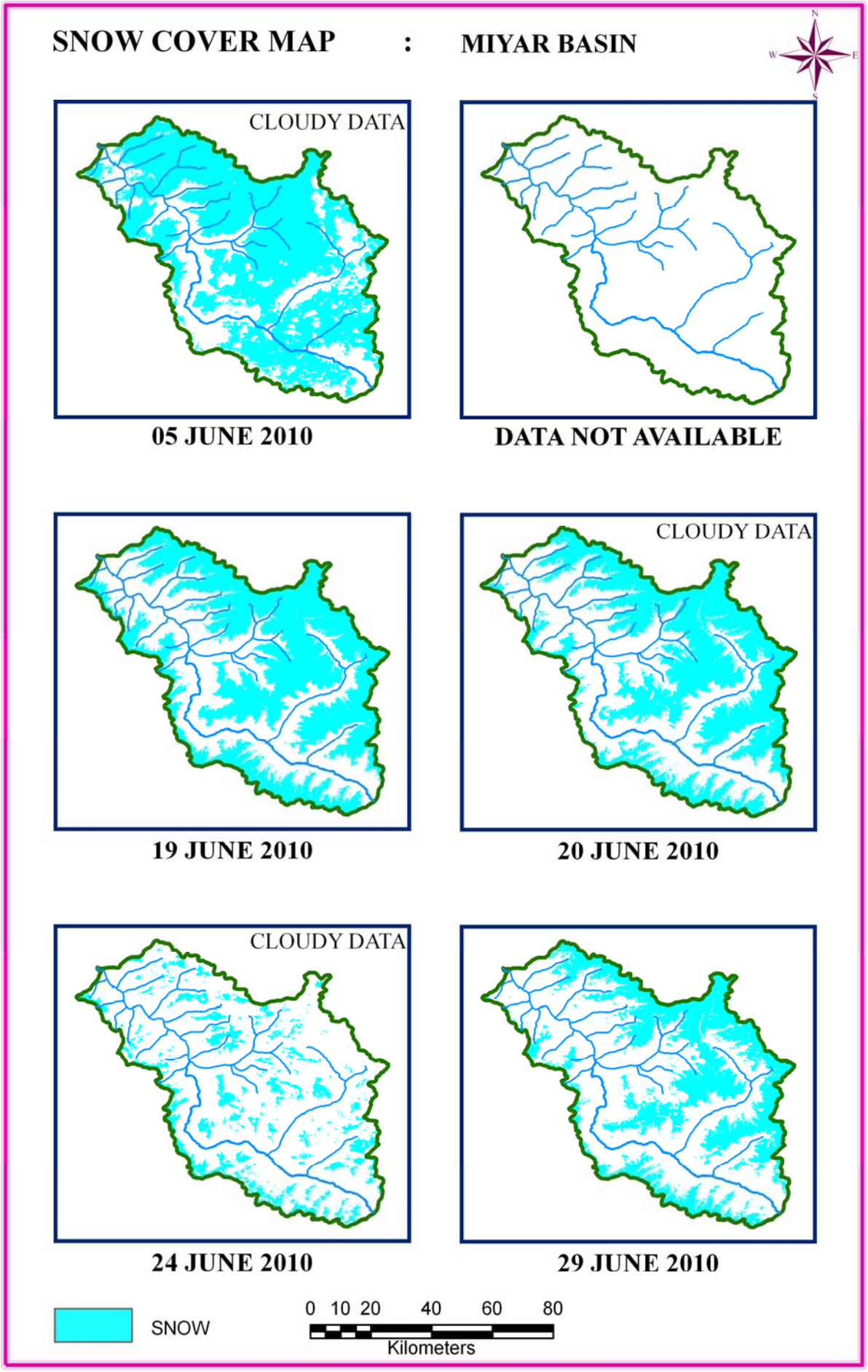


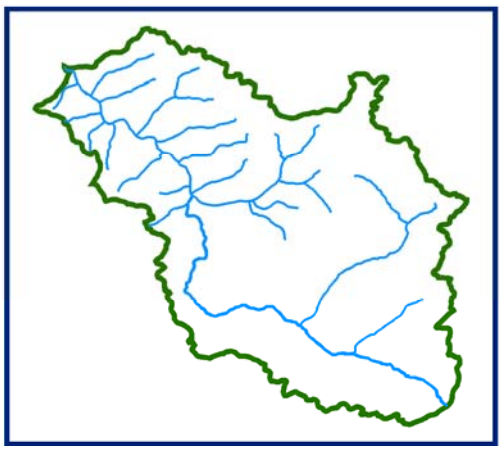
DATA USED
21 MAY 2010
26 MAY 2010
31 MAY 2010

SNOW

0 10 20 40 60 80
Kilometers


SNOW COVER MAP : MIYAR BASIN
N
W
E
S
CLOUDY DATA
05 JUNE 2010
DATA NOT AVAILABLE
19 JUNE 2010
CLOUDY DATA
20 JUNE 2010
CLOUDY DATA
24 JUNE 2010
29 JUNE 2010
SNOW
0 10 20 40 60 80
Kilometers

10 DAILY SNOW COVER MAP: MIYAR BASIN



DATA USED
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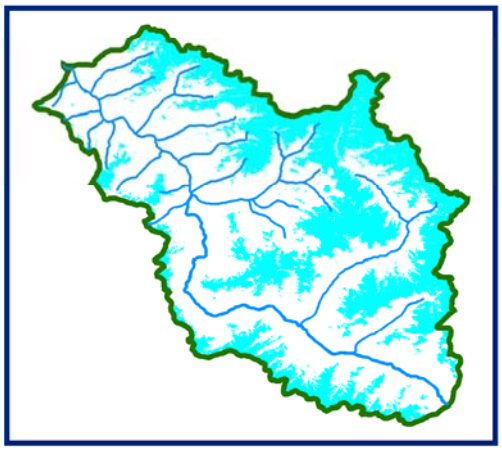
DATA USED
19 JUNE 2010



DATA USED
29 JUNE 2010

SNOW

0 10 20 40 60 80
Kilometers

BHUT BASIN

AREAL EXTENT OF SNOW (5 DAILY)

BASIN NAME: BHUT **BASIN AREA: 2218 sq km**

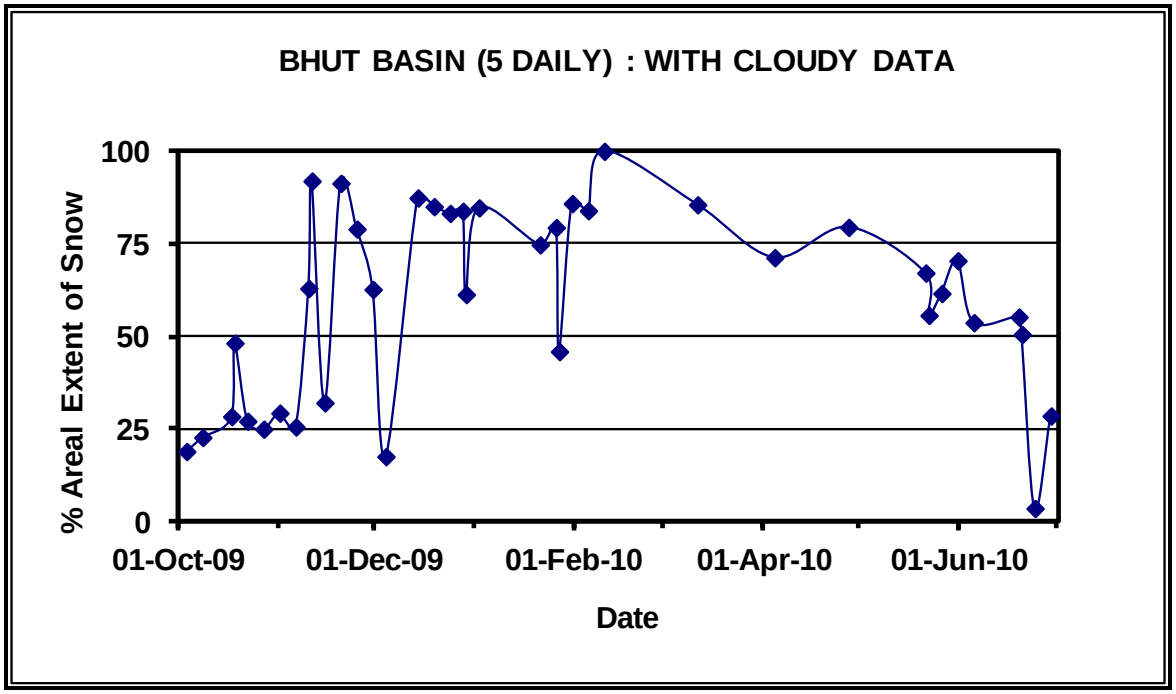
S No	Date	Snow cover (sq km)	Snow cover (%)	S No	Date	Snow cover (sq km)	Snow cover (%)
October 2009							
1	3-Oct-09	420.8	19	2	8-Oct-09	504.9	23
3	17-Oct-09	630.0	28	4	18-Oct-09	1069.8	48
5	22-Oct-09	602.1	27	6	27-Oct-09	529.8	24
November 2009							
7	1-Nov-09	650.8	29	8	6-Nov-09	567.8	26
9	10-Nov-09	1397.0	63	10	11-Nov-09	2040.1	92
11	15-Nov-09	712.3	32	12	20-Nov-09	2026.1	91
13	25-Nov-09	1752.4	79	14	30-Nov-09	1390.7	63
December 2009							
15	4-Dec-09	390.4	18	16	14-Dec-09	1938.7	87
17	19-Dec-09	1886.8	85	18	24-Dec-09	1846.4	83
19	28-Dec-09	1859.1	84	20	29-Dec-09	1360.6	61
January 2010							
21	2-Jan-10	1879.5	85	22	21-Jan-10	1658.2	75
23	26-Jan-10	1761.4	79	24	27-Jan-10	1019.1	46
25	31-Jan-10	1905.2	86				
February 2010							
26	5-Feb-10	1862.3	84	27	10-Feb-10	2218.0	100
March 2010							
28	11-Mar-10	1897.9	86				
April 2010							
29	4-Apr-10	1581.3	71	30	27-Apr-10	1762.8	79
May 2010							
31	21-May-10	1489.7	67	32	22-May-10	1235.7	56
33	26-May-10	1366.8	62	34	31-May-10	1562.8	70
June 2010							
35	5-Jun-10	1192.4	54	36	19-Jun-10	1225.9	55
37	20-Jun-10	1121.5	51	38	24-Jun-10	80.0	4
39	29-Jun-10	633.9	29				
July 2010							
40	8-Jul-10	927.2	42	41	14-Jul-10	527.7	24

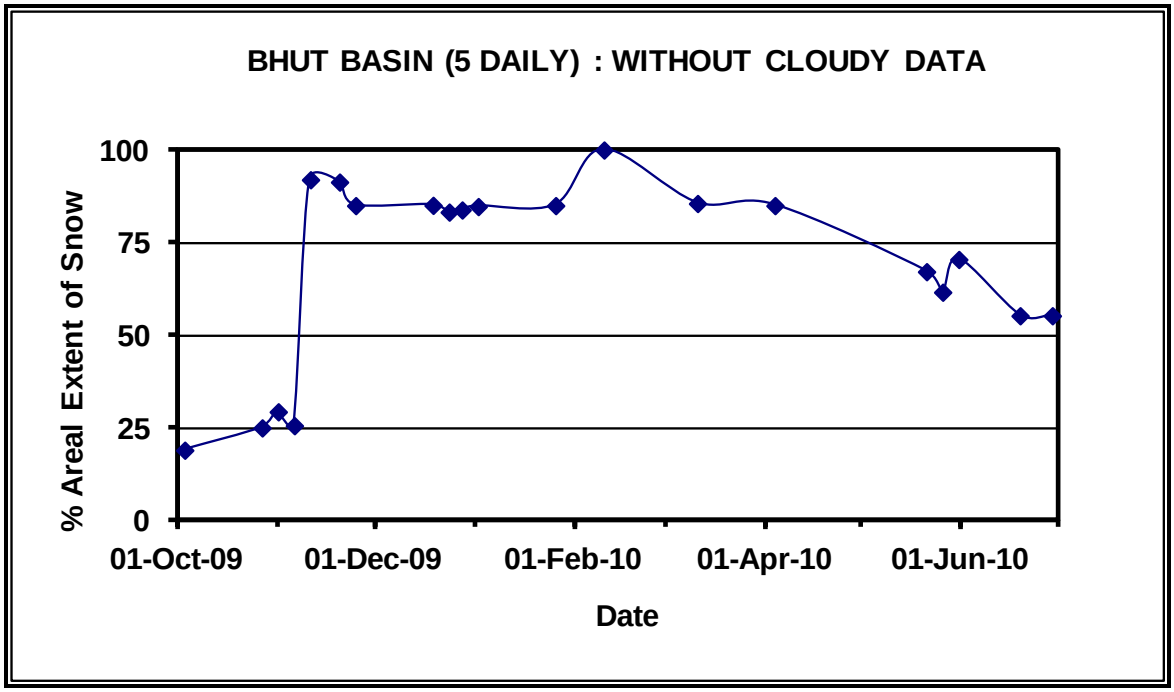
AREAL EXTENT OF SNOW (10 DAILY)

BASIN NAME: BHUT **BASIN AREA: 2218 sq km**

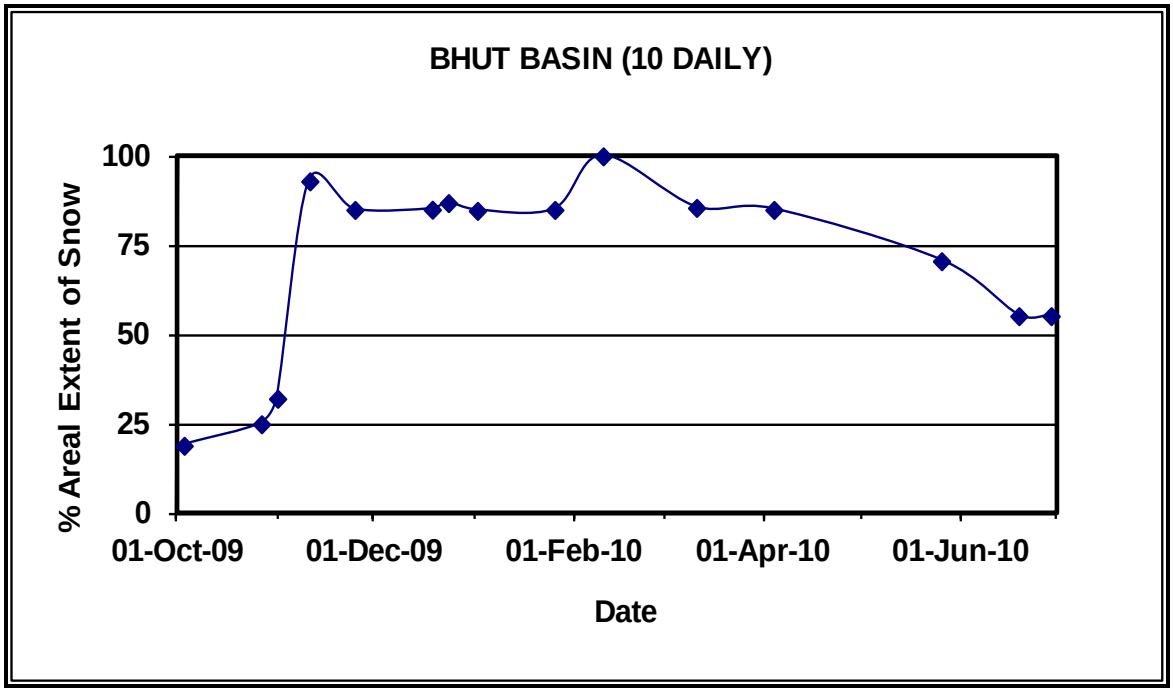
S No	Date	Snow cover (sq km)	Snow cover (%)	S No	Date	Snow cover (sq km)	Snow cover (%)
October 2009				**November 2009**			
1	3-Oct-09	420.8	19	3	1-Nov-09	712.8	32
2	27-Oct-09	529.8	24	4	11-Nov-09	2065.3	93
				5	25-Nov-09	1752.4	79
December 2009				**January 2010**			
6	19-Dec-09	1886.8	85	8	2-Jan-10	1879.5	85
7	24-Dec-09	1927.8	87	9	26-Jan-10	1761.4	79
February 2010				**March 2010**			
10	10-Feb-10	2218.0	100	11	11-Mar-10	1897.9	86
April 2010				**May 2010**			
				12	26-May-10	1566.9	71
June 2010				**July2010**			
13	19-Jun-10	1225.9	55	14	8-Jul-10	927.2	42

Snow cover depletion curve



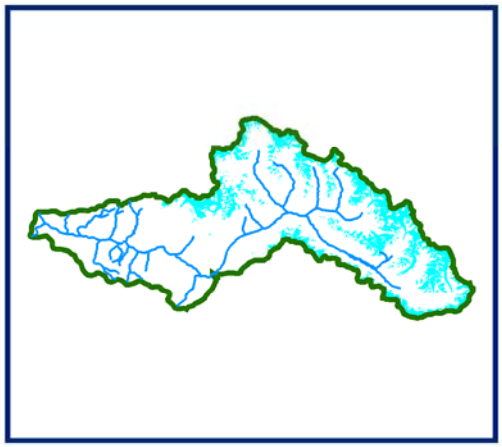


Snow cover depletion curve

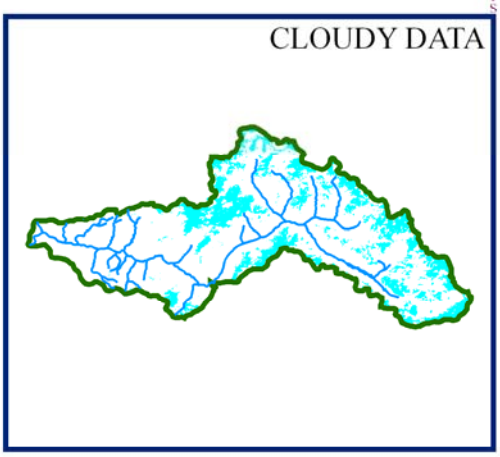


SNOW COVER MAP

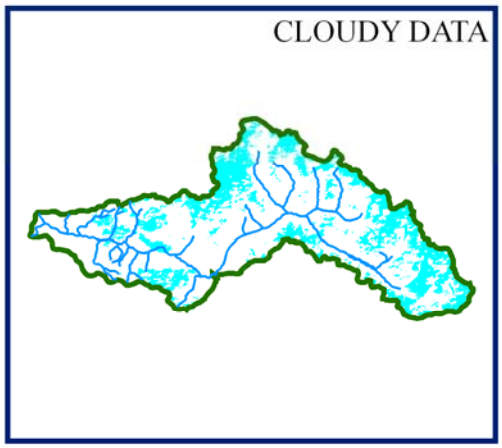
SNOW COVER MAP : BHUT BASIN



03 OCTOBER 2009



08 OCTOBER 2009



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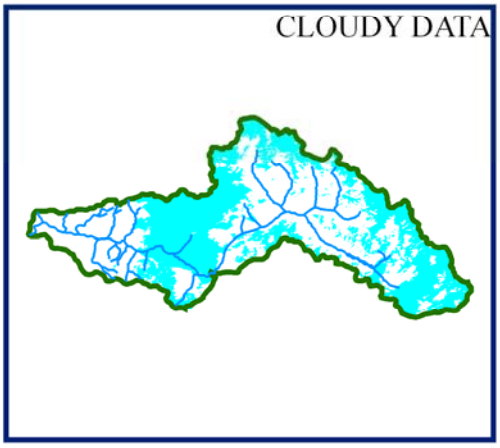
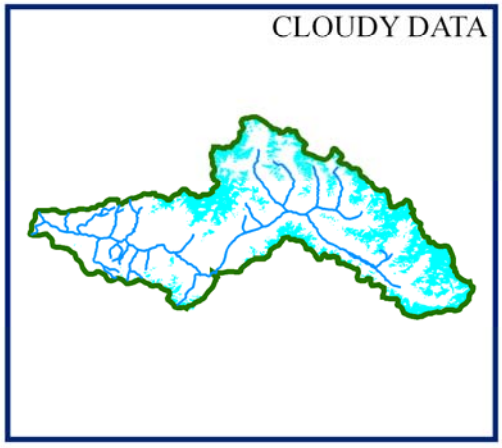
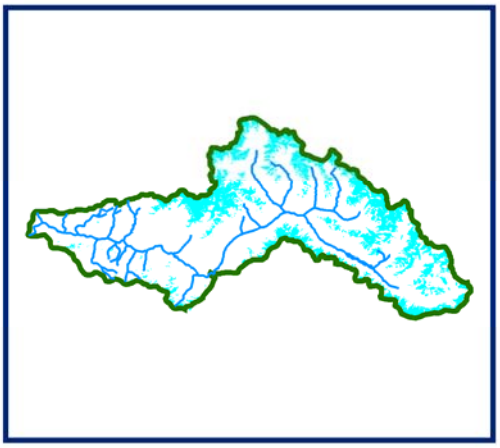


18 OCTOBER 2009



22 OCTOBER 2009



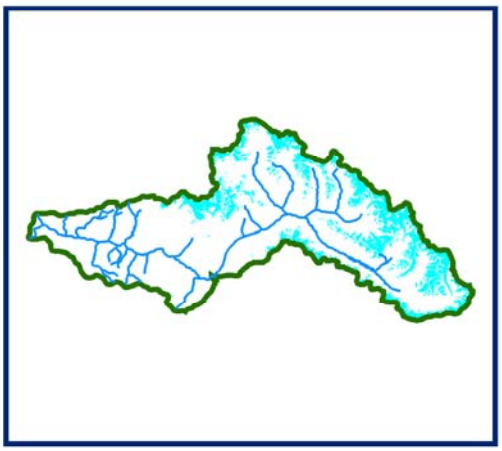
27 OCTOBER 2009

SNOW

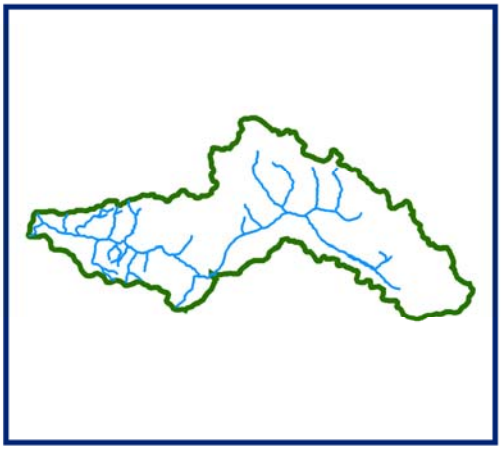
0 15 30 60 90 120

Kilometers

10 DAILY SNOW COVER MAP: BHUT BASIN



DATA USED
03 OCTOBER 2009



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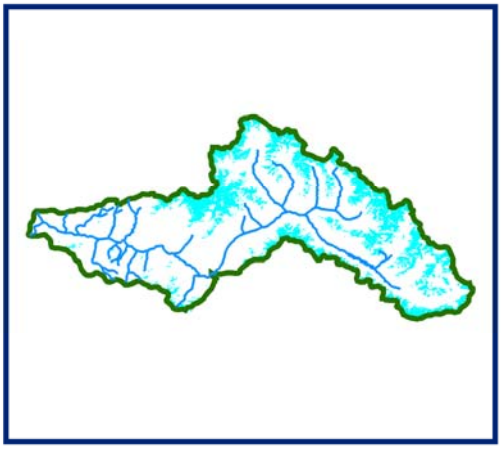
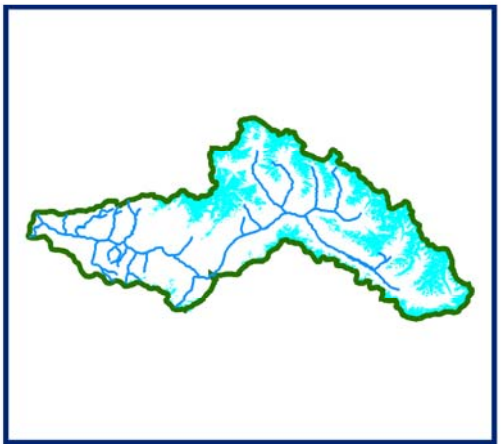


DATA USED
27 OCTOBER 2009

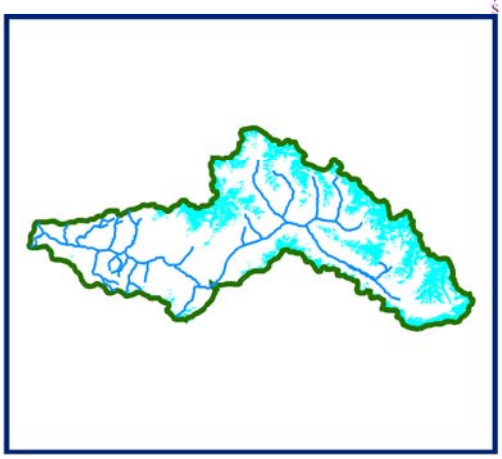
SNOW

0 15 30 60 90 120
Kilometers

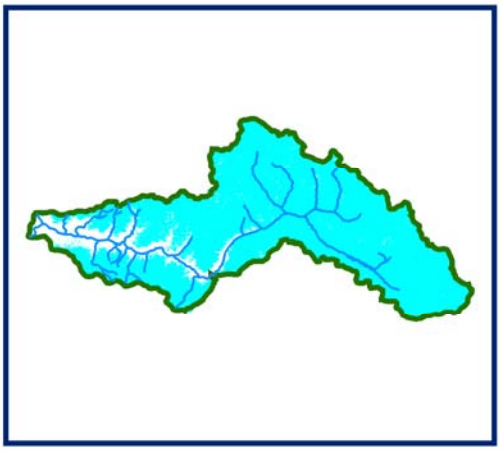
SNOW COVER MAP : BHUT BASIN



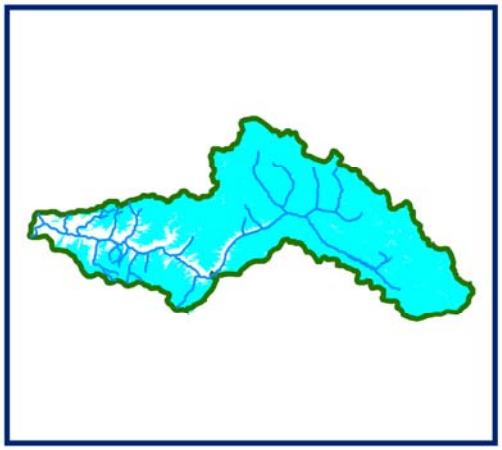
01 NOVEMBER 2009



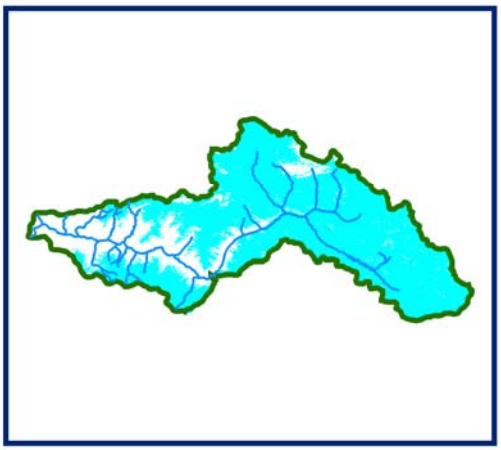
06 NOVEMBER 2009



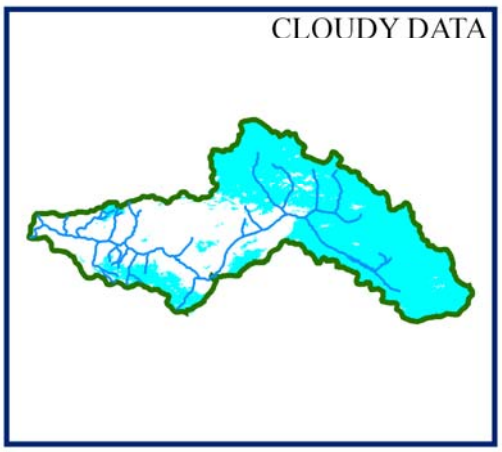
11 NOVEMBER 2009



20 NOVEMBER 2009



25 NOVEMBER 2009



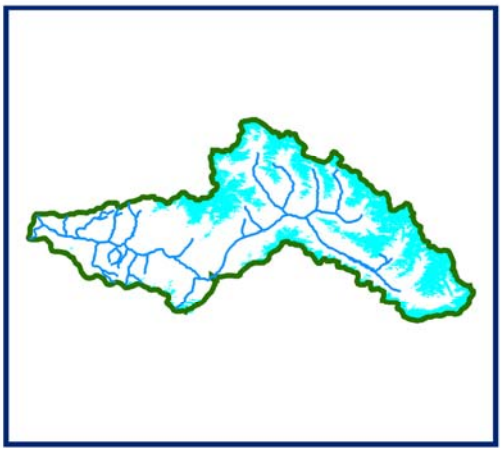
30 NOVEMBER 2009

SNOW

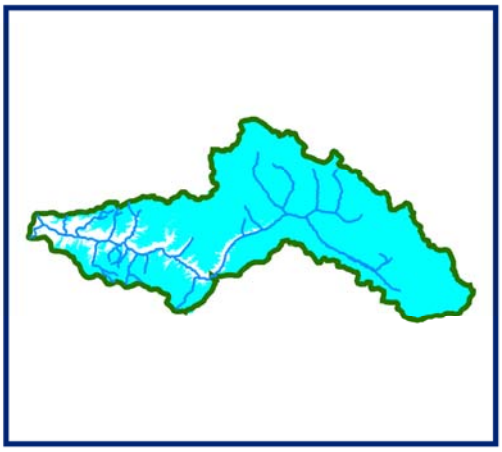
0 15 30 60 90 120

Kilometers

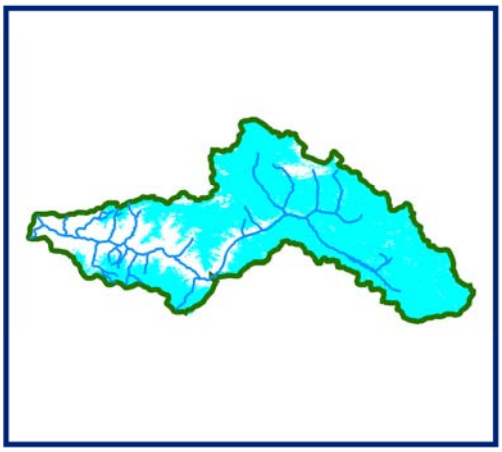
10 DAILY SNOW COVER MAP: BHUT BASIN



DATA USED
01 NOVEMBER 2009
06 NOVEMBER 2009



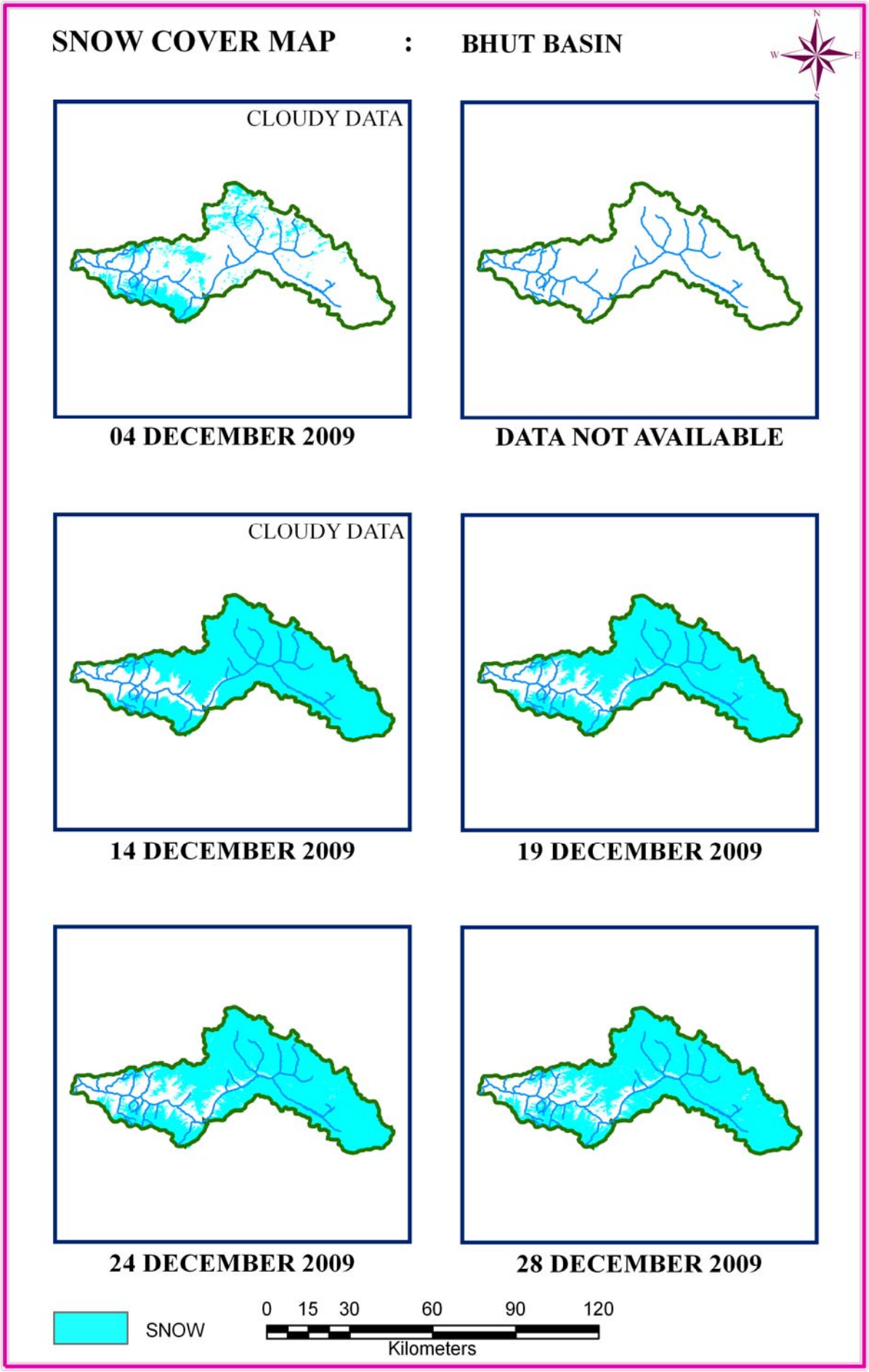
DATA USED
11 NOVEMBER 2009
20 NOVEMBER 2009



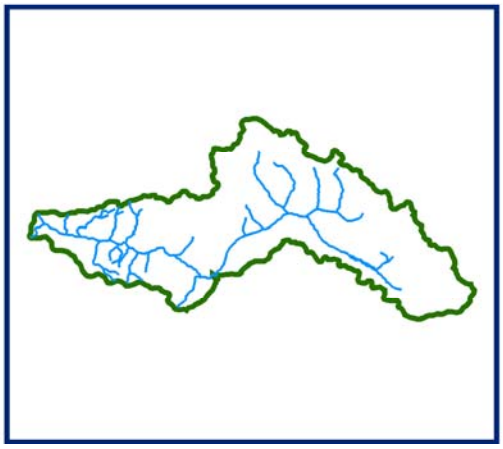
DATA USED
25 NOVEMBER 2009

SNOW

0 15 30 60 90 120
Kilometers


SNOW COVER MAP : BHUT BASIN
N
W
E
S
CLOUDY DATA
04 DECEMBER 2009
DATA NOT AVAILABLE
CLOUDY DATA
14 DECEMBER 2009
19 DECEMBER 2009
24 DECEMBER 2009
28 DECEMBER 2009
SNOW
0 15 30 60 90 120
Kilometers

10 DAILY SNOW COVER MAP: BHUT BASIN



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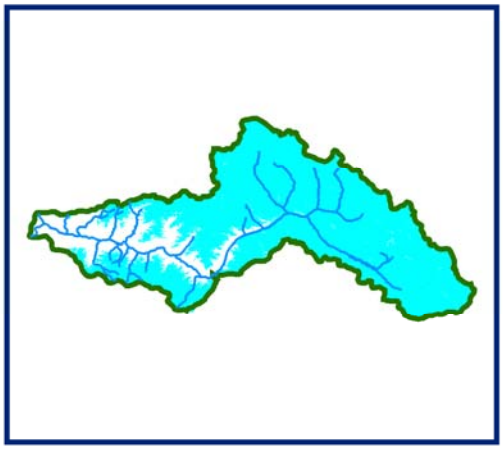

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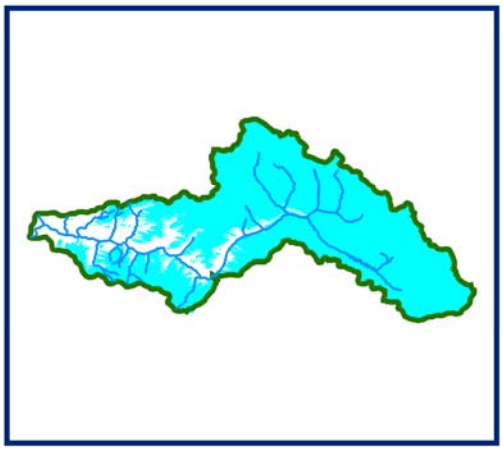
19 DECEMBER 2009



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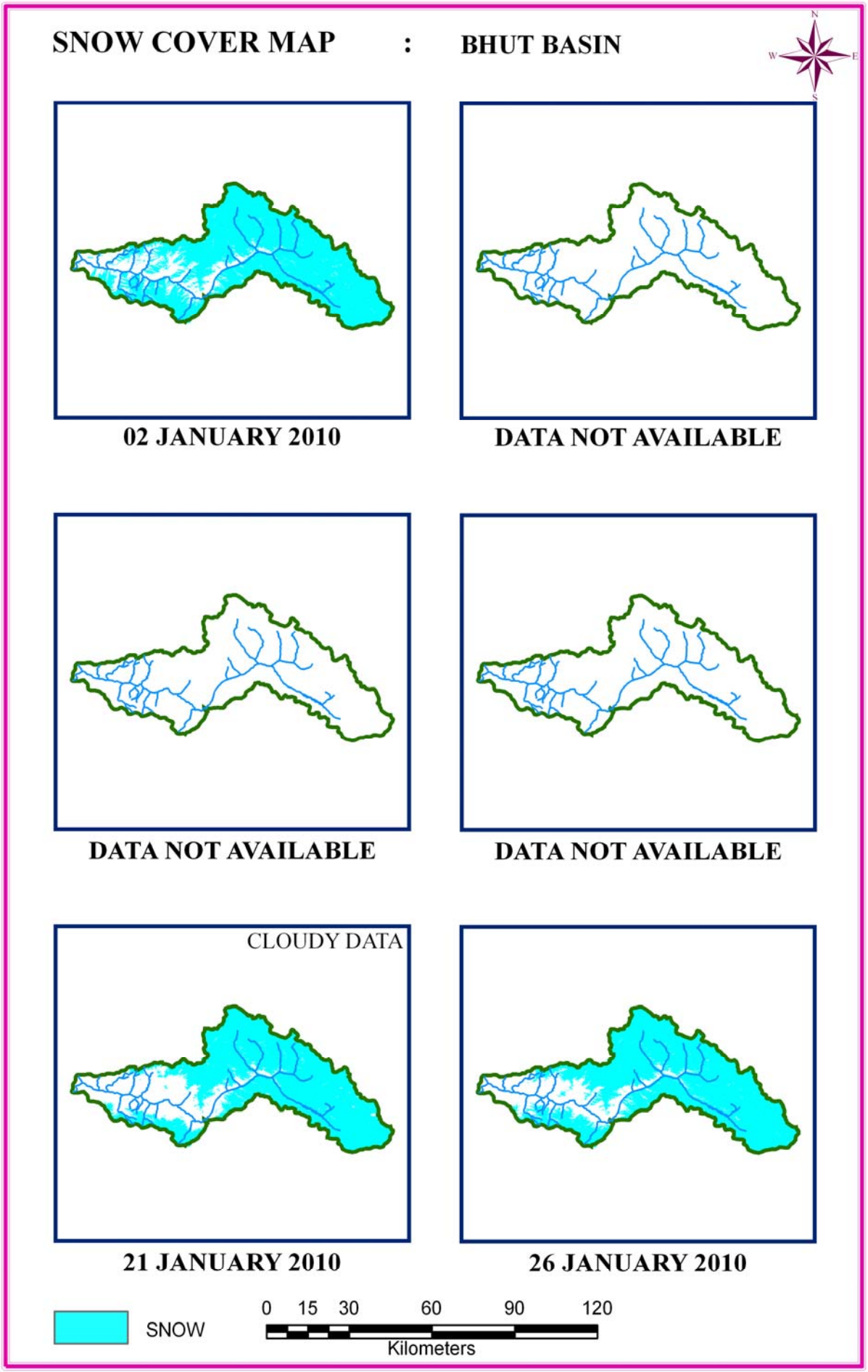
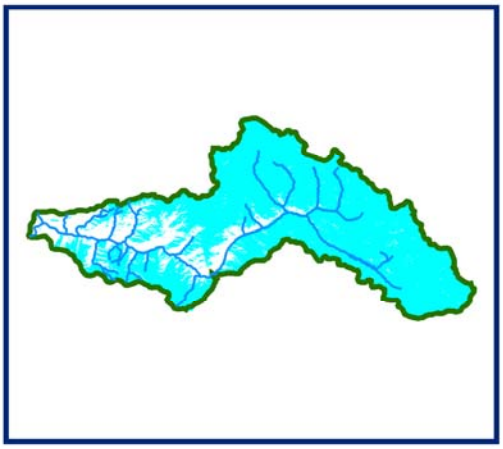
24 DECEMBER 2009
28 DECEMBER 2009

SNOW

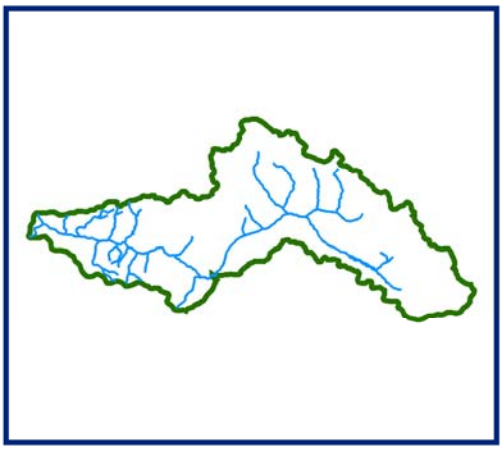
0 15 30 60 90 120
Kilometers


SNOW COVER MAP : BHUT BASIN
N
W
E
S
02 JANUARY 2010
DATA NOT AVAILABLE
DATA NOT AVAILABLE
DATA NOT AVAILABLE
CLOUDY DATA
21 JANUARY 2010
26 JANUARY 2010
SNOW
0 15 30 60 90 120
Kilometers

10 DAILY SNOW COVER MAP: BHUT BASIN



DATA USED
02 JANUARY 2010



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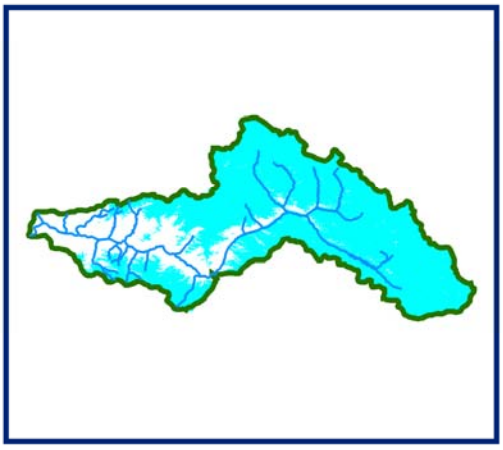
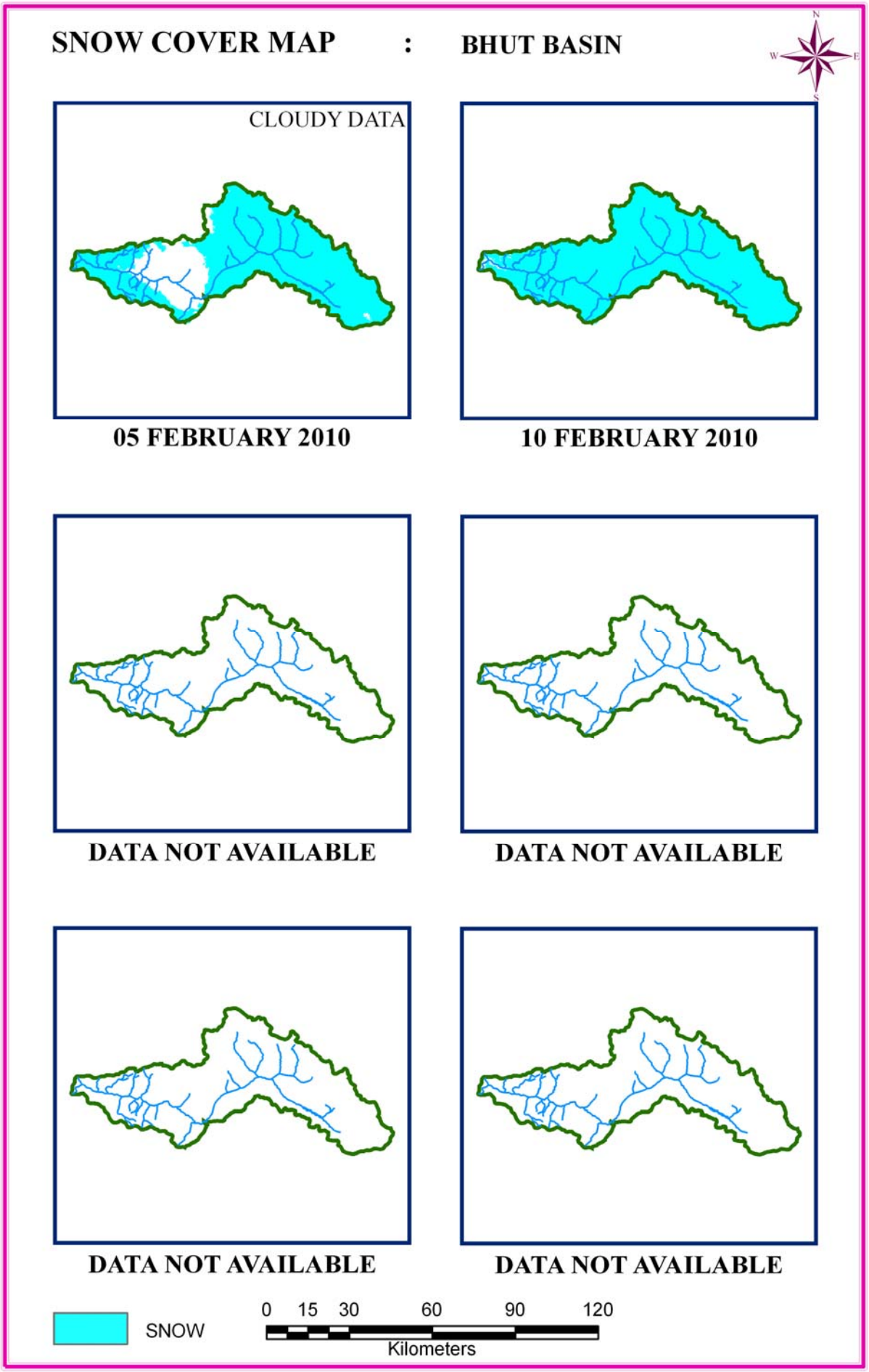


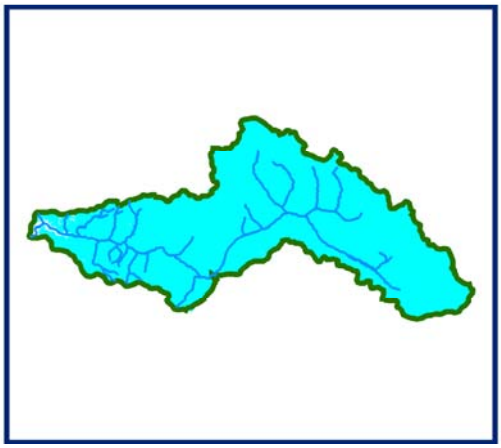
DATA USED
26 JANUARY 2010

SNOW

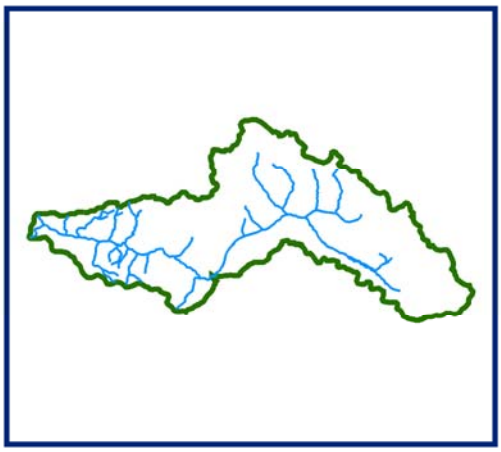
0 15 30 60 90 120
Kilometers


SNOW COVER MAP : BHUT BASIN
N
W
E
S
CLOUDY DATA
05 FEBRUARY 2010
10 FEBRUARY 2010
DATA NOT AVAILABLE
DATA NOT AVAILABLE
DATA NOT AVAILABLE
DATA NOT AVAILABLE
SNOW
0 15 30 60 90 120
Kilometers

10 DAILY SNOW COVER MAP: BHUT BASIN



DATA USED
10 FEBRUARY 2010



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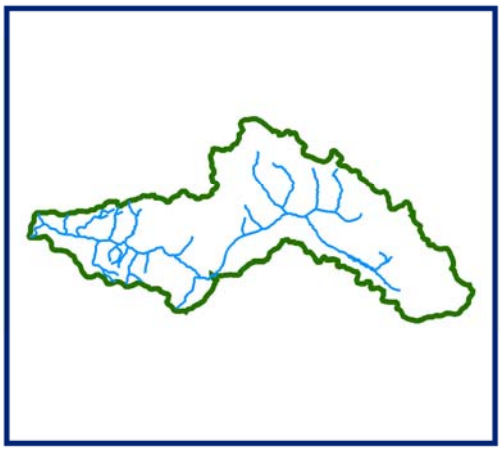
DATA NOT AVAILABLE

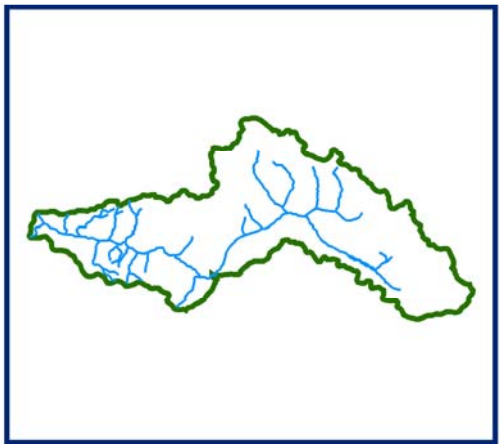


DATA USED
DATA NOT AVAILABLE

SNOW

0 15 30 60 90 120
Kilometers

SNOW COVER MAP : BHUT BASIN



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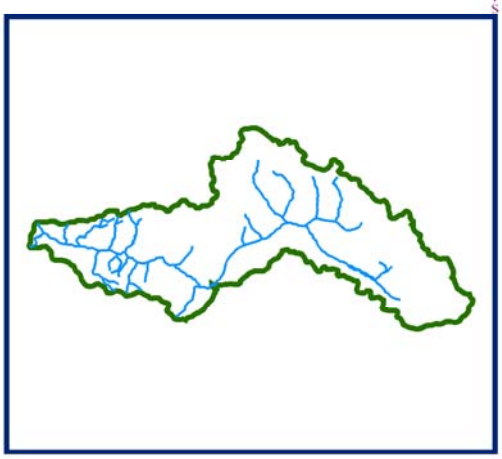

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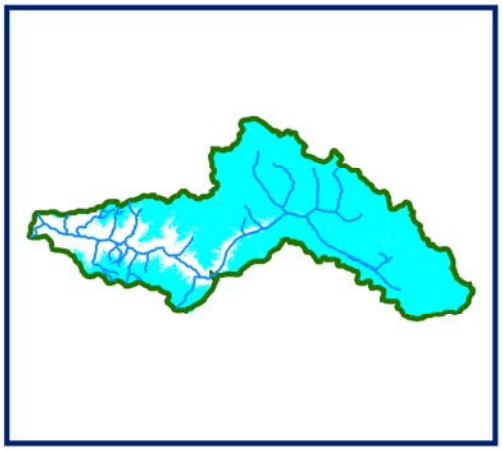
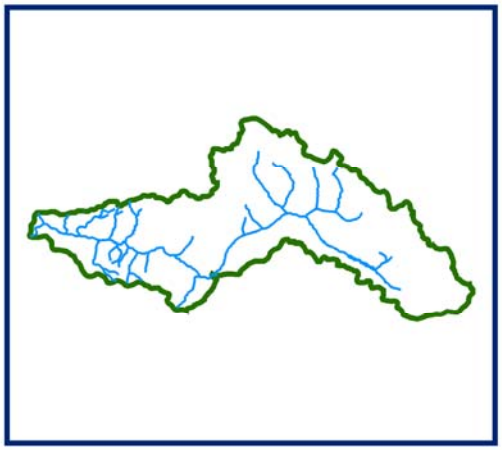


11 MARCH 2010



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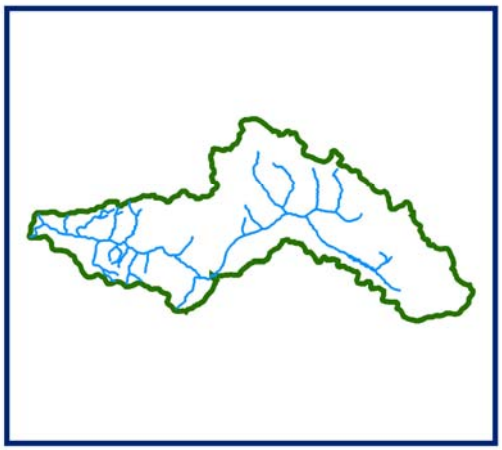
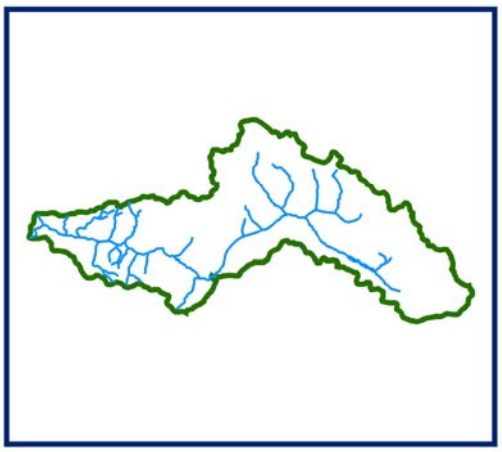


DATA NOT AVAILABLE



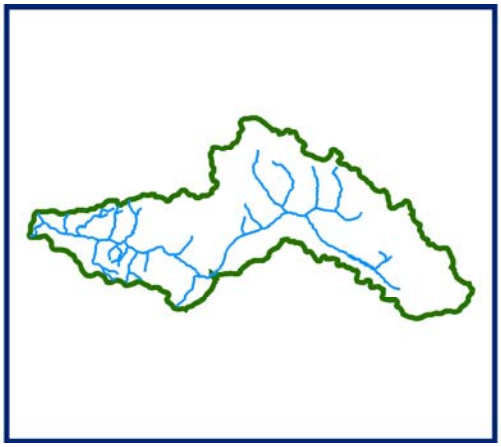
DATA NOT AVAILABLE

SNOW

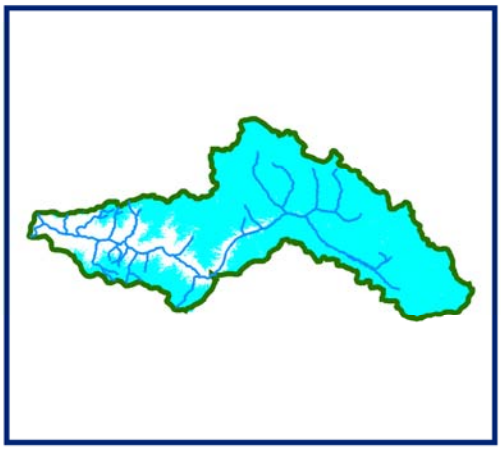
0 15 30 60 90 120

Kilometers

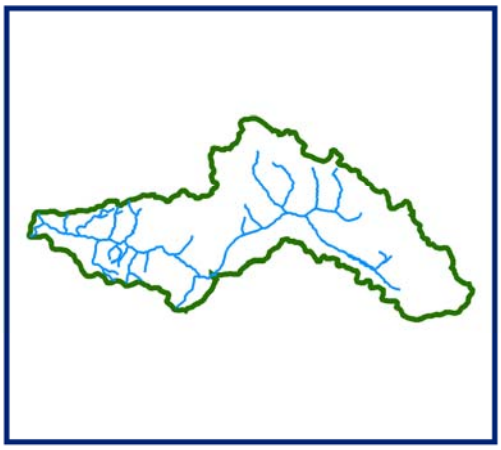
10 DAILY SNOW COVER MAP: BHUT BASIN



DATA USED
DATA NOT AVAILABLE



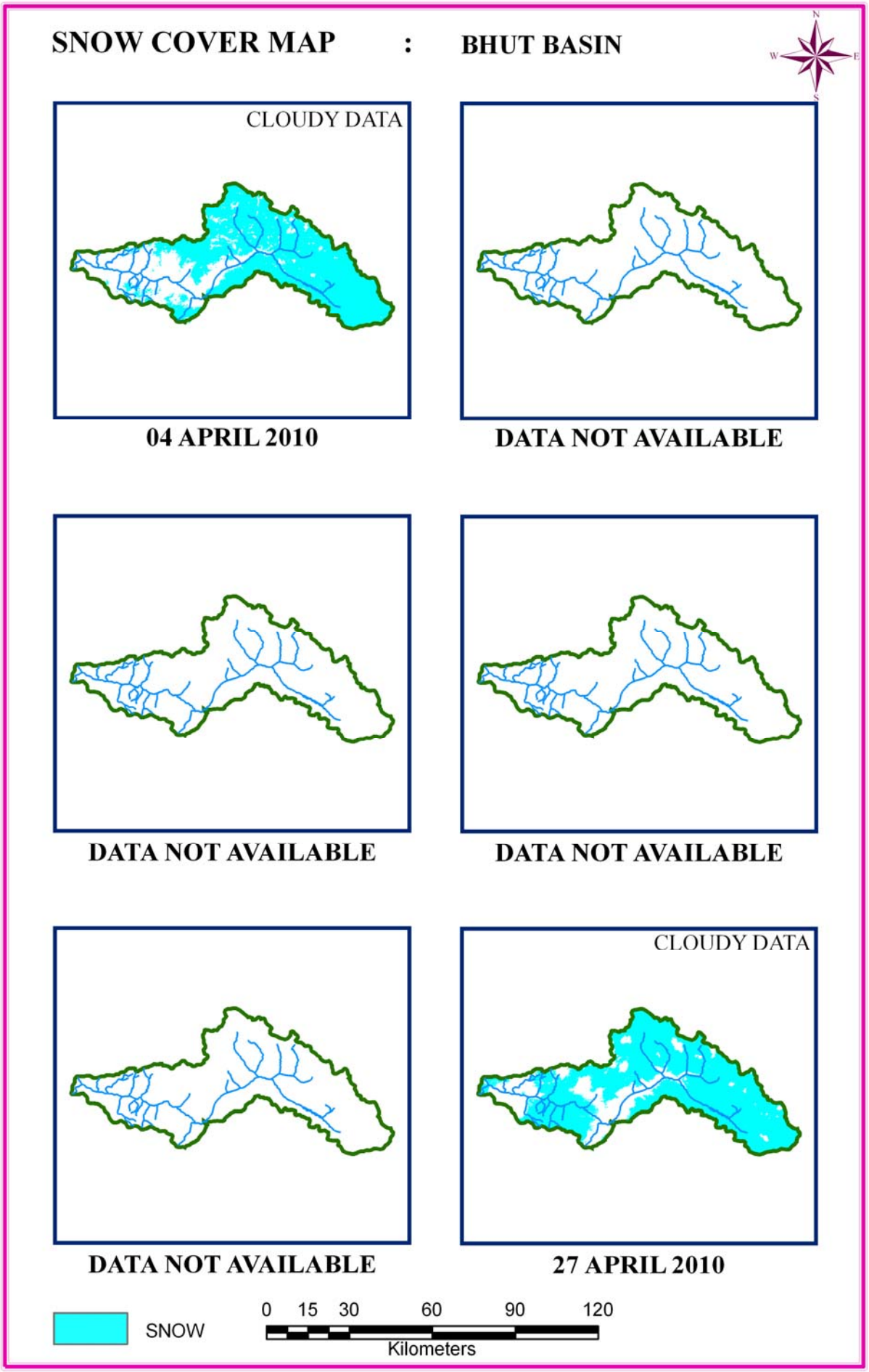
DATA USED
11 MARCH 2010



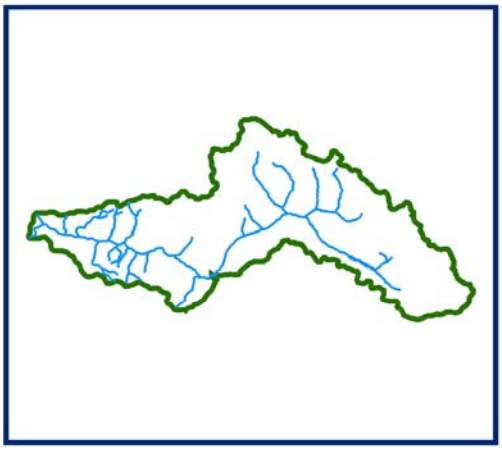
DATA USED
DATA NOT AVAILABLE

SNOW

0 15 30 60 90 120
Kilometers


SNOW COVER MAP : BHUT BASIN
N
W
E
S
CLOUDY DATA
04 APRIL 2010
DATA NOT AVAILABLE
DATA NOT AVAILABLE
DATA NOT AVAILABLE
DATA NOT AVAILABLE
CLOUDY DATA
27 APRIL 2010
SNOW
0 15 30 60 90 120
Kilometers

10 DAILY SNOW COVER MAP: BHUT BASIN



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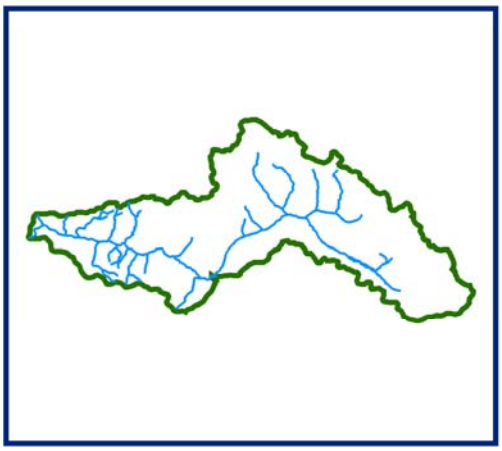

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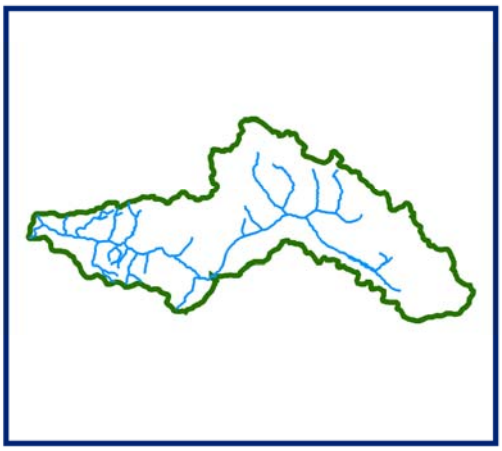
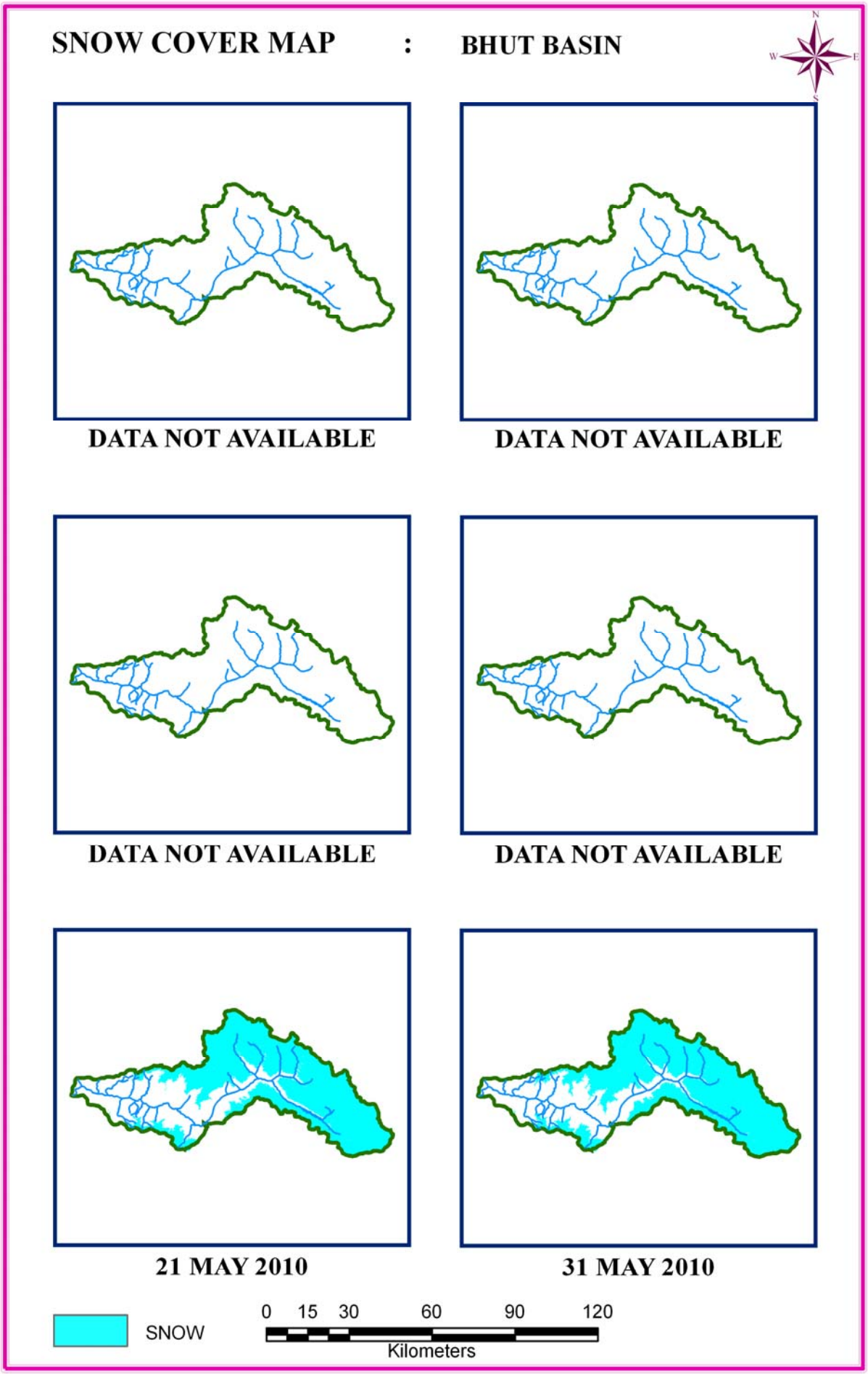


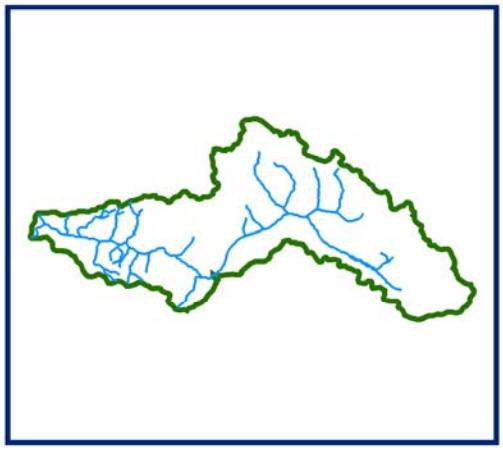
DATA USED
DATA NOT AVAILABLE

SNOW

0 15 30 60 90 120
Kilometers


SNOW COVER MAP : BHUT BASIN
N
W
E
S
DATA NOT AVAILABLE
DATA NOT AVAILABLE
DATA NOT AVAILABLE
DATA NOT AVAILABLE
21 MAY 2010
31 MAY 2010
SNOW
0 15 30 60 90 120
Kilometers

10 DAILY SNOW COVER MAP: BHUT BASIN



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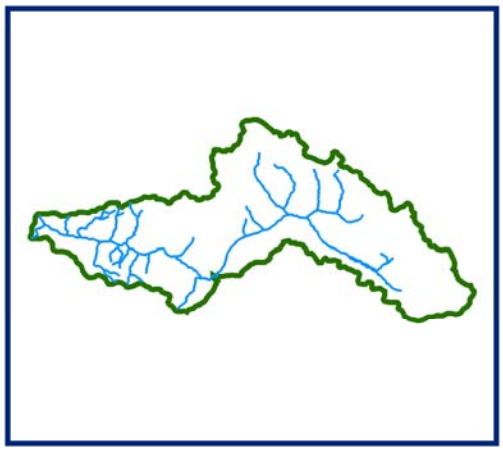

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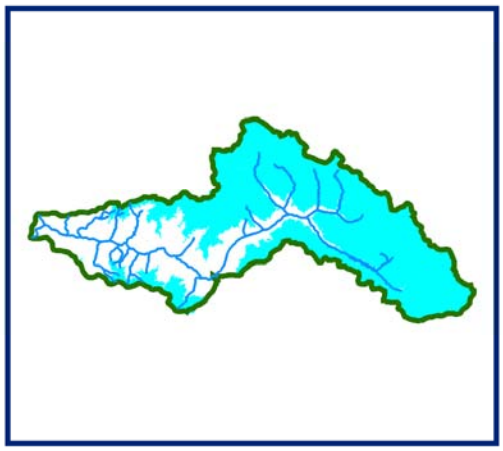
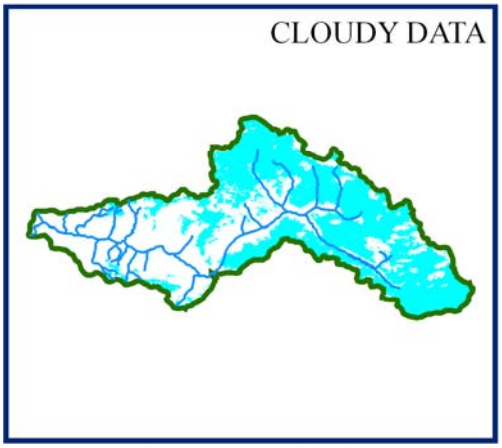


DATA USED
21 MAY 2010
26 MAY 2010
31 MAY 2010

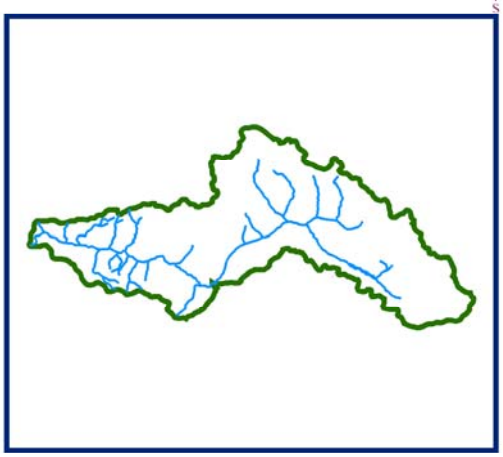
SNOW

0 15 30 60 90 120
Kilometers

SNOW COVER MAP : BHUT BASIN



05 JUNE 2010



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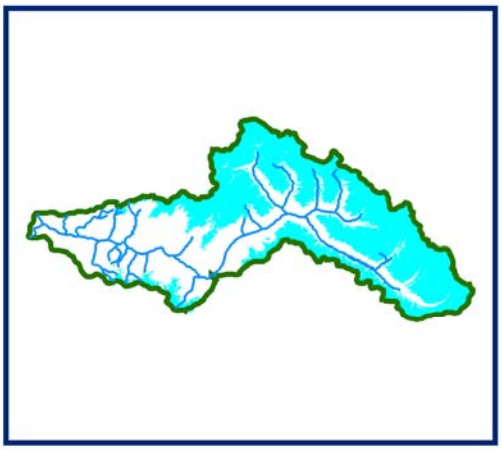
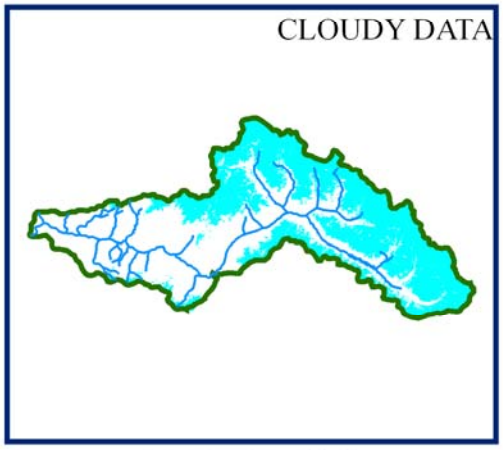
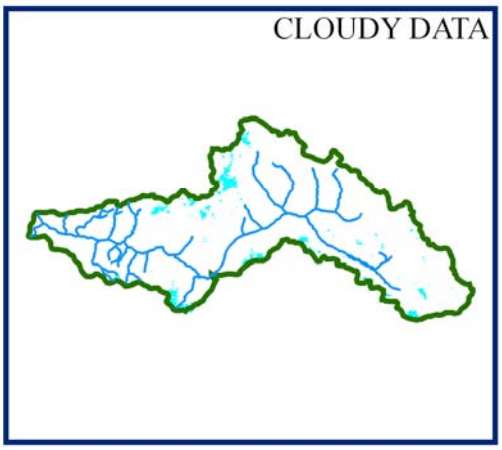


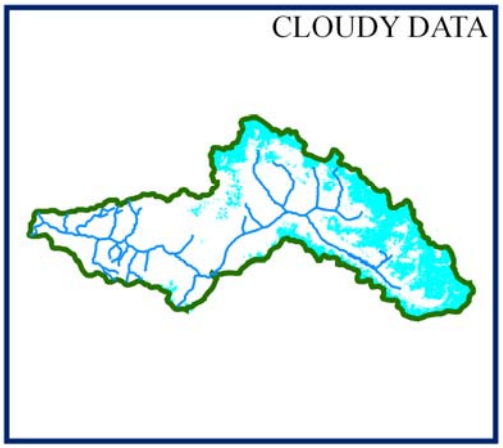
19 JUNE 2010



20 JUNE 2010



24 JUNE 2010



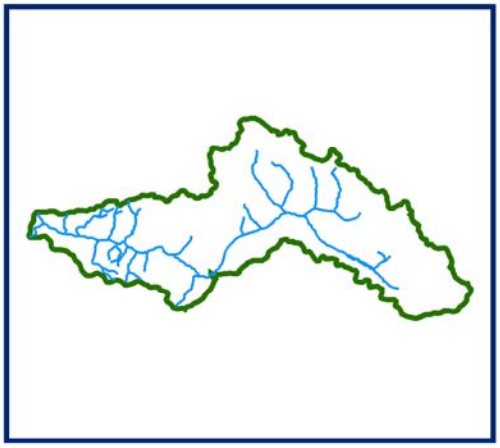
29 JUNE 2010

SNOW

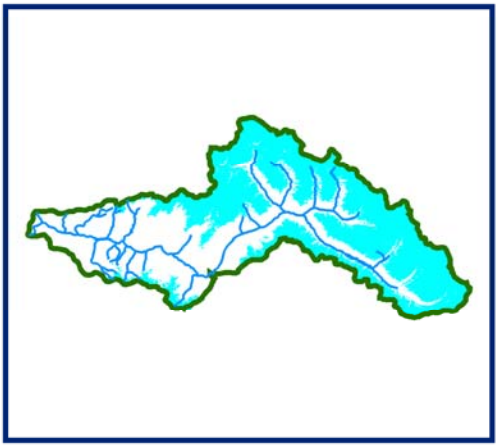
0 15 30 60 90 120

Kilometers

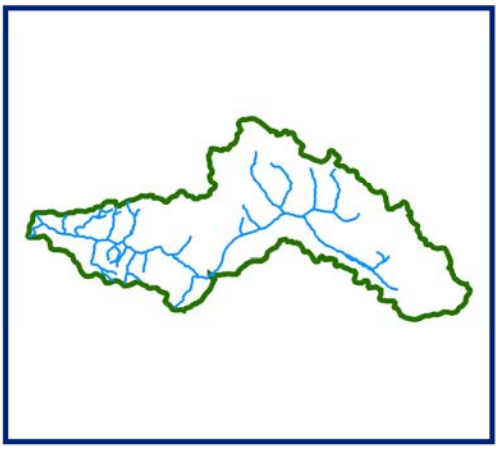
10 DAILY SNOW COVER MAP: BHUT BASIN



DATA USED
DATA NOT AVAILABLE



DATA USED
19 JUNE 2010



DATA USED
DATA NOT AVAILABLE

SNOW

0 15 30 60 90 120
Kilometers

WARWAN BASIN

AREAL EXTENT OF SNOW (5 DAILY)

BASIN NAME: WARWAN **BASIN AREA: 4770 sq km**

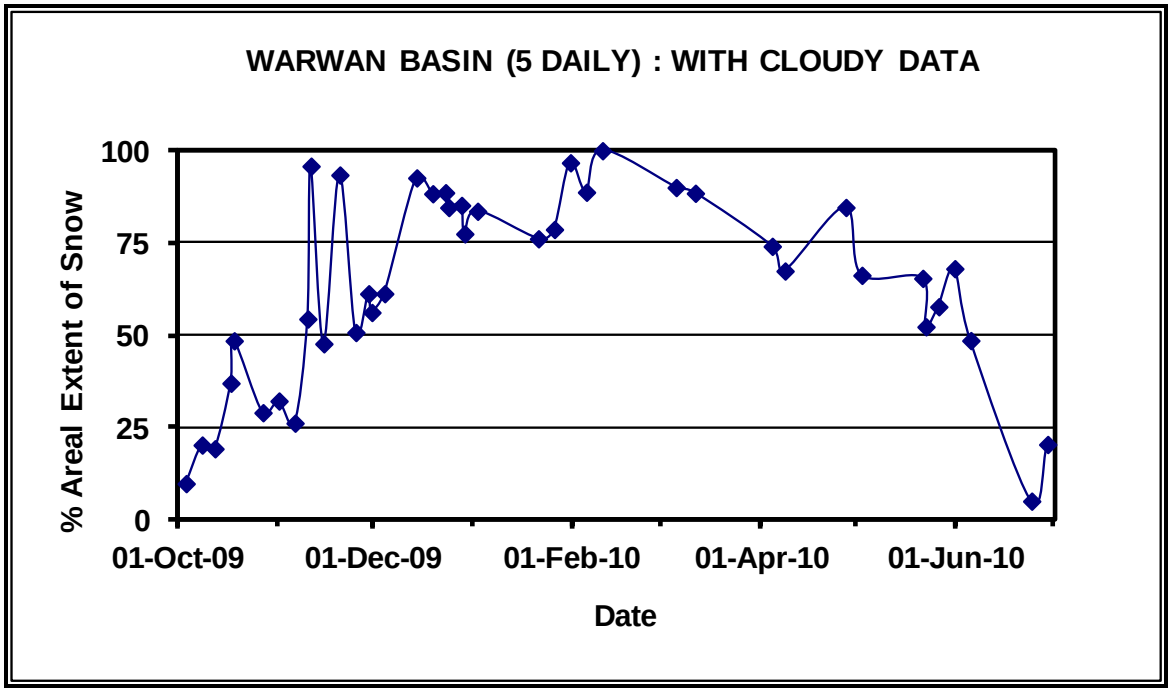
S No	Date	Snow cover (sq km)	Snow cover (%)	S No	Date	Snow cover (sq km)	Snow cover (%)
October 2009							
1	3-Oct-09	460.2	10	2	8-Oct-09	947.8	20
3	12-Oct-09	900.7	19	4	17-Oct-09	1729.5	37
5	18-Oct-09	2266.3	49	6	27-Oct-09	1357.0	29
November 2009							
7	1-Nov-09	1504.6	32	8	6-Nov-09	1224.7	26
9	10-Nov-09	2542.1	54	10	11-Nov-09	4474.7	96
11	15-Nov-09	2228.5	48	12	20-Nov-09	4362.8	93
13	25-Nov-09	2371.1	51	14	29-Nov-09	2861.1	61
15	30-Nov-09	2624.4	56				
December 2009							
16	4-Dec-09	2862.3	61	17	14-Dec-09	4326.2	93
18	19-Dec-09	4126.1	88	19	23-Dec-09	4139.1	89
20	24-Dec-09	3951.7	85	21	28-Dec-09	3978.3	85
22	29-Dec-09	3618.4	77				
January 2010							
23	2-Jan-10	3904.3	84	24	21-Jan-10	3556.2	76
25	26-Jan-10	3674.5	79	26	31-Jan-10	4517.5	97
February 2010							
27	5-Feb-10	4145.1	89	28	10-Feb-10	4670.0	100
March 2010							
29	5-Mar-10	4204.6	90	30	11-Mar-10	4132.0	88
April 2010							
31	4-Apr-10	3460.9	74	32	8-Apr-10	3148.7	67
33	27-Apr-10	3952.5	85				
May 2010							
34	2-May-10	3094.2	66	35	21-May-10	3055.8	65
36	22-May-10	2443.2	52	37	26-May-10	2696.9	58
38	31-May-10	3178.1	68				
June 2010							
39	5-Jun-10	2269.2	49	40	24-Jun-10	238.4	5
41	29-Jun-10	955.0	20				
July 2010							
42	8-Jul-10	1526.7	33				

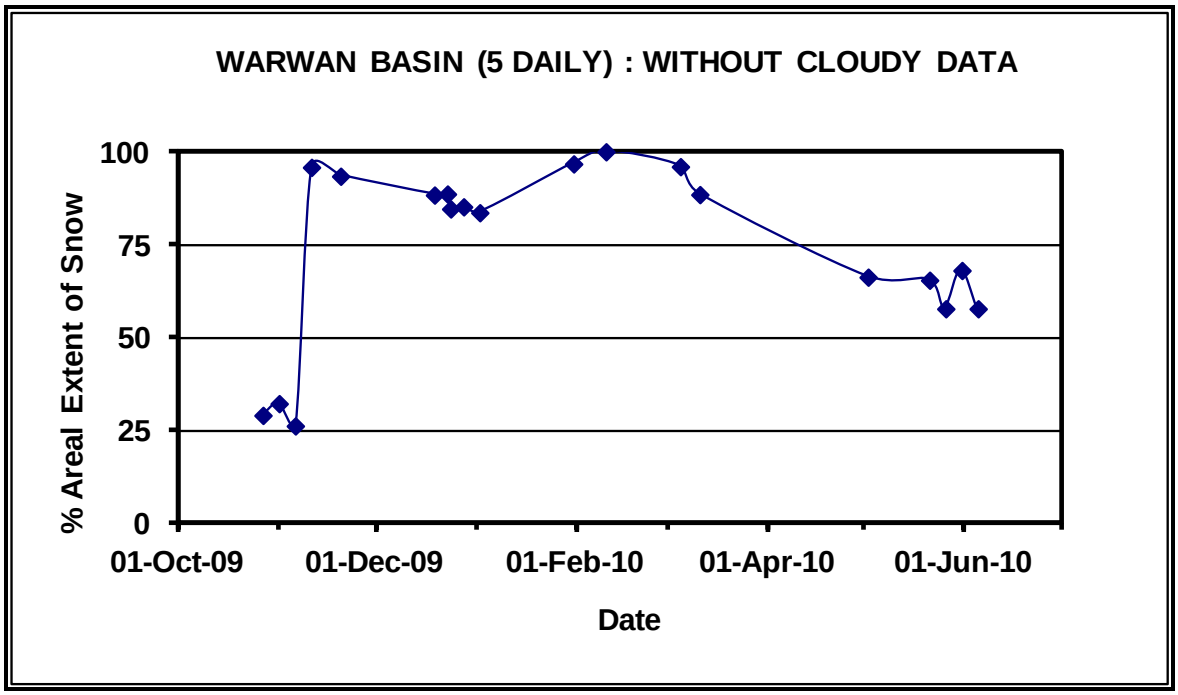
AREAL EXTENT OF SNOW (10 DAILY)

BASIN NAME: WARWAN **BASIN AREA: 4670 sq km**

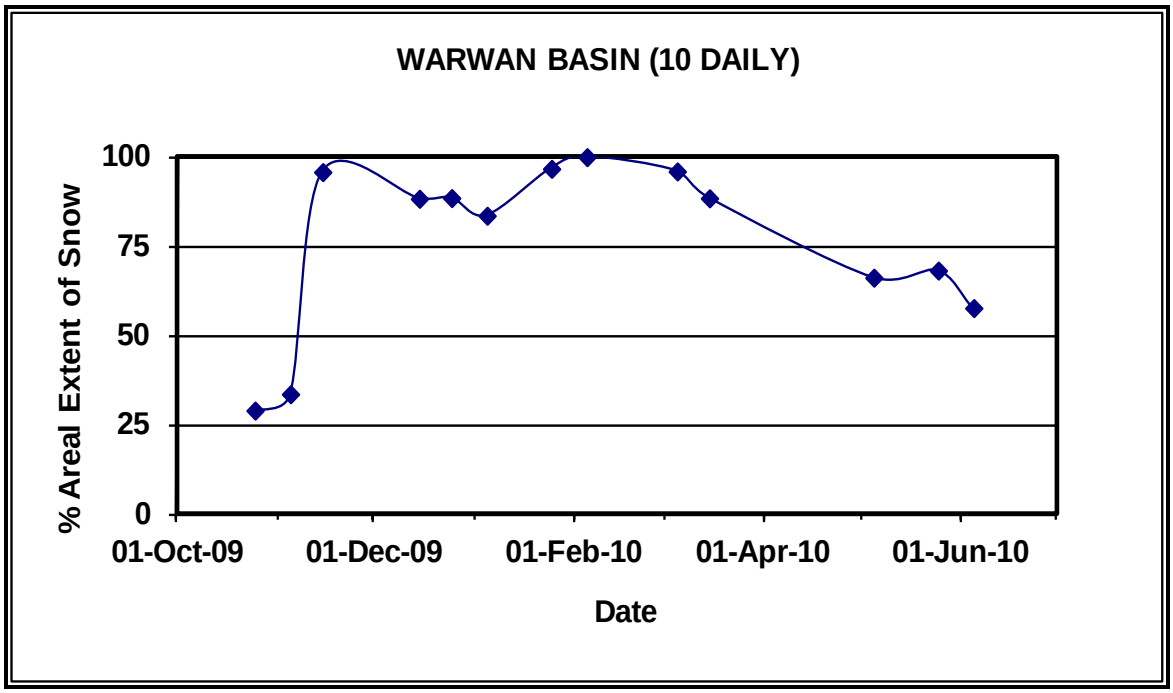
S No	Date	Snow cover (sq km)	Snow cover (%)	S No	Date	Snow cover (sq km)	Snow cover (%)
October 2009				**November 2009**			
1	27-Oct-09	1357.0	29	2	1-Nov-09	1571.1	34
				3	11-Nov-09	4474.7	96
December 2009				**January 2010**			
4	19-Dec-09	4126.1	88	6	2-Jan-10	3904.3	84
5	24-Dec-09	4135.1	89				
February 2010				**March 2010**			
7	10-Feb-10	4670.0	100	8	11-Mar-10	4132.0	88
April 2010				**May 2010**			
				9	2-May-10	3094.2	66
				10	26-May-10	3187.0	68
June 2010				**July2010**			
				11	8-Jul-10	1526.7	33

Snow cover depletion curve



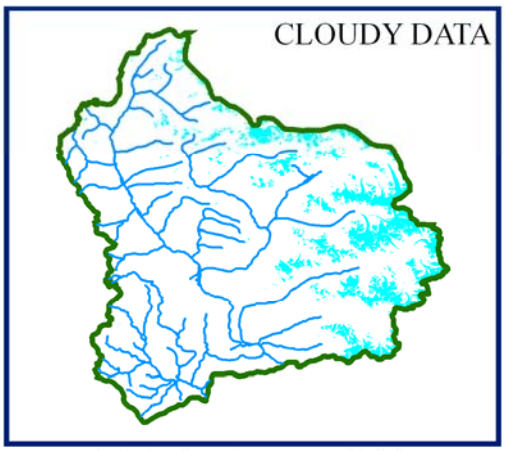


Snow cover depletion curve

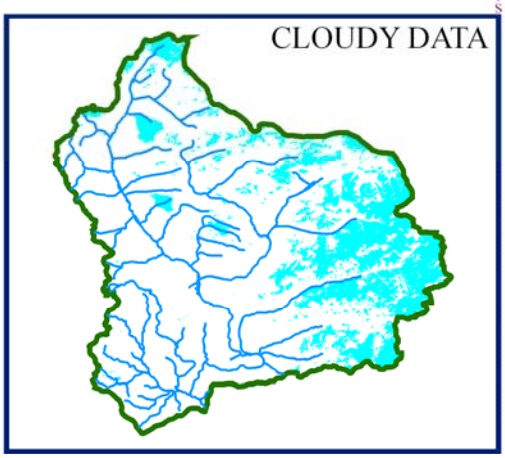


SNOW COVER MAP

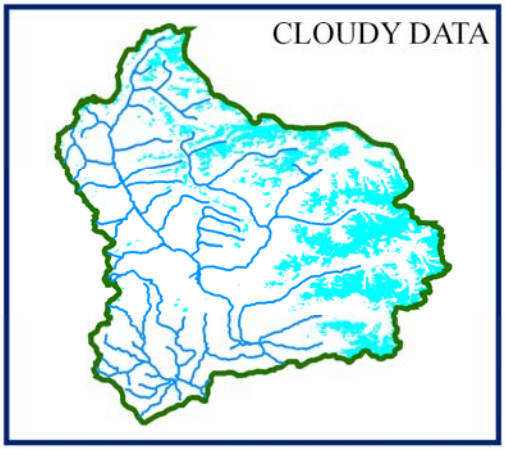
SNOW COVER MAP : WARWAN BASIN



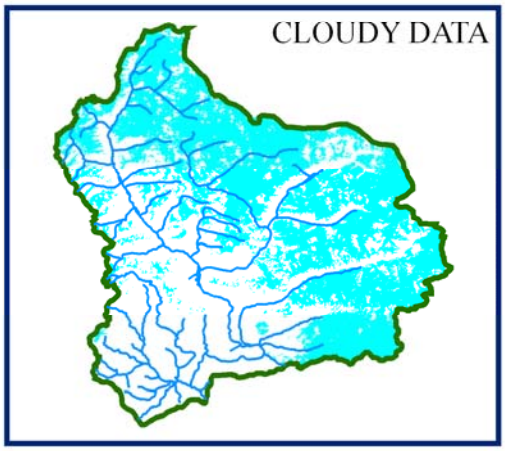
03 OCTOBER 2009



08 OCTOBER 2009



12 OCTOBER 2009



18 OCTOBER 2009

DATA NOT AVAILABLE

27 OCTOBER 2009

SNOW

0 15 30 60 90 120

Kilometers

10 DAILY SNOW COVER MAP : WARWAN BASIN

DATA USED
DATA NOT AVAILABLE

DATA USED
DATA NOT AVAILABLE

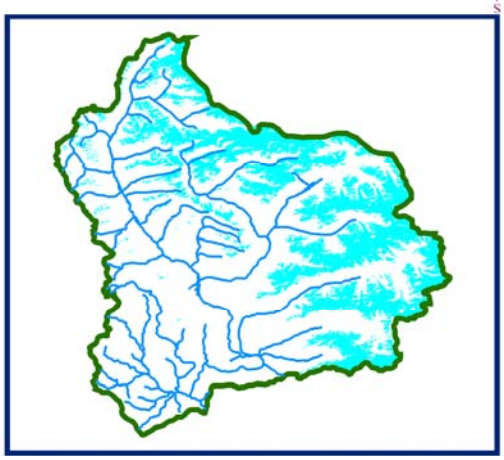
DATA USED
27 OCTOBER 2009

SNOW

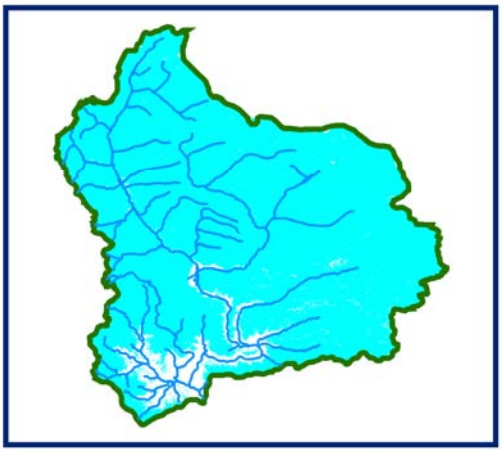
0 15 30 60 90 120
Kilometers

SNOW COVER MAP : WARWAN BASIN

01 NOVEMBER 2009

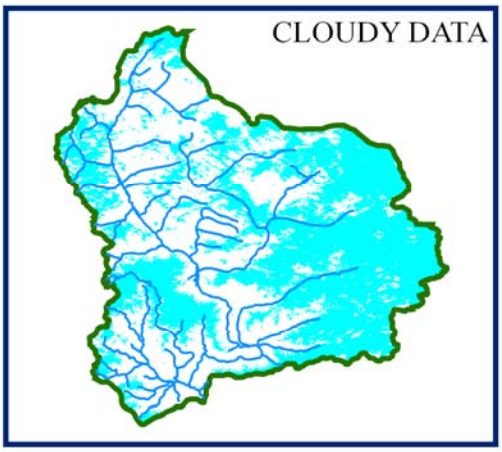


06 NOVEMBER 2009

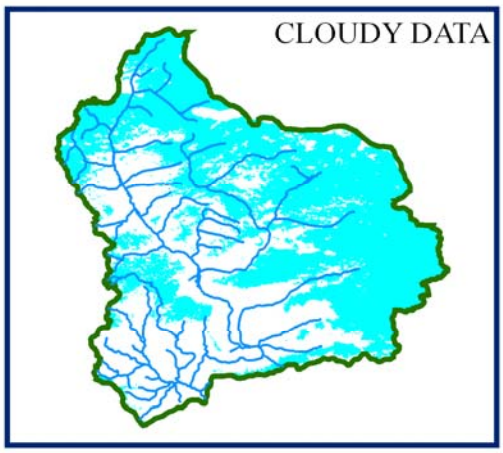


11 NOVEMBER 2009

20 NOVEMBER 2009



25 NOVEMBER 2009



30 NOVEMBER 2009

SNOW

0 15 30 60 90 120

Kilometers

10 DAILY SNOW COVER MAP : WARWAN BASIN

DATA USED
01 NOVEMBER 2009
06 NOVEMBER 2009

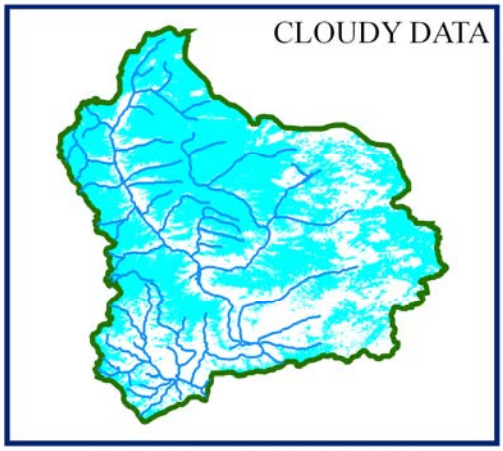
DATA USED
11 NOVEMBER 2009
20 NOVEMBER 2009

DATA USED
DATA NOT AVAILABLE

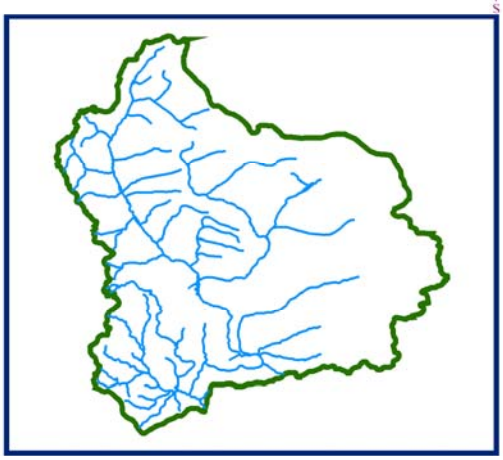
SNOW

0 15 30 60 90 120
Kilometers

SNOW COVER MAP : WARWAN BASIN



04 DECEMBER 2009



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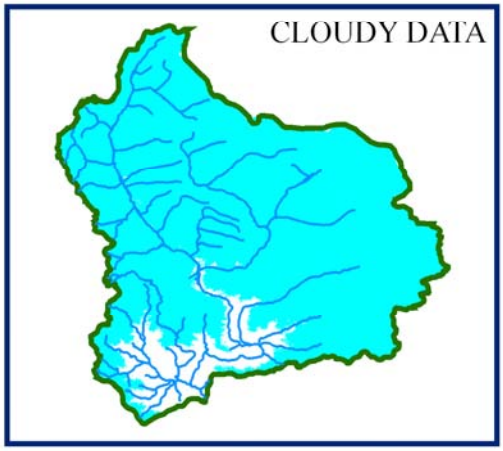


14 DECEMBER 2009

19 DECEMBER 2009

23 DECEMBER 2009

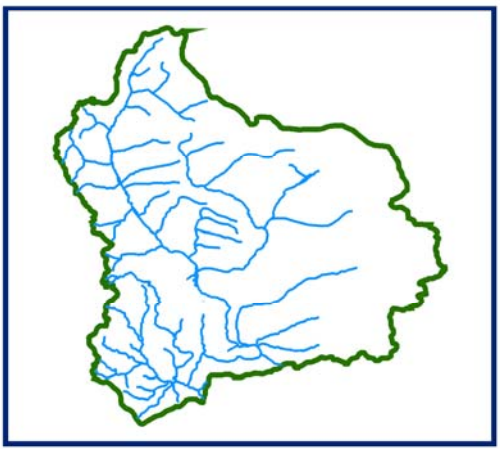
28 DECEMBER 2009

SNOW

0 15 30 60 90 120

Kilometers

10 DAILY SNOW COVER MAP : WARWAN BASIN



DATA USED
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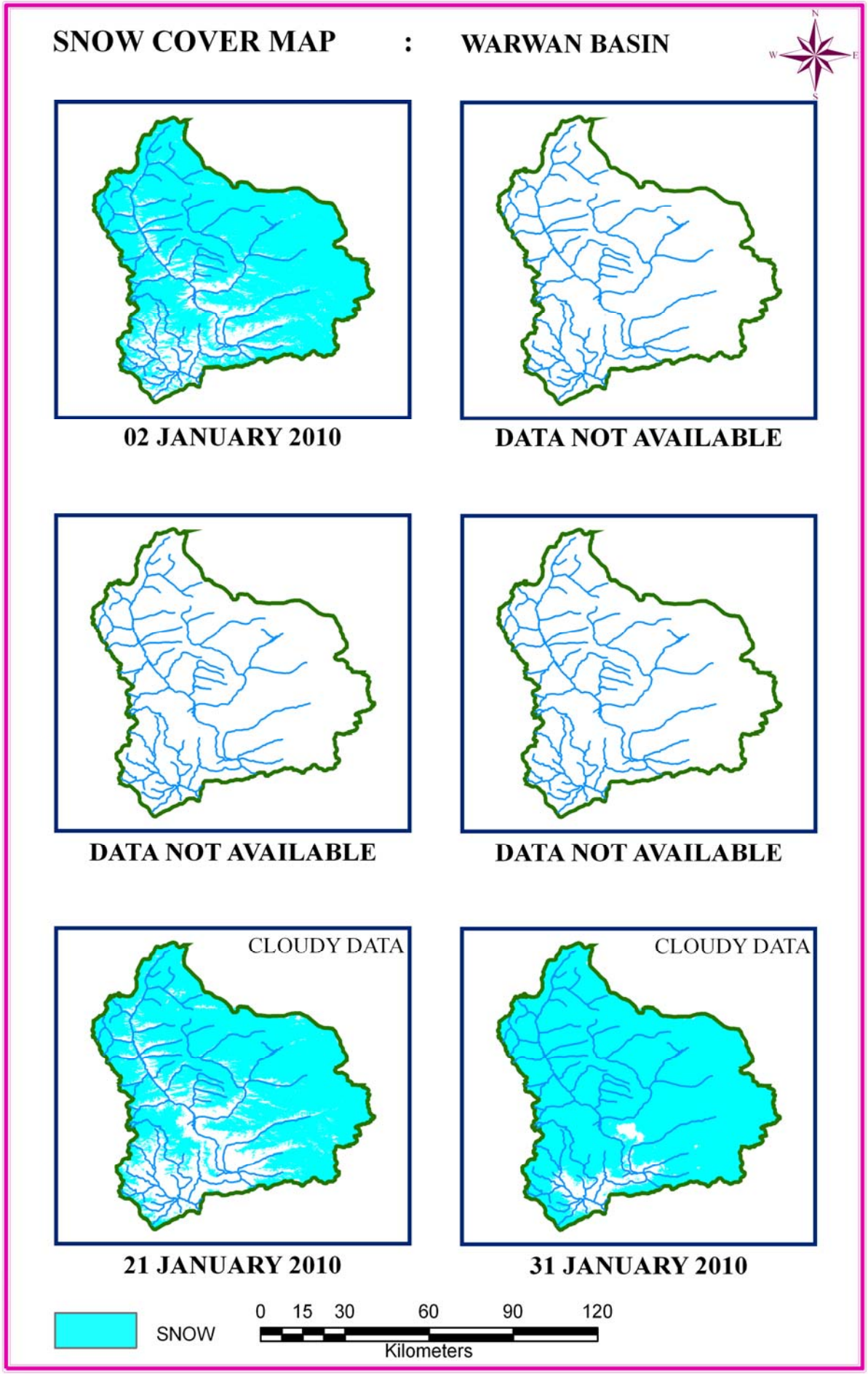
DATA USED
19 DECEMBER 2009

DATA USED
23 DECEMBER 2009
24 DECEMBER 2009
28 DECEMBER 2009

SNOW

0 15 30 60 90 120
Kilometers


SNOW COVER MAP : WARWAN BASIN
N
W
E
S
02 JANUARY 2010
DATA NOT AVAILABLE
DATA NOT AVAILABLE
DATA NOT AVAILABLE
CLOUDY DATA
21 JANUARY 2010
CLOUDY DATA
31 JANUARY 2010
SNOW
0 15 30 60 90 120
Kilometers

10 DAILY SNOW COVER MAP : WARWAN BASIN

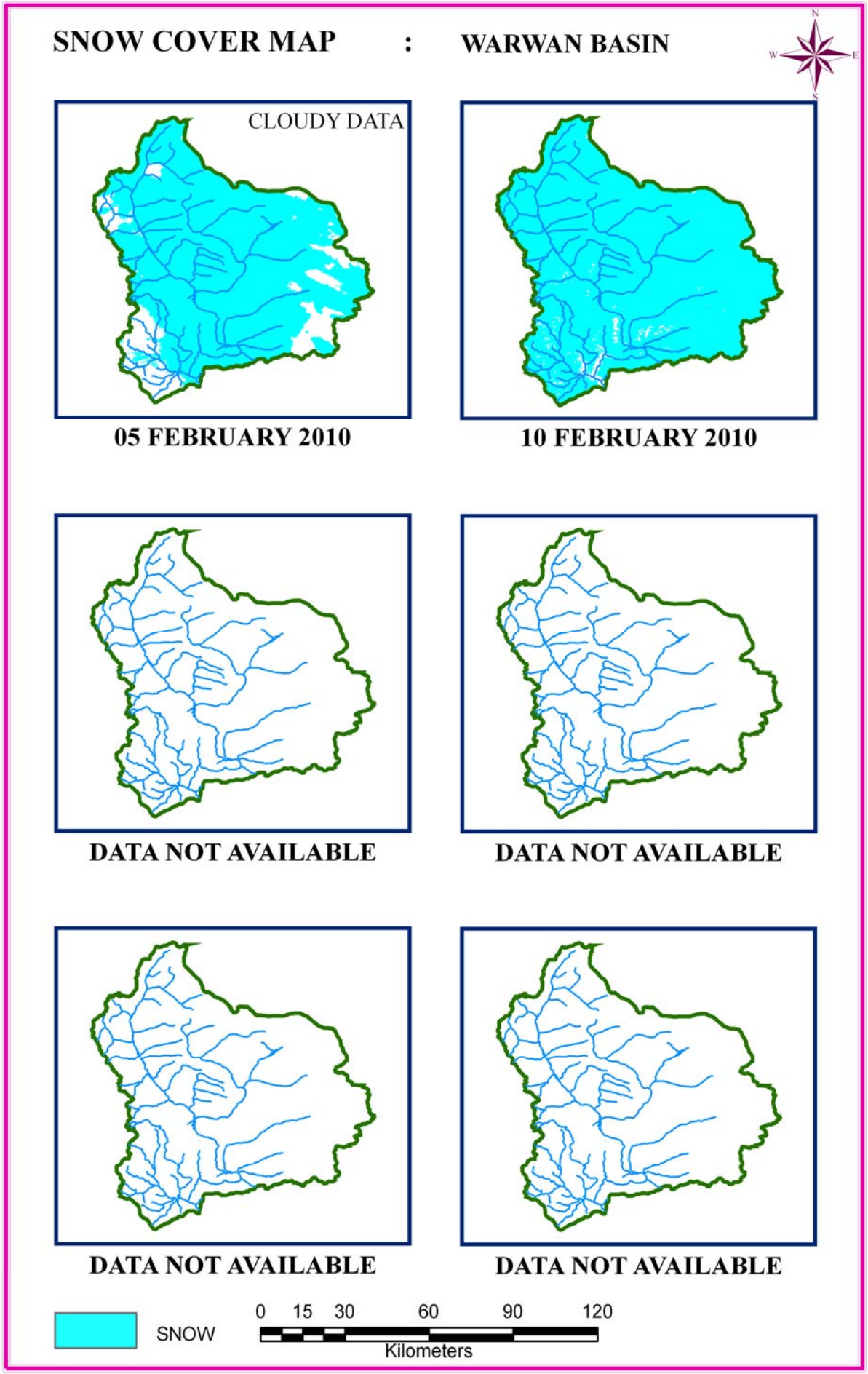
DATA USED
02 JANUARY 2010

DATA USED
DATA NOT AVAILABLE

DATA USED
DATA NOT AVAILABLE

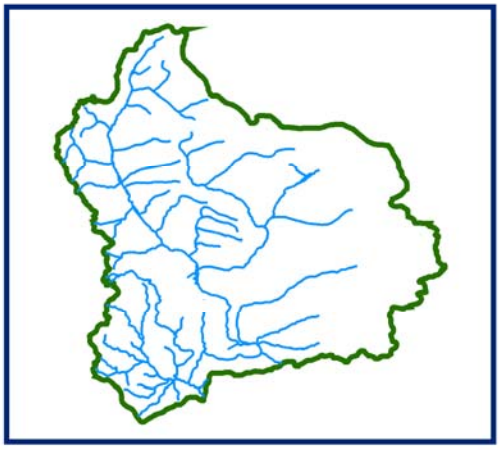
SNOW

0 15 30 60 90 120
Kilometers


SNOW COVER MAP : WARWAN BASIN
N
W
E
S
CLOUDY DATA
05 FEBRUARY 2010
10 FEBRUARY 2010
DATA NOT AVAILABLE
DATA NOT AVAILABLE
DATA NOT AVAILABLE
DATA NOT AVAILABLE
SNOW
0 15 30 60 90 120
Kilometers

10 DAILY SNOW COVER MAP : WARWAN BASIN

DATA USED
10 FEBRUARY 2010



DATA USED
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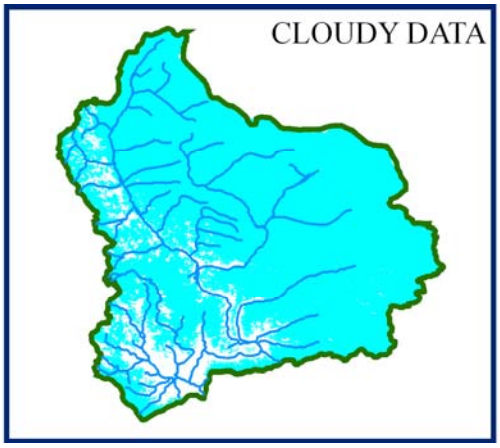
DATA USED
DATA NOT AVAILABLE

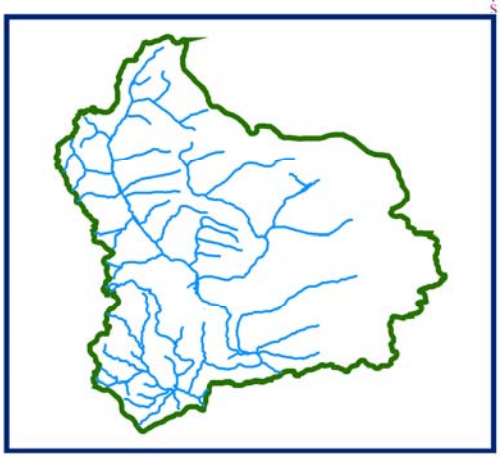
SNOW

0 15 30 60 90 120
Kilometers

SNOW COVER MAP : WARWAN BASIN



05 MARCH 2010



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11 MARCH 2010

DATA NOT AVAILABLE

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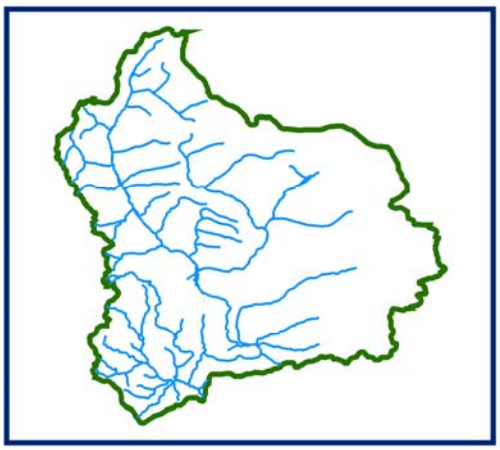


DATA NOT AVAILABLE

SNOW

0 15 30 60 90 120

Kilometers

10 DAILY SNOW COVER MAP : WARWAN BASIN

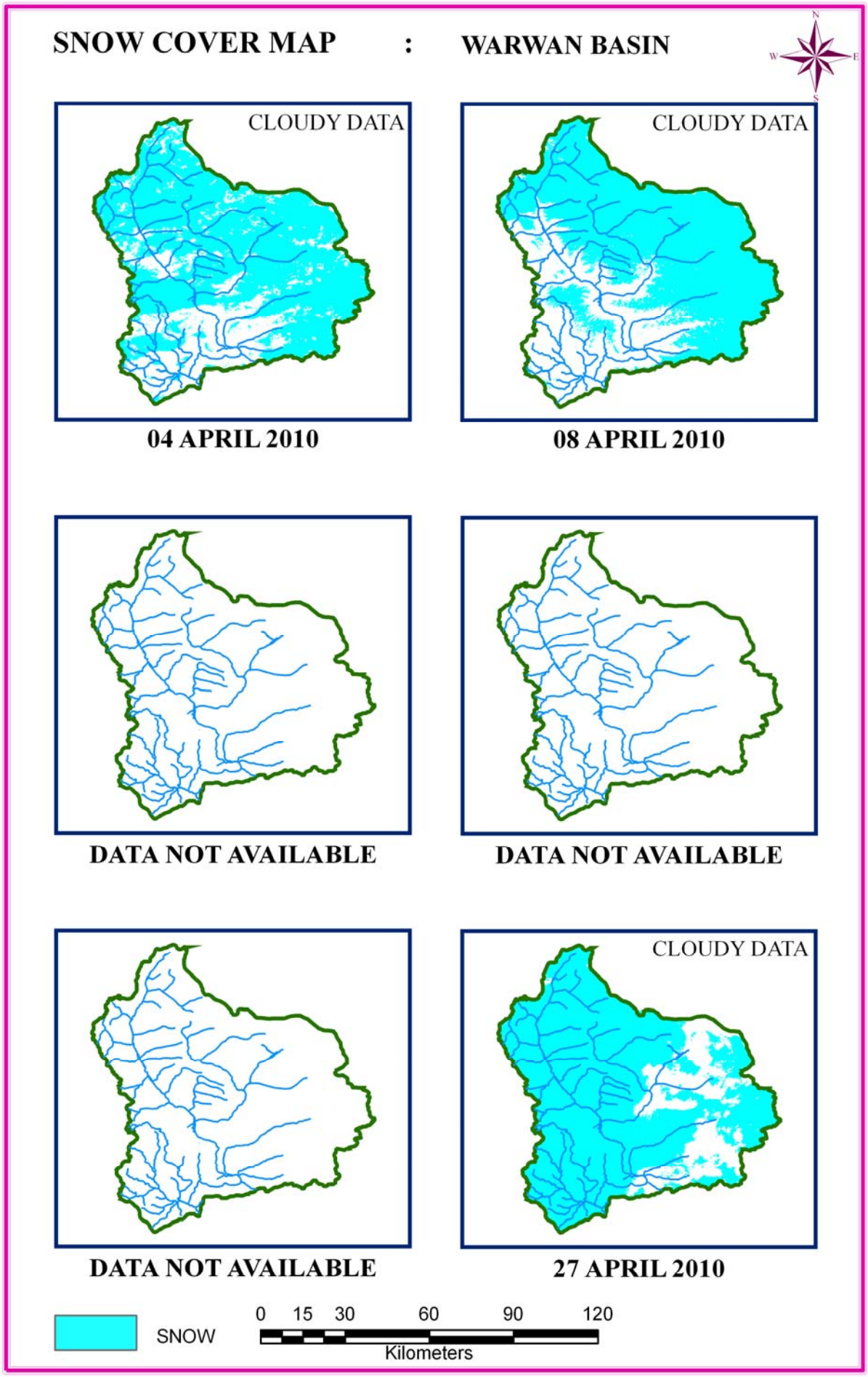
DATA USED
DATA NOT AVAILABLE

DATA USED
11 MARCH 2010

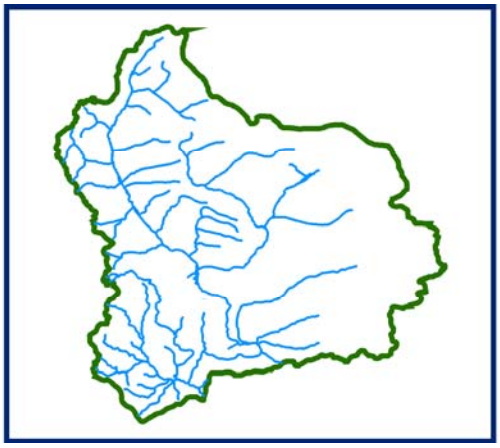
DATA USED
DATA NOT AVAILABLE

SNOW

0 15 30 60 90 120
Kilometers


SNOW COVER MAP : WARWAN BASIN
N
W
E
S
CLOUDY DATA
04 APRIL 2010
CLOUDY DATA
08 APRIL 2010
DATA NOT AVAILABLE
DATA NOT AVAILABLE
DATA NOT AVAILABLE
CLOUDY DATA
27 APRIL 2010
SNOW
0 15 30 60 90 120
Kilometers

10 DAILY SNOW COVER MAP : WARWAN BASIN



DATA USED
DATA NOT AVAILABLE

DATA USED
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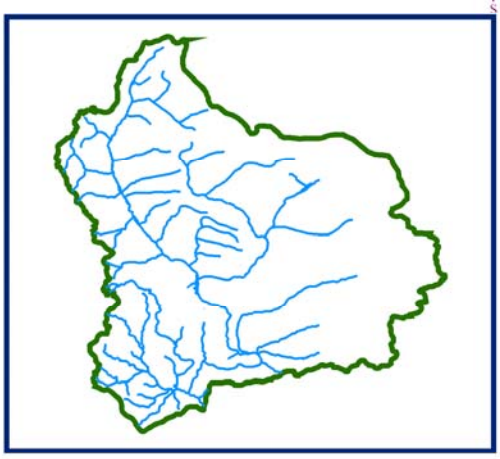
DATA USED
DATA NOT AVAILABLE

SNOW

0 15 30 60 90 120
Kilometers

SNOW COVER MAP : WARWAN BASIN

02 MAY 2010



DATA NOT AVAILABLE

DATA NOT AVAILABLE

DATA NOT AVAILABLE

21 MAY 2010

31 MAY 2010

SNOW

0 15 30 60 90 120

Kilometers

10 DAILY SNOW COVER MAP : WARWAN BASIN

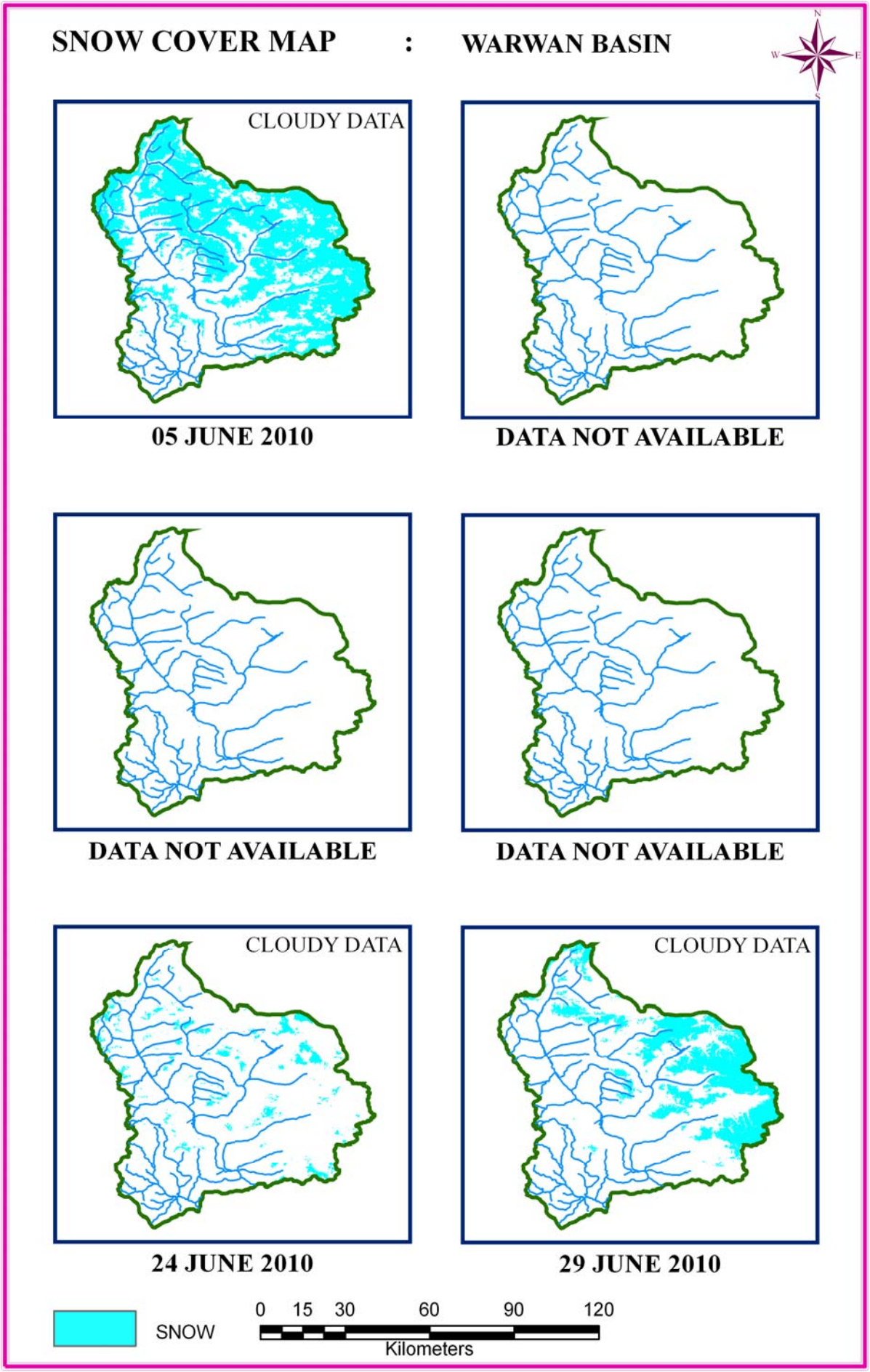
DATA USED
02 MAY 2010

DATA USED
DATA NOT AVAILABLE

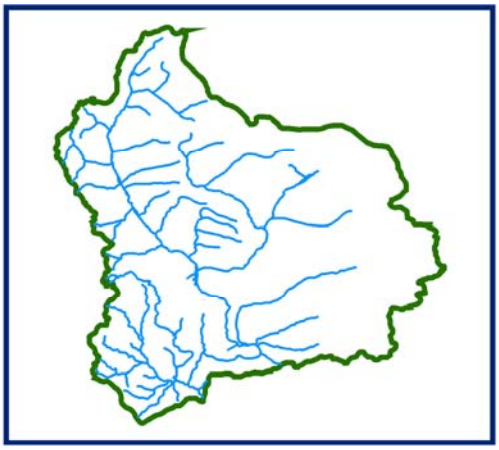
DATA USED
21 MAY 2010
26 MAY 2010
31 MAY 2010

SNOW

0 15 30 60 90 120
Kilometers


SNOW COVER MAP : WARWAN BASIN
N
W
E
S
CLOUDY DATA
05 JUNE 2010
DATA NOT AVAILABLE
DATA NOT AVAILABLE
DATA NOT AVAILABLE
CLOUDY DATA
24 JUNE 2010
CLOUDY DATA
29 JUNE 2010
SNOW
0 15 30 60 90 120
Kilometers

10 DAILY SNOW COVER MAP : WARWAN BASIN



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SNOW

0 15 30 60 90 120
Kilometers