The Applications of L-band and S-band Radar Measurements to Monitor Cryosphere

Authors: OPN Calla, Shubhra Mathur, Kishan Lal Gadri, Shruti Singhal

Presenter: Shubhra Mathur

International Centre for Radio Science
Plot No. 1, Rano ji Ka Baag, Khokhariya Bera, Nayapura, Mandore, Jodhpur- 342304 Rajasthan
Objectives

Pre-Launch of NISAR

1. Till the launch of NISAR, ICRS would like to develop new models and methodologies using PALSAR datasets to achieve the objectives. The ground based scatterometer will also be used for database generation over NW Himalayas.

2. L-band PALSAR data does not bring out clearly the wet snow information at -3 dB, -2 dB and -1 dB threshold value but C-band ASAR is more sensitive to detect wet snow as compared to L-band data. TerraSAR-X data was found very useful for thin fresh snow detection also (Venkataraman et al., 2009).

3. Validation of the new developed methods and techniques will be carried out using ground truth scatterometer which will be developed having same specification as that of NISAR.

After-Launch of NISAR

- Sea Ice monitoring over Arctic and Antarctica
- Mapping of ice sheet flow velocity
- Extraction of grounding line
- Applications to mountain glacier mapping.
- Monitoring of Surging glacier
- The SD, SWE, Extent of Snow and its diurnal variation over NW Himalayas will be done using NISAR.
Data sets of RADAR and Radiometer will be fused together to reduce the noise ratio and roughness factor which is maximum in RADAR.

Another advantage for this fusion technique is to obtain the larger swath because the repeat cycle of NISAR is 12 days with data swath of >270 Km.

- For validating of new developed models Ground truth data will be collected using SASE observatories in NW Himalayan Region and Indian Station in Antarctica and Arctic region.
- Ground based Scatterometer will be developed by ICRS at same frequencies. It will also work in Altimetry and radiometric mode.
- This ground based scatterometer will help in generating data base for backscattering coefficient vs. incidence angle for different frequencies and depths of dry snow.
- Estimation of the liquid water content by means of the ratio of the scattering coefficient of a field covered by snow to the scattering coefficient of a field without snow.
We would suggest that NISAR could also work in Scatterometer, Altimeter and Radiometric mode to enhance the information content with regard to cryospheric studies.
Conclusion

1. For monitoring sea ice over Arctic and Antarctica the Co polarization combination have the best ability to classify sea ice.

2. The SD, Snow water Equivalent and snow extent over NW Himalayas will be done using NISAR.

3. Using InSAR technique one will be able to map ice sheet flow over large areas.

4. Glacier thickness can be calculated by InSAR and multiaperture InSAR (MAI).

5. L-band has more tolerance against temporal decorrelation than S-band for extraction of grounding line of snow.

6. ICRS suggest that NISAR could also operate in Radiometric mode.

7. ICRS proposed that NISAR could also work in Altimetry mode which will help in generating the Digital elevation Models (DEM) for snow cover areas.

8. To get optimal result in SAR, transmission needs to be done in circular and reception in horizontal and vertical polarization. The phase angle between horizontal and vertical polarization should be preserved. This configuration preserves complete information about object without any loss of information.

9. The revisit time of 12 days is too long for snow studies it could be 2-3 days.

ICRS Aims To Utilize NISAR For DIRECT BENEFIT For COMMON MAN Of SOCIETY.
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