Surface dynamics of floating parts around Polar Glacier Ice tongue, East Antarctica observed using RISAT-1 MRS and high resolution Resourcesat LISS-4 data

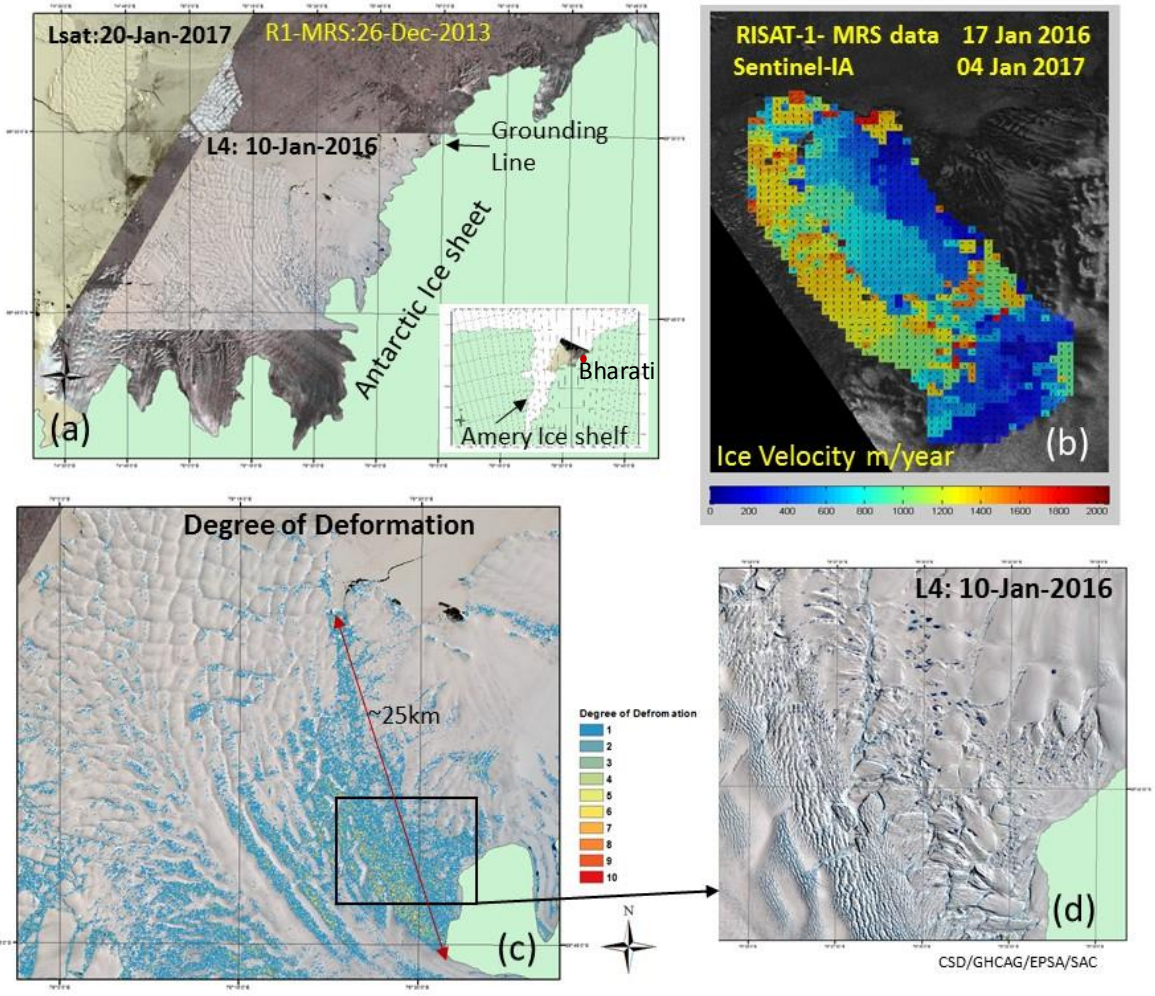

Figure. (a) Polar record glacier tongue located between Indian research station bharati and Amery ice shelf; (b) Annual velocity map (2016-17); (c) Degree of deformation (from 1 to 10) and (d) micro-scale deformation features observed in LISS_4 data

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Fractures in terms of crevasses and rifts are playing great role in weakening of ice shelves, which leads to separation of large ice mass from ice sheet in to the Ocean. Surface dynamics and deformation study was carried out to understand the stability of Polar record glacier (Fig. a) and surrounding floating ice parts located ~50km away from Indian Antarctic research base Bharati towards the Amery ice shelf.

Polar record Glacier, which was first surveyed in 1947 and approved in 1952 as the glacier that possess an ice tongue. The length of the Polar record tongue is up to 50 km at the centre and width including adjacent floating parts is around 35-40 km.

Highlight of the study is as summarised below.

- RISAT-MRS (26-Dec-2013; 17-Jan-2016), Resoursesat LISS-4 (10-Jan-2016) and Sentinel-1A (04-Jan-2017) and Landsat (20-Jan2017) data were utilised in the study
- Velocity fields (speed and direction) are derived using the RISAT (2016) and Sentinel (2017) data by applying intensity tracking method, which takes care of orientation component. As observed in Fig. (b), western parts are moving much faster compared to the eastern parts
- The dynamics of floating ice streams (such as polar record tongue) are complex. Typically ice streams that covers such a huge area contain smaller streams of ice. Each ice flow produces its own set of stress fields throughout the ice tongue, which is reflected in different flow pattern (Fig. B)
- Micro-scale deformation structures are visible on the LISS-4 image (Fig. d). Filtering and post-filtering processing carried out to compute the degree of deformation (Fig. c).
- Results show the ~25km long deformation belt (Fig. c) extending from front-to-grounding line. Such features (Fig. c & d) are sign of rift genesis, which and affects the stability of floating ice mass that leads to calving of large ice mass.