Ice & Snow Session

Chairs: J. Mouginot & N. Gourmelen

Session

- 12 talks and 10 posters
- Antarctic ice motion, ground-line detection and monitoring, dynamics ice-fluctuations in Antarctica and Greenland, small ice-caps (Iceland, Patogonia), mountainous glaciers, periglacial landforms and glacial rebound
- Reviews of ERS2 2011 3-days campaign and ERS2-ASAR cross-interferometry

Seed questions

1. What recommendations does this thematic community have for Sentinel-1 observation scenarios over InSAR areas of interest (global/supersite), in terms of revisit frequency and pass (ascending / descending)? Data delivery ?
2. What major challenges remain for glaciology, and how can satellite observations (InSAR in particular) assist?
3. What are the relative advantages and disadvantages of InSAR observations of ice at C-band and L-band?
4. What are the advantages of a short-repeat InSAR mission for glaciology? In terms of providing new understanding of physical processes, how short do we need?

Seed questions

1. What are the advantages of acquiring simultaneous range and azimuth displacements for glaciology?
2. What are the observables that glaciology wants from SAR and InSAR datasets?
3. With three InSAR missions phased out in 2011, the community is facing a potential data gap until new missions like Sentinel-1 are online. What are the most important regions for the cryosphere community that the remaining InSAR missions should provide data for (at minimum)?

Reccomendations

Sentinel-1: Ideally to operate at **HH-polarization**, with interferometric wide swath (**IWS**) mode, with **ascending/descending** passes for full coverage of ice every cycle.
- IWS is better than Strip Map (SM) for calibration and mosaicking of data;
- EWS degrades the spatial resolution too much.
- Ascending/descending passes required for 3d vector mapping, layover in mountains glaciers and velocity field referencing.

Sentinel-1: Frequent visit (every cycle) is desirable to :
- capture rapid events and their time sequence (ice-shelf collapse, glacier speed up, calving, drawdown, seasonal variation, etc.) --> new science.
- enables data stacking to map ice motion in the interior (< 1 m/yr)
- enables ice shelves motion retrieval (tidal contamination).
- optimal revisit time is unknown as events can take place on a time scale of hours to days. Can we envision even shorter repeat time with sensors configuration such as Sentinel1 a&b for study of ultra-rapid deformation (e.g. stick slip on the scale of 1 hour)?

Reccomendations

Selection of "**supersites**" for systematic acquisitions;
- Maybe following the Tandem-X supersites definition (5 main outlet glaciers in Greenland; PIG, Thwaites Totten and the Peninsula in Antarctica + Mountain glaciers in Himalaya, Patagonia, Alaska).
- Careful about assuming too much a priori which area matters and which does not --> focus on **all coastal regions** as a threshold mission with a set of predefined tracks
- For ice sheet wide mapping, once a year is probably sufficient because large changes in the interior regions are not expected. Yet you need sufficient data stacking to tackle motion of less than 1 m/yr (e.g. a couple of months of data).
- Do not forget the smaller glaciated areas: Sentinel-1 systematic mapping of ALL ice sheets and glaciers (Patagonia, Alaska, Himalaya, Alps, Svalbard, Canadian ice caps, etc.) decided a-priori, every cycle if possible, at the minimum by series of 4 consecutive cycles (3 for grounding line mapping, 4 in case of gaps), with coast-to-coast tracks.

Reccomendations

New challenges with Sentinel-1:
We will be able to handle distribution of all data in RAW/SLC format and produce velocity maps.
Coarser resolution IWS data compared to stripmap --> Additional studies needed with 6+ days temporal baselines (e.g. ERS-2 2011)
TOPSAR azimuth co-registration?

Sentinel-1: Coordinate with RADARSAT-2 and constellation for coverage of South Pole.

Coordinate with other satellite (TSX-TDX, Cosmo, Radarsat) for continuity measurements on specific “supersites” (rapidly changing areas), now that three InSAR missions phased out in 2011.

Maintain the ERS-1/2 and Envisat ASAR data archive.

Advantages and disadvantages of C-band and L-band: L-band procures higher coherence but also higher contamination from the ionosphere. Would S-Band be a good compromise ?