# Using TanDEM-X observations for extracting glacier and sea-ice topographies

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Space-based Synthetic Aperture Radar interferometry (InSAR) applications have been widely used to monitor the cryosphere over past decades. Due to temporal decorrelation, interferometric coherence often degrades severely on fast moving glaciers and sea-ice. In addition, higher sensitivity ambiguity by large baseline configurations, which are needed for extracting topographic information over low relief areas such as sea-ice surfaces. TanDEM-X observations, which overcome the temporal decorrelation due to its simulatanious measurements by its two sattelite constellation, has used short baseline which are sufficient for generating excellent DEM in most locations around the world. However, it is still difficult to estimate detail topographic characteristics over the low slope sea-ice or glacier surfaces due to relatively less sensitive height ambiguity from small baselines.

In this study, we use the TanDEM-X large baseline formation following scientific phase timeline to generate high spatial and sensitive topographic elevation model for glaciers and sea-ice. We obtained seven TanDEM-X bistatic and pursuit monostatic mode observations of glaciers and sea-ice located in both Greeland and Antarctica. As expected, coherent interferometric phases (0.5 ~ 0.8) are well maintained over sea-ice and glaciers despite their fast movements, thanks to TanDEM-X simultanious measurements. The height ambiguity of the datasets are ranged from 7.1 ~ 9.7 m, which is very favourable for extracting topographic information in low relief region. Because of high sensitive ambiguity, we can extract detail geomorphological features on sea-ice and glaciers. High resolution interferometric phase including topographic information is also useful for separating iceberg from sea-ice or open water. We will validate the TanDEM-X derived sea-ice topography by comapring it to the SAR/Interferoemtric Radar Altimeter observations acquired by CryoSat-2. Routine TanDEM-X observations will be very useful for a better understanding of the dynamics of sea-ice and glacier movements.