

4. TanDEM-X Science Team Meeting, 12 - 14 June 2013, DLR Oberpfaffenhofen

Monitoring Polar Ice Sheets using TanDEM-X – Preliminary Results

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The main objective of this work is the scientific evaluation of TanDEM-X for glacier mass balance studies. Accurate knowledge of ice velocity, the grounding line position, and elevation information (and eventual changes) is crucial for ice flux measurements and subsequently for mass balance estimates of glaciers and ice sheets. Spaceborne SAR has proven an invaluable tool for glaciology. In particular, velocity maps of glaciers as well as grounding line measurements can be undertaken with unparalleled coverage and accuracy. TanDEM-X represents a significant advance over traditional SAR acquisitions, as topographic information is also readily available. Our team has produced an Antarctica-wide ice velocity product that was generated using data from other spaceborne SAR missions (ERS-1/2, RADARSAT-1, ALOS PALSAR, ENVISAT ASAR, and RADARSAT-2) collected during the International Polar Year (IPY). We also produced an InSAR-based grounding line product. Both products are available for free download at NSIDC. Based on our data, we proposed a 3-year TanDEM-X acquisition plan for selected test sites in Antarctica. We also prepared a similar acquisition plan for test sites on the Greenland Ice Sheet. Data collection geared towards glaciology throughout the mission duration ensures a unique reference data set that is not possible with any other mission. The test sites were carefully chosen for maximum impact of the data collection on a continental scale. TanDEM-X plays an important role in providing data continuity for ice velocity measurements for the Pine Island / Thwaites Glacier region as well as for Totten Glacier. We will present preliminary results of these sites as well as for Denman Glacier and show early results of data assessments for Getz Coast and southern Larsen C Ice Shelf tributaries. We will map out the way forward, discuss challenges encountered so far, and make a recommendation for future acquisitions. Our results will help us to refine ice flux measurements where possible. Based on data availability we will also have a change record for the TanDEM-X test sites. Velocity results from TanDEM-X will be used together with data from other sensors to generate a second, post IPY reference map of Antarctica, as well as ice velocity time series for selected sites. Any grounding line data we are able to retrieve will eventually be made available in an updated grounding line product.