Antarctic Field Campaign in Support of Satellite Data Analysis for Ice Sheet Topography

Helmut Rott

ENVEO IT and ACINN, Innsbruck, AUSTRIA

Satellite sensors provide comprehensive data on surface topography and topographic change of ice sheets and glaciers world-wide. These data are a key source for global, spatially detailed estimates of ice sheet and glacier mass balance. Precise high resolution topographic data are also required for studying and modelling ice flow dynamics. The synergy of satellite-borne altimeters with high resolution interferometric SAR data of the TanDEM-X satellite formation is of particular interest for these tasks. The integration of data from optical and microwave sensors requires specific corrections accounting for differences in spatial resolution, coverage and signal penetration.

In order to support the development and validation of data integration algorithms for topographic satellite sensors, the lecturer performed field measurements in the Heritage Range, West Antarctica, in December 2016, studying structural properties and stratification of snow and ice. Logistic support was provided by Antarctic Logistics and Expeditions (ALE). The snow pit measurements covered different snow and ice regimes, including bare ice surfaces (blue ice) and snow packs subject to different wind exposure conditions and accumulation rates. These data provide an excellent basis for evaluating satellite topographic data from various satellite missions such as TanDEM-X, CryoSat (Ku-band radar altimeter) and ICESat (lidar-altimeter), as well as for validating electromagnetic models on radar signal propagation. Ongoing work shows promising results for inverting radar backscatter intensity and interferometric coherence to quantify radar signal penetration in polar snow.