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Surface topography in the center of Dronning Maud Land, Antarctica, derived from airborne radar altimetry and ground based kinematic GPS measurements

C. Wesche (1), O. Eisen (1), V. Helm (1), S. Riedel (1), A. Rülke (2), D. Steinhage (1)

(1) Alfred Wegener Institute for Polar and Marine Research, Bremerhaven, Germany, (2) Institute for Planetary Geodesy, Technical University of Dresden, Germany (christine.wesche@awi.de)

The knowledge of the surface topography of the ice sheets is an essential boundary condition for estimating mass balances with respect to sea level change and as well paleo climatic reconstruction. Nowadays satellites provide an easy accessible way to derive surface topography on a continental scale, but they lack either of horizontal resolution (radar satellite altimetry) or horizontal coverage (laser satellite altimetry). For regional surveys airborne altimetry and ground-based kinematic GPS measurements provide both, high horizontal resolution and coverage.

We will present a new high resolution digital elevation model (DEM) for central Dronning Maud Land (DML), Antarctica, between 10˚W and 20˚E and in the south of the coastal mountains up to 80˚S, based on airborne altimetry (ARA) and ground-based GPS measurements As the interior of Dronning Maud Land (DML), Antarctica, is a gently inclined region, slope induced error of radar altimetry can be neglected in this flat region. The ground based kinematic GPS measurements were processed with nearby reference stations, precise ephemeris, ionosphere-free solution and the tropospheric model of “Niell”. The ARA data are a combination of kinematic GPS measurements and radar altimetry; the kinematic GPS data were processed like the ground based data. While determing the surface topography from the GPS and altimeter measurements, the aircraft attitude was taken into account.

Because of the short baselines (maximum 26 km), the ground based data derived el-

evation data with an elevation accuracy of 0.03 m. The along track distance of data point are 2.8 m. To this end, ground based kinematic GPS measurements provide high resolution elevation information. Due to the long baselines (because of the scope of the aircraft) and the penetration of the radar signal into the snow surface, the ARA derived less accurate elevation information than the ground based kinematic GPS measurements. To check the penetration of the radar signal into the surface, we performed a cross-over point analysis between the ground data and ARA. By combining the two data sets, we achieve a high spatial resolution over the whole area of investigation, which eases the interpolation.

The generated surface topography in the area of investigation builds a reference DEM for a combined accurate DEM of whole DML, which consists of several geophysical data sets.