



Combined use of ERS SAR interferometry and IceSat laser altimeter data to derive surface topography on the Antarctic inland ice

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Small surface undulations on the Antarctic ice sheet may cause a small scale spatial variability in the accumulation pattern, which may prove of importance for the interpretation of the temporal variability of accumulation retrieved from ice cores. By now, spaceborne radar altimeters do not resolve the surface topography in the required detail.

By means of ERS-1/2 SAR interferometry a digital elevation model (DEM) was derived for the surrounding of the EPICA (European Project for Ice Coring in Antarctica) drilling site Kohnen (0E, 75S; 2850m). Because the area of interest is at the margin of possible acquisitions for ERS SAR, only a small number of interferometric pairs is available. The horizontal motion in this region is small and uniform and was neglected in this analysis. The precise baseline was adjusted using IceSat laser altimeter data.

The coherence of the interferograms is partly low, caused on the one hand by the temporal change of backscattering properties and on the other hand by the low signal to noise ratio of the dry and comparable homogeneous snow pack. Standard filtering methods and spatial averaging are applied to reduce the noise and to improve the SNR. The quality of the new DEM is tested by ground based kinematic GPS measurements. The relative accuracy is significantly improved compared to previous DEMs. Differences to the GPS measurements cannot only be explained by low coherence but are also a result of variations in the penetration depth of the radar signal.