



Topographic analysis for the exploration of safe transport paths in East Antarctica by satellite remote sensing

Stefan Knetsch (1), Stuart McFadzean (2), Christian Pfeifer (1), and Osama Mustafa (1)

(1) ThINK – Thuringian Institute of Sustainability and Climate Protection, Jena, Germany (stefan.knetsch@think-jena.de), (2) White Desert Ltd, London, UK

Identifying safe traverse routes and safe landing areas on snow or ice for scientific expeditions and logistical operations in Antarctica is a significant challenge. Therefore the authors developed satellite based approaches to support traverse planning as well as the exploration of a new blue ice runway in Dronning Maud Land, East Antarctica. For traverse planning an optical (Landsat-8, 15 m ground sample distance (GSD)) and a C-band radar image (Sentinel-1, 10 m GSD and Radarsat-2 1.5 m GSD) were used. To detect shear zones with higher risk of crevasses we acquired data on ice flow speed. Hi-res optical images (World View-2, 0.4 m GSD) and a stereographic derived Digital Surface Model (2 m GSD) were used for planning the blue ice runway. By combining and analysing these data sets a detailed identification of dangerous areas (e.g. crevasses, erratica, steep slopes) was possible. For the runway exploration additional hi-res maps on micromorphological parameters (e.g. slope, roughness) and cross sections were created in scales up to 1:12,000. All results were delivered as interactive offline-capable field maps. To deal with highly dynamic glacial areas, near-time support to field teams and access to the most recent satellite images, was provided. Antarctica is a high stakes environment and our analyses can identify potential hazards during the planning phase to reduce costs, time and increase the safety of field work.