Geophysical Research Abstracts,
Vol. 11, EGU2009-3586, 2009
EGU General Assembly 2009

Past and future thermal characteristics of permafrost in Svalbard

B. Etzelmueller (1), K. Isaksen (2), T.V. Schuler (1), and R. Benestad (2)

(1) University Oslo, Department of Geoscience, Physical Geography Section, Oslo, Norway (bernd.etzelmuller@geo.uio.no), (2) Norwegian Meteorological Institute, Oslo, Norway

Within the EU-funded PACE project a 102 m deep borehole was drilled at Janssonhaugen, Svalbard, in 1998. The boreholes penetrate Cretaceous sandstone bedrock with low ice content overlain by a thin (0.2–0.5 m) weathering layer containing no organic material, the ground surface has no vegetation, and during winter snow cover is thin or completely absent due to deflation. Thus, a high correlation is observed between air temperature and ground surface temperature and the climate signal that penetrates the ground shows little disturbance by near-surface latent heat effects. The site is representative for the mountains in the area. The 10-year long series show that the permafrost has warmed considerably. Significant warming is detectable down to at least 60 m depth, and present decadal warming rate at the permafrost surface are on the order of 0.07 °C yr-1, with indications of accelerated warming during the last decade (Isaksen et al. 2007). In this study we have calibrated a surface temperature driven 1D-heat flow model with phase transitions to the temperature measurements in the borehole. This model was then forced by ground surface temperatures derived either from historical observed air temperature data for the 20th Century and an empirical statistical downscaled ensemble covering the 21st Century. The latter is based on the multi-model World Climate Research Programme (WCRP) Coupled Model Intercomparison Project (CMIP3) of the most recent Special Report Emission Scenario (SRES) A1b (in which atmospheric CO2 reaches 720 parts per million by 2100) produced for the Intergovernmental Panel on Climate Change (IPCC) Assessment Report 4 (AR4). The presentation demonstrate the possible impact of projected higher air temperatures in the high Arctic on the ground thermal regime, and geomorphological and geotechnical consequences will be discussed.