Geophysical Research Abstracts, Vol. 9, 04703, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-04703

An integrated approach to recent and future permafrost variability and retreat in Greenland and Alaska

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Despite its importance for geo- and climate science as well as engineering, little interaction has taken place between the permafrost and climate modelling communities. In a new research initiative, we intend to bridge this gap, at the local to regional scale, for two quite different geographical regions; western Greenland and Alaska. This will be achieved by performing simulations with the HIRHAM regional climate model at an unprecedented spatial scale that can address central permafrost issues such as the accurate zonation of permafrost, active layer depth and seasonality. Using this approach, it will be possible to combine climate modelling with spatially oriented approaches to permafrost modelling at scales of societal interest. The main objectives of the project are 1) to provide regional simulations for present and future climate on a 10 km grid for western Greenland (a coastal/maritime permafrost regime) and northern Alaska (a continental interior permafrost regime) with the HIRHAM model; 2) to establish a series of permafrost and climate monitoring sites representative of the range of permafrost types encountered near the margins of the two regions; 3) to implement a state-of-the-art permafrost model to be calibrated against field measurements, which will be driven by the output of the regional climate model; 4) a quantitative assessment of how permafrost responds to these simulated climate changes using state-of-the-art permafrost models, which will permit mapping of the permafrost conditions for the present and future. We present here preliminary results for the period 1950 to 2100 based on HIRHAM simulations with a 25 km grid applied over Greenland.