

The ARCTEX-campaign: Long-term Monitoring of Sensible and Latent Heat Fluxes at a High Arctic Permafrost Site in Svalbard

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Recent climate warming in the Arctic requires improvements in the permafrost and carbon cycle monitoring, accomplished by setting up long-term observation sites with high-quality in-situ measurements of atmospheric turbulent fluxes applying the eddy-covariance method and/or the laser-scintillometry in Arctic landscapes. Accurate quantification and well adapted parameterizations of turbulent fluxes e.g. during neutral to stable stratified conditions are a fundamental problem in soil-snow-ice-vegetation-atmosphere interaction studies.

Results from the Arctic-Turbulence-Experiments (ARCTEX-2006 and 2009) during the winter/spring transition 2006 and summer 2009, and results from the long-term atmospheric flux station of the Alfred-Wegener-Institute for Polar and Marine Research (2008 to 2009) - both performed on Svalbard - focus on the intermittency of the turbulent fluctuation of momentum and/or scalars, on the existence of a disturbed vertical temperature profile (sharp inversion layer) close to the surface in the Arctic spring at Svalbard causing misleading surface temperature estimations, on the appearance of possible free convection events, and on the annual cycle of the surface energy budget at a high-arctic permafrost site.

A quality assessment and quality control adapted to polar regions demonstrates that specific errors of direct heat flux measurements like snowdrift effects could be minimized. Relevant recommendations and improvements regarding the arrangement of the instrumentation under polar distinct exchange conditions and (extreme) weather situations are presented.