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Comparative studies of land-atmosphere energy exchange in high and low Arctic tundra ecosystems

Christian Stiegler (1), Anders Lindroth (1), Magnus Lund (2), and Mikkel P Tamstorf (2)

(1) Department of Physical Geography and Ecosystem Science, Lund University, Lund, Sweden, (2) Department of Bioscience, Aarhus University, Roskilde, Denmark

The energy balance of arctic terrestrial ecosystems is of crucial importance to understand future climate change in high northern latitudes. Despite a growing interest in the Arctic local measurements and observations of climate characteristics are still scarce. Therefore, we present first results of comparative short- and long-term eddy covariance and energy balance measurements of high and low Arctic terrestrial ecosystems in Greenland. The study area covers high Arctic tundra heath and fen ecosystems in Zackenberg (Northeast Greenland National Park, 74°30'N, 21°00'W) and low Arctic terrestrial ecosystems in the Kobbefjord area close to the city of Nuuk (West Greenland, 64°07'N, 51°21'W). By using a mobile eddy covariance and energy balance tower we collected data during late winter (April 2012), early summer (June/July 2012) and late summer (August 2012). Mobile eddy covariance and energy balance measurements during late winter in Zackenberg focus on the energy balance of undisturbed snow covered surfaces with variable snow depth and snow layer structure. Data collection on thin snow layers with disturbed surfaces and exposed vegetation also show the impact of Muskox cratering on the surface energy balance. Measurements during early summer in the Kobbefjord area were conducted on characteristic bare soils with scattered cushion plants, on grasslands with sedge vegetation and on shrub vegetation up to 100 cm in height. Late summer measurements of energy balance and eddy covariance in the Zackenberg valley focus on transect measurements of energy balance components and active layer thickness of adjacent high arctic fen and heath ecosystems. In addition to the short-term mobile measurements we use and analyse data sets from permanent stations monitoring eddy covariance and energy balance on heath and fen sites in both high and low Arctic environments. Long-term measurements provide continuous data since early April 2012 and in this study we compare our mobile measurements with this long-term energy balance data sets. First results of albedo characteristics during late winter show distinct differences among the measured snow surfaces. Albedo during summer varies considerably within and between the high and low Arctic tundra sites. Further results of energy flux partitioning and energy balance closure will be presented and discussed at the conference.