Diary 8 – 24 April 2012

Arctic Winter Climate Feedbacks

Zackenberg

One of the main topics for the terrestrial winter/spring campaign at Zackenberg is improving our knowledge on the wintertime climate feedback mechanisms. For this, the WinExchange project has sent four persons from Aarhus, Lund and Stockholm Universities to the spring campaign of the new Arctic Research Centre at Aarhus University. The WinExchange group is focusing on carbon feedbacks of lakes and wet and dry terrestrial ecosystems and energy balance of snow covered surfaces.

The wet fens of the area emit methane during summer when the active layer is thawed and during fall bursts in October/November during the freeze-in but little is known about the winter processes. Therefore we are using a combination of the existing methane gradient monitoring and probe and chamber measurements to gain more knowledge. The two CO_2 eddy covariance monitoring stations are started up earlier than usual for late-winter fluxes. One in the fen was even running all the way over winter into February but then unfortunately stopped due to power problems.

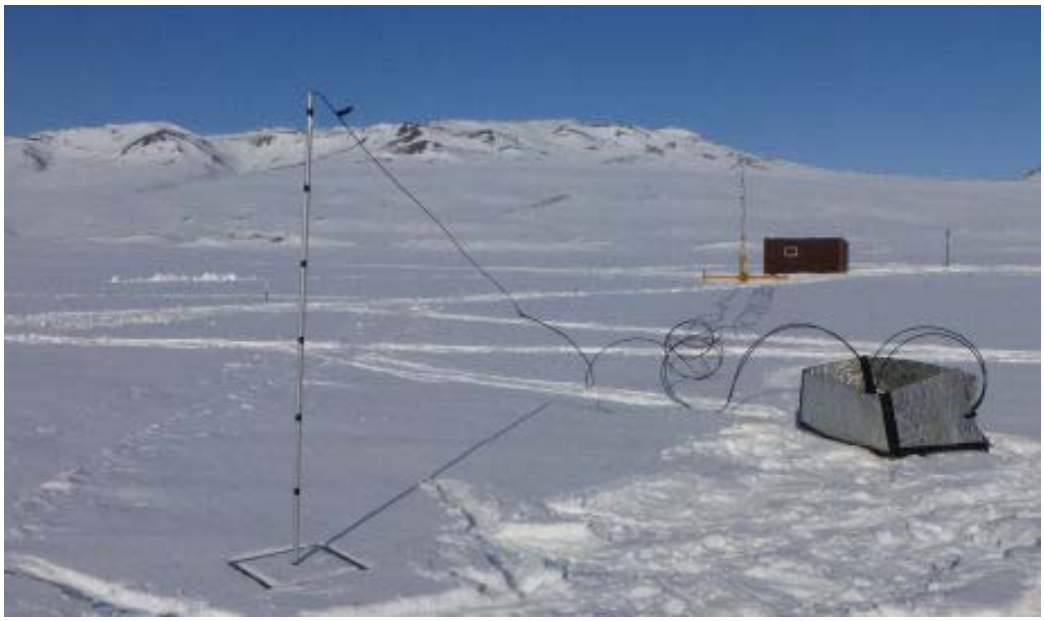

Figure 1 Carbon flux and concentration measurements at the fen. Photo: Mikkel P. Tamstorf

At the lakes we are sampling ice samples and gas for flux estimates and isotopic analyses. The ice at the lakes in the Zackenberg area is extremely brittle and it's therefore difficult to obtain cores. However, with 185 cm of ice there is plenty of ice to test new methods on.

Conditions have been perfect for wintertime measurements as we have had stable low temperatures between -15°C and -28°C for more than two weeks. No sign of spring yet although the sun is rising steadily more and more every day prolonging the energy input from the sun. With the rising sun the energy balance of the system is slowly going towards positive. In the Zackenberg area the INTERACT project installed two new stations for energy balance measurements (full radiation balance with soil snow sensors and sonic anemometer for the remaining energy balance parameters).

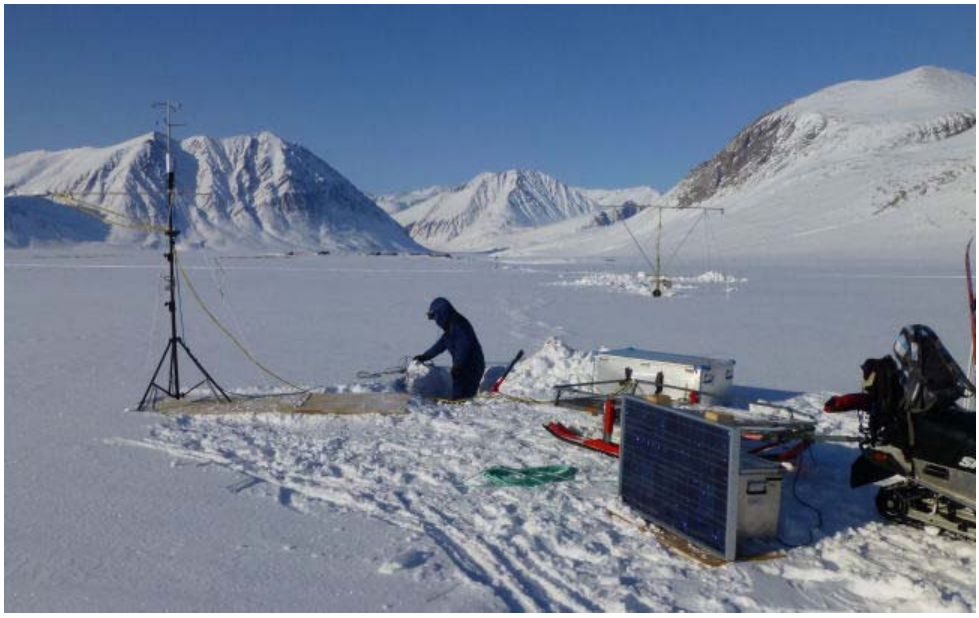

Figure 2 Mobile energy balance measurements calibrated to the permanent station. Photo: Mikkel P. Tamstorf

In addition to the permanent stations a mobile station have been moved from site to site during the last couple of weeks covering areas with different amounts of snow from the fully snow covered fens (>1.30 m snow) over the heath types (1.0-1.2 m snow) to the shallow snow surfaces where muskoxen is foraging and further impacting the energy balance of the area.

Figure 3 Pit for snow layer structure and densities. Photo: Mikkel P. Tamstorf

Snow is a major factor for both carbon and energy feedbacks and we are therefore also performing a lot of snow depth and density monitoring throughout the valley system that will go into the landscape snow modelling as well as support the individual measurements.

The field campaign is, for most of us, coming to a close in a few days, but many of the measurements will continue into the melt period as part of the GeoBasis programme that will continue to run all summer and fall.

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