Combination of CP & CSA

D6.2 – Ten distributed energy exchange stations established

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Dissemination Level		
PU	Public	X
PP	Restricted to other programme participants (including the Commission Services)	
RE	Restricted to a group specified by the Consortium (including the Commission Services)	
CO	Confidential, only for members of the Consortium (including the Commission Services)	

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Publishable Executive Summary

Ten energy exchange stations have been established at four major research platforms in the North Atlantic Region. A fen and a heath station in Nuuk, West Greenland, a fen and a heath in Zackenberg Northeast Greenland, a fen in Adventdalen, Svalbard and on lake, birch forest, fen and palsa locations in the Stordalen area near Abisko in northern Sweden. They have all been subject to certain “child diseases” many of which were associated with the power supply as a new fuel cell technology was problematic. However, all installations are now in place. During 2012 the data flow will be streamlined and power supplies optimised so that the stations in the coming years will provide energy exchange data from this range of different logistical platforms. This data will support wider GHG flux measurement operations as well as regional climate model validation.

1. Overview

The ideas behind this deliverable were developed at the same time as the ICOS and DEFROST projects and INTERACT WP6 will work closely together with those projects. The purpose of D6.2 is to up-grade, extend and integrate measurements of feedback mechanisms for terrestrial environments in a changing climate.

In this deliverable the focus is on extending the network and availability of energy exchange measurements from a range of representative sites in the North Atlantic region. The aim has been jointly with D6.1 to have the improved flux measurements and distributed energy exchange monitoring sites up and running by the end of the summer 2011.

Discussions have been made with a climate modelling group to discuss the locations of sites and the following advice was obtained:

- Spread out stations over the INTERACT climate envelope
- Try to avoid physical boundaries (sea, mountains etc.)
- Avoid too much topography, mountains areas and stay in lowlands if possible
- Give preference to sites with other information available and data being gathered (which is the case for all the INTERACT Sites)

It was decided that 10 set of sensors would be distributed among 4 different INTERACT sites to cover a large part of the INTERACT climatic gradient that has not been covered previously by earlier initiatives. More than one sensor would be placed at one site and the new sensors would complement already existing infrastructure to cover for example changes in vegetation (forest vs. no forest) and changes in hydrology connected to permafrost vs no permafrost. We aimed to complement already ongoing activities and to develop systems that can fully monitor the energy exchange that has not been possible to do earlier at the chosen sites. Sites discussed and agreed on were:

- Nuuk
- Zackenberg
- Svalbard
- Abisko

See individual descriptions in the following text.

2. Individual locations

2.1. Nuuk, West Greenland

2.1.1. Fen

A 2-meter high radiation mast was installed, equipped with sensors for net radiation (Kipp & Zonen CNR4), snow depth (Campbell Scientific sonic ranging sensor SR50a), soil and snow temperature profiles (Campbell Scientific temperature probe 107), soil moisture (Delta-T SM300), soil heat flux (Hukseflux HFP01SC), air temperature and humidity (Campbell Scientific CS215), precipitation (Young 52203), NDVI (Skye SKR1800), air pressure (Campbell Scientific CS100) and ground water level (Druck PDCR1830).

2.1.2. Heath

A 2-meter high radiation tower was installed, equipped with sensors for net radiation (Kipp & Zonen CNR4), snow depth (Campbell Scientific sonic ranging sensor SR50a), soil and snow temperature profiles (Campbell Scientific temperature probe 107), soil moisture (Delta-T SM300), soil heat flux (Hukseflux HFP01SC), air temperature and humidity (Campbell Scientific CS215) and NDVI (Skye SKR1800).

Final installation work at the Nuuk Heath site on 24 November 2011.

2.2. Zackenberg, NE Greenland

2.2.1. Fen

A 4-meter high radiation tower was installed, equipped with sensors for net radiation (Kipp & Zonen CNR4), snow depth (Campbell Scientific sonic ranging sensor SR50a), soil and snow temperature profiles (Campbell Scientific temperature probe 107), soil moisture (Delta-T SM300), soil heat flux (Hukseflux HFP01SC), air temperature and humidity (Campbell Scientific CS215), precipitation (Young 52203), NDVI (Skye SKR1800), PAR (SDEC France JYP-1000), air pressure (Campbell Scientific CS100), and ground water level (Druck PDCR1830).

2.2.2. Heath

A 4-meter high radiation tower was installed, equipped with sensors for net radiation (Kipp & Zonen CNR4), snow depth (Campbell Scientific sonic ranging sensor SR50a), soil and snow temperature profiles (Campbell Scientific temperature probe 107), soil moisture (Delta-T SM300) and soil heat flux (Hukseflux HFP01SC)

Transporting INTERACT energy exchange tower from the Zackenberg station to the field in August 2011.

2.3. Adventdalen, Svalbard

A 3-meter high radiation and flux tower was installed, equipped with sensors for net radiation (Kipp & Zonen CNR4), snow depth (Campbell Scientific sonic ranging sensor SR50a), soil and snow temperature profiles (Campbell Scientific temperature probe 107), soil moisture (Delta-T SM300), soil heat flux (Hukseflux HFP01SC), air temperature and humidity (Campbell Scientific CS215), precipitation (Young 52203), NDVI (Skye SKR1800), air pressure (Campbell Scientific CS100) and ground water level (Druck PDCR1830).

The Adventdalen INTERACT tower during installation, July 2011.

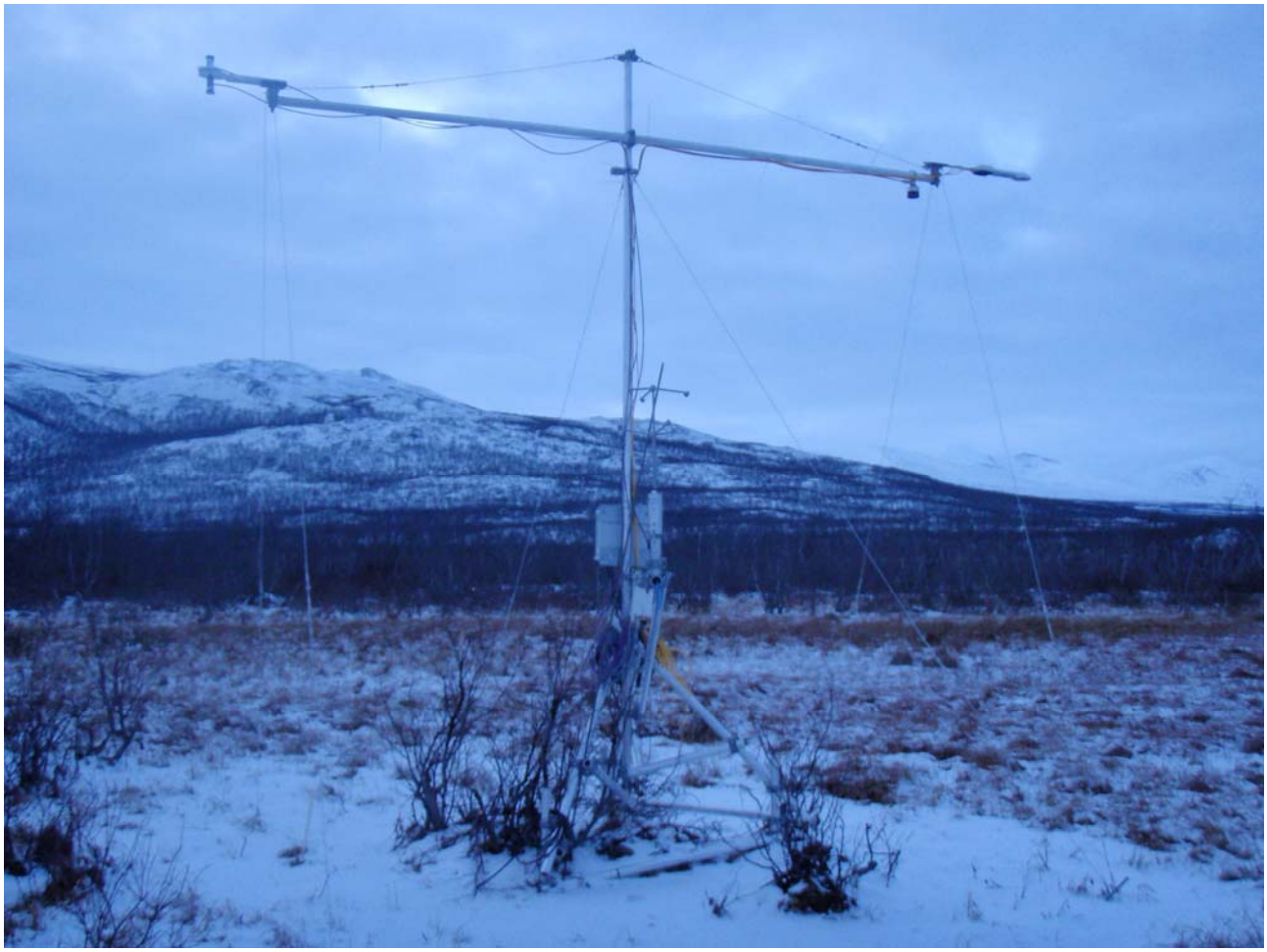
2.4. Stordalen, Northern Sweden

2.4.1. Birch forest

An old tower was equipped with sensors for net radiation (Kipp & Zonen CNR4), snow depth (Campbell Scientific sonic ranging sensor SR50a), soil and snow temperature profiles (Campbell Scientific temperature probe 107), soil moisture (Delta-T SM300), soil heat flux (Hukseflux HFP01SC), air temperature and humidity (Campbell Scientific CS215), precipitation (Young 52203), NDVI (Skye SKR1800) and air pressure (Campbell Scientific CS100).

2.4.2. Lake

A lake tower was installed, equipped with sensors for net radiation (Kipp & Zonen CNR4), snow depth (Campbell Scientific sonic ranging sensor SR50a), soil and snow temperature profiles (Campbell Scientific temperature probe 107), air temperature and humidity (Campbell Scientific CS215).



The Stordalen Fen INTERACT tower after installation 5 December 2011.

2.4.3. Fen

A 4-meter high radiation tower was installed, equipped with sensors for net radiation (Kipp & Zonen CNR4), snow depth (Campbell Scientific sonic ranging sensor SR50a), soil and snow temperature profiles (Campbell Scientific temperature probe 107), soil moisture (Delta-T SM300), soil heat flux (Hukseflux HFP01SC), NDVI (Skye SKR1800) and ground water level (Druck PDCR1830).

2.4.4. Palsa

No installation performed so far. This will be an ICOS site and full ecosystem setup will be installed before end of August 2012.

3. Data streaming

As all stations have only recently been installed and most are in a test phase (in particular in relation to the winter operation) there is as yet no fixed protocol for how the data will be collected and transferred in online available formats. We have been fortunate in having a joint full time PhD student employed at ULUND with the NCoE DEFROST (Christian Stiegler from Austria) who will be the main person responsible for collecting, interpreting and communicating results from the INTERACT towers over the coming four years. We have also organised a meeting in Lund in February 2012 to discuss details about how raw data will be handled and how the linkage will be made between the INTERACT WP6 data streaming and existing databases that we will link to.

4. Next steps

Other INTERACT partners are exploring the feasibility of establishing similar instrumentation at their sites.