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Site report: Finland - Sodankylä

(Submitted by Esko Kyrö)

Summary and Purpose of Document

This document contains an overview of the Sodankylä measurement programme with respect to GRUAN requirements, and responds to the questions to be discussed in this session.

Sodankylä site in the GRUAN network

Sodankylä site is operated by the Finnish Meteorological Institute Arctic Research Centre (FMI-ARC). Location of the site is 67.4 °N, 26.6 °E, 179 m above mean sea level (Figure 1), station's WMO number is 02836. The site is representative of high latitude conditions in the northern Europe. During winter and spring the upper air soundings are frequently sampling air inside the stratospheric vortex. Several measurement programs are running on the long term basis and are thus producing valuable data for the climate research (Table 1). For example Sodankylä has one of the longest records of upper air measurements of temperature and ozone in the European sector of Arctic. Recently new monitoring programs have also started: FTIR radiometer was installed in December 2008 with the primary objective to measure CO_2 and methane columns on regular basis. The site has also been active in instrument comparison (LAUTLOS-WAVVAP) and satellite (e.g. ENVISAT, Aura, MetOp) validation campaigns. Information on the activities at FMI-ARC can be found at fmiarc.fmi.fi.

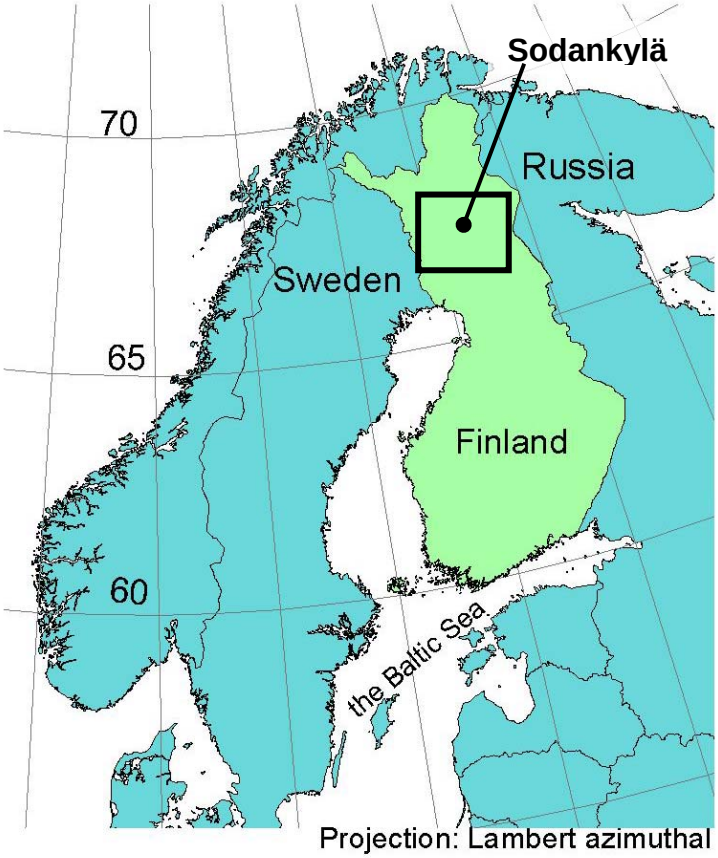

Figure 1: Location of Sodankylä site

Table 1: Regular observations at FMI-ARC, Sodankylä.

	Starting year	Description
Ground weather observations		
Temperature, Air pressure, Air relative humidity, Wind speed and direction, Precipitation, Visibility, Soil temperature, Snow cover	1908	Ground
Air chemistry: Radon-222 (Aerosol Beta activity, Alpha counting)	1996	Ground
Solar radiation observations		
Global-, Reflected-, Diffuse- and direct component of solar radiation, Sunshine hours radiation	1957	16 m Tower
Aerosol optical depth	2004	16 m Tower
Ground based UV- and Ozone observations		
Global UV-radiation, Spectral UV-radiation, **Total column ozone**	1990	Ground
Total column Ozone, Total column Nitrogen Dioxide	1990	Whole atmospheric pillar
Balloon borne observations		
Temperature, Air pressure, Air relative humidity, Wind speed and direction from radiosondes	1949	Ground to 30 km
Ozone concentration from ECC sonde	1988	Ground to 30 km
Water vapour concentration from a frost point hygrometer	2003	Ground to 30 km
Aerosol backscatter coefficient from backscatter sondes	1994	Ground to 30 km
Meteorological Mast Experiment		
Soil temperature- and moisture profiles, RH% at 10 cm, leaf (needle) wetness, heat flux	1999	Ground
Snow depth, Snow temperature profile, air temperature and relative humidity 10 cm above soil or snow	1999	Ground
Sonic wind speed, direction, temperature, friction velocity, heat vertical flux at 3 ,8,32 and 47 m	1999	48 m high meteorological mast
Temperature, Relative humidity, Wind 3,8,18,25,38,47 m, water vapour vertical flux	1999	48 m high meteorological mast
Global-, Reflected-, Diffuse- component of solar radiation, Net radiation, Photo-synthetically active radiation	1999	48 m high meteorological mast
Long-wave radiation, Outgoing long-wave radiation, Radiation temperature of canopy	1999	48 m high meteorological mast
Other observations		
Snow observations along a 4 -km snow course		Ground

1. a) Site status in respect of the requirements outlined in GCOS-121 and GCOS-112 (priority 1 and 2)

Priority 1 variables

- Surface observations

Standard surface parameters include surface pressure, temperature, humidity and wind. These are at the close proximity to the upper air soundings.

Surface measurements are automatic provided by the Vaisala Automated Weather Station (AWS) Milos 500. The AWS measurement are recorded with one minute temporal resolution. Regular calibration checks are made by the FMI.

- The upper air measurements

The upper air measurements are made on regular basis at 00 UT and 12 UT. The soundings system is DigiCora-3 manufactured by Vaisala Oy, The software has been updated on regular basis. The operational radiosondes are RS92-SGP using GPS. Altitudes can be calculated by both the GPS and the pressure measurements.

In Sodankylä we have been able to launch research grade hygrometers (CFH and FLASH-B) during the winter months since 2002. The motivation has been instrument intercomparisons such as the LAUTLOS-WAVVAP campaign in Sodankylä (Suortti et al., 2008; Vömel et al., 2007; Deuber et al., 2005); to study water vapour distribution in the upper troposphere and lower stratosphere (UTLS) at the vicinity of the polar vortex (Karpetchko et al., 2007); to provide accurate measurements of UTLS water vapour for satellite validation (Vömel et al., 2007). Since 2004 we have flown RS92 humidity sensors in each payload of the CFH instrument.

- Ground-based GPS receivers to measure total column water vapour

The GPS receiver is located at the nearby (20 km) Finnish Geodetic Institute (FGI) station . The GPS data and parallel AWS weather data are relayed directly through FGI to EUREF Permanent Network (EPN) and Zenith Total Delay and Total columnar amount of water vapour from this data are retrieved by Geoforschungszentrum Potsdam (GFZ).

Priority 2 variables

Priority 2 measurements at the site include surfaced radiation measurements; microwave radiometer measurements of temperature and moisture profiles (22 to 36.5 GHz); integrated trace gas measurements (ozone by Brewer #037, methane by FTIR); column aerosol measurements from sunphotometer (wavelengths of 862, 500, 412 and 368 nm with 5 nm FWHM bandwidth); profiles measurements of ozone by ECC type of sondes; aerosol backscatter profile in situ measurements at 490 nm and 940 nm on campaign basis.

b) Which guidelines/manuals do you use when taking measurements, if any?

The SYNOP observations are guided by Guide to Meteorological Instruments and Methods of Observation (1997). Ozonesondes are operated according to the manufacture's guide (ENSCI, 1996).

c) What is your data dissemination practice?

Data are submitted through the GTS and the FMI web server. Ozone data are submitted to the WMO database in Toronto and to the NILU database.

2. Needs: What do you need from lead centre / working group / secretariat?

One of the questions is how to organize additional financial support for the reference class sonde measurements such as the CFH.

3. News: Are there any scientific or organizational developments we should be aware of?

FTIR installation in December 2008 (priority 2 and 3 variables).

BKS/COBALD flights in January 2009 (priority 2 variables).

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