

Atmospheric Flagship program

3-7 /10/2016 Kieller

Summary of the WG3 (Boundary Layer)

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In an open and vivid discussion it became clear that the boundary layer research is an important topic for the atmospheric flagship programme in Ny-Ålesund. Current work is focused on: understanding the stable boundary layer, understanding the micrometeorological processes in Kongsfjord area, improvement of profiling the atmospheric parameters in the atmospheric column. This improvement would lead to the possibility to use the data for comparison with results gathered by atmospheric numerical model at different time scale resolution. But modeling cannot avoid the important contribution to “climate budget” provided by the ocean current that is in charge to transfer the accumulated heat in the ocean from low to high latitudes and in the atmosphere.

This further new step is expected to be synergically developed to be integrated with the atmospheric measurements.

The measurements, as well as the processes in the boundary layer can be linked directly to other processes or phenomena observed in the Arctic atmosphere as snow, aerosol and clouds that have been discussed in detail in WG4 WG1 and WG5 respectively. Due to the particular orography of the Kingsbay, several important questions are still unsolved, for example about the characteristics of the boundary layer as observed from Zeppelin station or from the village or even on the sea.

During the WG3 session brief talks were presented from the four groups which currently perform in Ny-Ålesund research in atmospheric boundary layer to describe instrumentation used, current researches and future perspective. The arguments are summarized below.

KOPRI performs measurements in the ABL in Ny-Ålesund to improve forecasts and cloud microphysics studies but they extend the interest also other regions of the Arctic.

NCAOR is interested in the hydrological cycle and uses boundary layer research to link their observations and modelling to understand precipitation in the Arctic on a large scale.

CNR is proceeding with the measurements at CCT to study the stability of ABL, and with the tethered balloon to provide aerosol profiles in and above the boundary layer.

AWI is interested on fluxes over different terrain and on coupling between micrometeorological and synoptic processes.

Moreover 3 groups that are not present at the moment in Ny-Ålesund consider coming back in Svalbard to:

-perform ABL measurements especially over snow covered surfaces and glaciers (University of Innsbruck)

- use UAV to understand the stable boundary layer and the boundary layer over complex orography (University of Bergen among others))s

-use controlled flying balloons for meteorological measurements over and around Svalbard (CNRF).

A point in WG3 session concerning the possible joint campaigns and projects foreseen for next year was open for discussion and three ideas were proposed:

- 1- Improve the atmospheric profiles by using the available tethered balloons systems in a coordinated way to: a) calibrate / improve the retrieval of the remote sensing instruments b) get information along the vertical above the CCT height c) combine aerosol / cloud measurements in the boundary layer. The equipment and expertise for this is readily available.
- 2- Use the cable car regularly for measurements of physical and meteorology parameters and aerosol / clouds along the slope of the zeppelin mountains. This is indeed very important to understand the influence of the slope of the mountain on the individual measurements. A modular box for different kind of observations directly connected to the cabin is desirable. Additionally also the masts of the cable car or the existing wiring for power and internet might possibly be used for the installation of a few meteorological sensors between the ground station and the Zeppelin station.
- 3- Assess a careful and uniform calibration of sensors and an intercomparison between different data processing procedures. In particular for what concern the turbulent fluxes that are small most of the year and hence a close comparison can only be done if the sensor calibration and the evaluation scheme are at least very similar.

Other activities related to boundary layer studies have also been presented and gaps concerning measurements have briefly been discussed.

In particular the growing expertise in using microwave radiometers will allow joint coordinated measurement programmes on the water vapour and temperature profiles to the test of new retrieval algorithms.

The new KOPRI wind lidar to be installed in the proximity of the CCT will be very useful, due to its scanning ability, to extend the wind profile above the CCTower. New Eddy Covariance measurements over ice / glaciers or a coastal site (e.g. Brandal) will be identified to better use the AWIs system currently installed at the old pier. This idea needs to be

discussed more in details between the groups interested. In any case AWI will go on with its installation on the old pier for the near future.

At the moment there are no joint publications of the Ny Alesund boundary layer group. A paper on meteorological measurements during the total solar eclipse 2015 from AWI and CNR is in preparation.

Apparently many groups will be in Ny Alesund by the last week of March 2017. This will allow the preparation of new boundary layer group meeting on site.

During the discussion it became clear that many stations are interested in understanding the Arctic climate in a more extended view. Hence it can be foreseen that even if the research in Ny-Ålesund will improve in the future, more stations at different sites will be urgently needed to decompose local and synoptic phenomena. Cooperation with Hornsund and measurements campaigns in the vicinity of Longyearbyen have been mentioned.