WG2 on "Long-term observations and trends in temperature, precipitation, clouds and radiation" had their meeting on Thursday, 6 October 2016. Scheduled were several presentations on atmospheric long-term observations of temperature, moisture and precipitation, and their relation to the atmospheric circulation. These were complemented with contributions on long-term observations of other climate variables. After this overview of the changing climate in Ny-Ålesund, future joint activities were discussed.

Marion Maturilli presented an update on the metadata collection of the meteorological station stations across Svalbard. In a next step, the metadata collection will be handed over to Christina Pedersen with the intention to publish the information on the Atmosphere Flagship webpage.

Based on the meteorological long-term data of several stations across Svalbard, **Sandro Dahlke** highlighted the climatological differences between the stations in the eastern part of Svalbard with their more continental cold climate compared to the warmer western part of Svalbard with maritime influence. Comparing with other stations across the Arctic, he emphasized the particular location of Svalbard in the North Atlantic region of the Arctic.

Herdis M.Gjelten explained the reconstruction and homogenization of the Svalbard temperature data series, and showed that warming occurred already in the 1930s and 1950s. Though the recent warming is the strongest, the autumn season (SON) in the 1950s had temperatures almost as high as today's values. The recent temperature trend is strongest in winter, from 1979 to now amounting to 2.3 degree per decade. An analysis of 'warm' (>0°C) and 'cold' (<-10°C) days reveals a reduced variability. Furthermore, significant trends in annual precipitation sum were reported for all stations.

Instead of looking at monthly data, **Marzena Osuch** applied the MASH method (moving average over shifting horizon) to daily air temperature and precipitation from Hornsund, Longyearbyen and Ny-Ålesund. She explained that the coldest period has shifted from December-January to March-April due to the increasing temperature in winter. While the distribution of precipitation at Hornsund was homogeneous over the early years, she pointed out a maximum in precipitation occurring in autumn (Aug./Sep.) in recent years. She mentioned that within Arctic Cordex, the validation of regional model data is potentially extendable to other Svalbard data.

Continuing on atmospheric circulation patterns, **Nuncio Murukesh** highlighted that the second EOF of Dec-Jan-Feb sea level pressure anomalies for 1979-2015 was increasing (Skandinavian Blocking). He further showed an example of the Indian rain radar. It was suggested that these data could be used to check the precipitation-correction planned for the met.no data.

Ewa Lupiskaya talked about mixed, liquid and solid precipitation, stating that at Hornsund a decrease in solid precipitation frequency was found for MAM and JJA, and at the same time a decrease in solid precipitation amount was observed in MAM, JJA and DJF. Based on a circulation type classification, she linked these observations to air advection from the southern sector leading to an increase in liquid precipitation and decrease in solid precipitation.

The uncertainty of solid precipitation measurements was discussed by **Mareile Wolff** who had participated in the WMO-SPICE study. She explained that the secondary reference for these measurements was provided by an automative gauge with double fence. Several other instruments and set-ups (e.g. weighing gauges, present weather sensors, dysdrometers, different fencing arrangements) were tested revealing large differences up to 60% in solid precipitation amount. She

noted that the undercatch of solid precipitation is larger at high wind speeds, and that the uncertainty of precipitation measurements should be considered in trend analyses.

Hans-Werner Jacobi summarized the outcome of WG4 on Snow, reporting that it is planned to create a data set of long-term snow observations, including meta data etc. He pointed out the need for common averaging periods for automatic snow heights, asking for a recommendation based on potential WMO standards. Considering long term snow height data, he mentioned Hornsund (from 1982) and the Bayelva site at Ny-Ålesund (from 1998).

An overview of the WG5 on Aerosols was given by **Radek Krecji**, stating that BC was found to have a slightly decreasing trend. He mentioned that the annual cycle of aerosol number density had its minimum in October and maximum in spring, and that the aerosol number size distribution was changing with the accumulation mode mostly present in Arctic haze season, while in summer the aerosol particles are smaller (due to wash-out). He noted that a change towards a more maritime system may have an effect on aerosol since DMS is a precursor, and pointed out the importance of distinguishing between local production and transport.

Stephen Platt reported on long-term observations of trace gases on Zeppelin mountain, listing e.g. the observation of CO2 and tropospheric O3 since 1989, and the rather new observations of isotopic components to identify source regions. He brought up that a lot of trend reports are available in NILU reports, and the observational data at http://ebas.nilu.no/default.aspx. He gave an overview on local and regional methane sources, and described related activities with the OsloCTM3 global chemical transport model.

Concluding the documentation of long-term observations, several WG2 participants presented short information e.g. on cloud observations, glacier retreat, sea ice on Kongsfjord and permafrost thawing.

In the final discussion, the participants agreed on 2 activities that some WG2 members will jointly work on in the future:

(1) SNOW / PRECIPITATION [joint activity of WG2 and WG4]

- Goal: generating a common data set
- involved will be various groups in Ny-Ålesund and Hornsund, bringing in measurements of snow height, precipitation; compare with Microwave Rain Radar
- First step: decision on correction for precipitation data

(2) AEROSOLS / CLOUDS / WATER VAPOUR [joint activity of WG1, WG2 and WG5]

- decreasing sulphate / increasing water vapor
  - ➔ what does it mean for aerosol formation ?
  - ➔ what does that mean for clouds ?

  Including the following data and participants cloud cover and cloud base (NIPR), aerosols (Sweden, Italy, KOPRI), humidity & thermodynamic state, radiation (AWI), remote sensing (lidar, radar) (AWI, NIPR, Univ.Cologne), visual cloud observations (Hornsund)