Status of the Polar BSRN Sites
Ny-Ålesund and Neumayer

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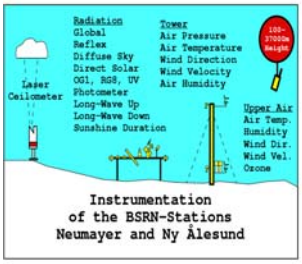
Introduction

The Alfred Wegener Instiute for Polar and Marine Research operates two BSRN stations in the polar regions:

Ny-Ålesund in the Arctic (together with the Norwegian Polar Institute) and Neumayer in Antarctica, both equipped with identical instruments. Continuous measurements started in 1992 and 1982, respectively.

In addition to the radiation measurements, both stations provide synoptic weather observations as well as daily upper air soundings and weekly ozone soundings.



Instrumentation

The ventilated radiation sensors get inspected several times a day. Active solar trackers (2AP SCI-TEC / Kipp&Zonen) are used to point automated photometers (Schulz&Partner, Germany) and a pyrheliometer (NIP, Eppley, USA) towards the sun. Additionally, the trackers shade the pyranometers (CM11, SCI-TEC/Kipp & Zonen, Canada) and a pyrgeometer (PIR, Eppley, USA, modified at Davos).

Currently, minute-by-minute averaged radiation fluxes are obtained by using a data logger (CR7, Campell Scientific, USA).

Arctic Station: Ny-Ålesund, Spitsbergen (78º 56'N, 11º 57'E)

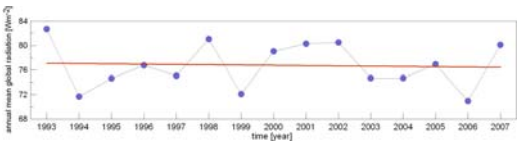


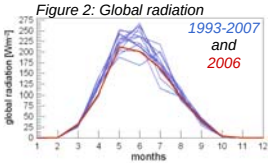
Figure 1: Annual mean global radiation (blue dots) with linear regression (red) revealing a -0.47 Wm^{-2} decrease per decade.

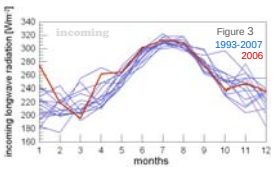
BSRN Station Ny-Ålesund in March.

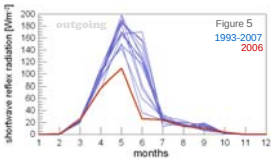
BSRN Station Ny-Ålesund in August.

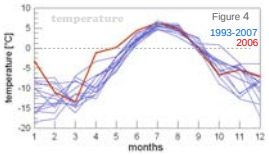
In Ny-Ålesund, the mean annual global radiation since 1993 varies around 76.7 ± 6 Wm^{-2}. The observation period obviously is too short for trend analysis, and the 0.6 % decrease per decade found for the period between 1993 and 2007 is clearly not significant. Variability between the years occurs due to different meteorological conditions and the according changes in cloud amount. The year 2006 provides an evident example.

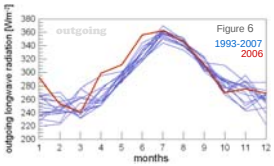
Figure 2: Global radiation











Figures 3 to 6: The incoming longwave radiation (Fig.3) indicates a rather high cloud amount in April 2006, probably causing -or at least supporting- the much higher temperatures during April-May-June 2006 compared to other years (Fig.4). In fact, temperatures were above 0ºC already in April, leading to a much earlier onset of snow melting. The effect of this change in surface structure is observed both in the lower shortwave reflex radiation (Fig.5) and in the higher outgoing longwave radiation (Fig.6) during the otherwise snow covered period April to May (even beginning of June).

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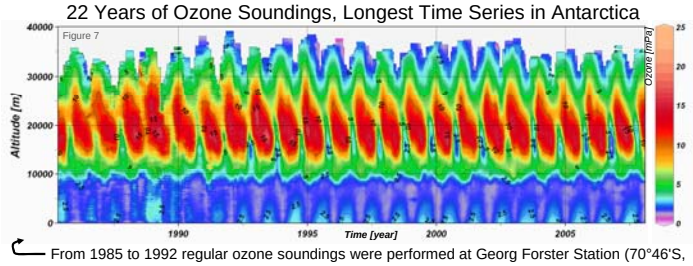
Antarctic Station: Neumayer (70º 39' S, 8º 15' W)

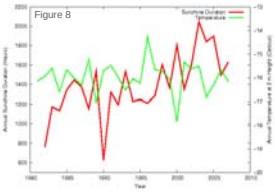
Due to snow accumulation the current Neumayer II station is rebuilt. The new station 'Neumayer III' is a construction which can adapt to the snow surface without getting buried, and has an expected lifetime of 25 years. It is planned to be operative by March 2009, relocating the meteorological observatory and BSRN program without interruption.

Sketch of the Neumayer III station.

22 Years of Ozone Soundings, Longest Time Series in Antarctica



From 1985 to 1992 regular ozone soundings were performed at Georg Forster Station (70°46'S, 11°41'E), afterwards 750 km further west at Neumayer Station (70°39'S, 8°15'W). Figure 7 shows the combined dataset, clearly demonstrating the austral spring ozone depletion and its annual variation.



At Neumayer, an increase of the global radiation is found, accompanied by a reverse trend of the downward-longwave radiation and a strong increase of the annual sunshine duration. Ceilometer data imply that the total cloud amount above Neumayer is decreasing. Figure 8 shows the annual sunshine duration and mean temperature, clearly anti-correlated as a result of the well known "Antarctic radiation paradox". Yet, the temperature does not decrease with increasing sunshine duration, probably due to compensation of the cloud effect by other factors (e.g. greenhouse gases).

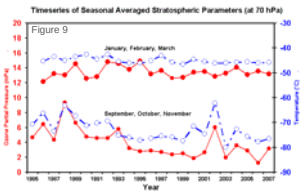


Figure 9: 22 year timeseries of ozone partial pressure (*red*) and temperature (*blue*) on the 70 hPa level for different seasons, showing a remarkable trend for austral spring. A recovery of the springtime ozone depletion is not yet found.

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