



The BSRN radiation measurement fields at two of AWI's polar research stations: Neumayer in Antarctica and Ny-Ålesund in the Arctic.



## The World Radiation Monitoring Center at AWI: a central worldwide data archive for Earth system sciences

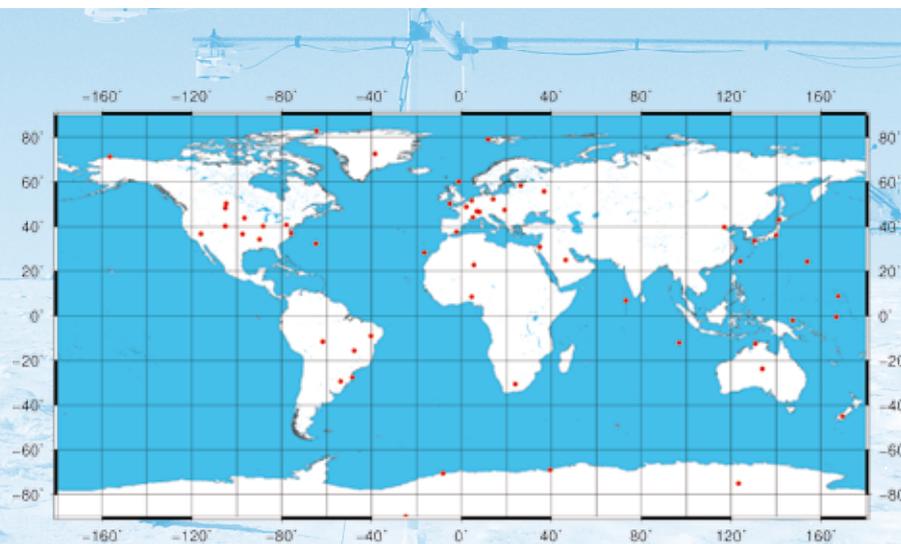
The word 'climate' comes from Greek and means 'inclination'. As a matter of fact, the mean inclination of the Sun to the Earth's surface has decisive impacts on our climate zones. Of course, there are diverse other factors that influence the radiation balance and thus the climate of our Earth: such as the anthropogenic rise in the greenhouse gas  $\text{CO}_2$  and the diminishing reflectivity of the Earth's surface due to melting snow and ice.

Long-term radiation measurements are of great importance for climate researchers. When the Intergovernmental Panel on Climate Change first turned its attention to the compilation of climate research knowledge in the 1980s, it perceived that the quality of the existing radiation measurements often did not meet the standards of modern climate research. This situation thus led to the establishment of the Baseline Surface Radiation Network (BSRN) within the framework of the World Climate Research Programme in 1992. The objective of this global network is to carry out the best possible surface radiation measurements at a few selective stations around the globe. The core of the network is its central archive, which all climate researchers can freely access. AWI has

been operating this World Radiation Monitoring Centre (WRMC) since 2008.

How did this come about? Bipolar research is part of the core business of the Alfred Wegener Institute for Polar and Marine Research (AWI). AWI has maintained two permanently manned polar research stations in this connection: the Neumayer Antarctic research station in Queen Maud Land since 1981 as well as the Koldewey Arctic research station in Ny-Ålesund on Spitsbergen since 1991. The continuous measuring programmes of the two stations have included extensive surface radiation measurements right from the beginning. Together with seven other stations, the two AWI stations formed the nucleus of the BSRN in 1992.

**Fig 1:** The worldwide network of measurement stations  
Figure: Wolfgang  
Cohrs, AWI



The World Radiation Monitoring Center was developed at the same time under the direction of Prof. Ohmura at the Swiss Federal Institute of Technology Zurich (ETH). When Prof. Ohmura retired, the search commenced for a new operator. Because of its scientific expertise and outstanding IT infrastructure, the Alfred Wegener Institute was chosen.

The World Radiation Monitoring Center was given a new face at AWI. In addition to the file archive it took over, all data were imported into the PANGAEA information system. This archive serves the purpose of archiving, publishing and distributing geo-referenced data in the field of Earth system research (<http://www.pangaea.de>). The WRMC website was also completely redesigned (<http://www.bsrn.awi.de/>). Besides the stations' large volume of metadata, the WRMC homepage now offers clearly structured link lists for direct access to all data via PANGAEA. In the meantime 5,800 station-months of data are available from 51 stations.

The World Radiation Monitoring Center not only stores the radiation measurements of many stations which have been sampled every minute, but also many complementary meteorological observations that are necessary to interpret



**Fig 2:** Glass domes of a pyranometer during the polar night at Neumayer. The pyranometer serves to measure solar and diffuse sky radiation.  
Photo: Gert König-Langlo, AWI

radiation measurements. They include the vertical profiles of air temperature and humidity obtained by means of weather balloons as well as cloud observations and cloud heights.

Globally, the surface radiation is estimated via satellites. Comparison with the direct measurements of the WRMC makes it possible to improve their accuracy. Climate models, too, rely on methods for supplying data on surface radiation. These radiation calculations can be checked and optimised with the data from the World Radiation Monitoring Center. Trend analyses are also possible using the WRMC measurements since some stations have been operating continuously for 18 years already. Initial results indicate trends in the radiation coming from the Sun, very probably as a consequence of changes in the air pollution control policy. Insolation rises over regions with decreasing air pollution whereas it drops over India and China.