

Name of research institute or organization:

Federal Office of Meteorology and Climatology MeteoSwiss, Payerne

Title of project:

Global Atmosphere Watch Radiation Measurements

Part of this programme:

GAW

Project leader and team:

Dr. Laurent Vuilleumier, project leader

Dr. Giovanni Martucci

Mr. Gilles Durieux

Project description:

The goal of the Global Atmosphere Watch Radiation Measurement program at Jungfraujoch is providing long-term monitoring of surface downward radiation fluxes. It is conducted in the framework of the GAW Swiss Alpine Climate Radiation Monitoring program (SACRaM), which applies operational guidelines similar to those of the international Baseline Surface Radiation Network, except for the daily maintenance requirements due to the remote nature of the site. In 2017, the degree of availability of the data was disappointing. In average, the data availability for radiation parameters reached 84.3%, while it is usually about 97% or higher. The problem was similar to the one affecting our measurements in 2016: the sun tracker pointing to the sun for automatic direct irradiance measurements was not well aligned resulting in low quality direct irradiance data. It was believed that the problem was solved in 2016, but after repeated failures it became clear that the problem was caused by incorrect adjustment settings in the alignment correction software. This issue was identified in the second part of 2017 and corrected at the end of the year.

The measurement program includes short-wave (solar spectrum) and long-wave (infrared thermal) broadband measurements as well as UV broadband measurements. Short- and long-wave measurement series are important for climate research, while UV measurements are of interest for both public health and exploring the relationship between the evolution of the ozone layer and radiation. Broadband radiation is measured both as global downward hemispheric irradiance and as direct sun irradiance. In addition, direct spectral irradiance is also measured, which allows the total column of several atmospheric constituents to be determined.

In association with the WMO GAW Precision Filter Radiometer (PFR) network, MeteoSwiss also operates sun photometers at the four SACRaM stations measuring the direct solar irradiance in 16 narrow spectral bands within the range 305-1024 nm since 1998. One of the four sites is Jungfraujoch (timeseries 1999-2017), characterized by alpine environment and partial free tropospheric conditions (mainly in winter, Hermann et al, 2015, Poltera et al., 2017). At nine wavelengths, aerosol optical depths (AOD) are computed at times when no clouds are in the path of the direct solar beam.

Key words:

Solar irradiance, ultraviolet, visible, infrared, spectral irradiance, precision filter radiometer (PFR), pyranometer, pyrhelimeter, UV biometer, total aerosol optical depth (AOD), integrated water vapor (IWV)

Internet data bases:

<http://wrdc-mgo.nrel.gov/> (World Radiation Data Centre – WRDC)

Collaborating partners/networks:

Study of solar photometry (aerosol optical depth) and long-wave infrared radiative forcing in collaboration with the "Physikalisch-Meteorologisches Observatorium Davos" (PMOD) / World Radiation Center (WRC)

Scientific publications and public outreach 2017:

Refereed journal articles and their internet access

Poltera, Y., G. Martucci, M. Collaud Coen, M. Hervo, L. Emmenegger, S. Henne, D. Brunner and A. Haeefe, PathfinderTURB: an automatic boundary layer algorithm. Development, validation and application to study the impact on in situ measurements at the Jungfraujoch, Atmos. Chem. Phys., **17**, 10051-10070, <https://doi.org/10.5194/acp-17-10051-2017>, 2017.

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