Status of Japanese BSRN stations

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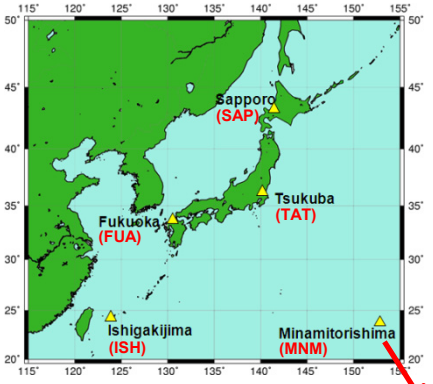
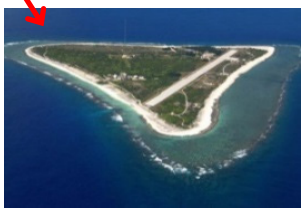
Domestic stations (SAP, TAT, FUA, ISH, MNM)



Sun / sky photometer

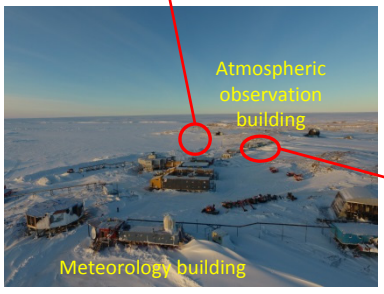


Minamitorishima (MNM) is a small island on the western North Pacific with a coast line of about 6 kilometers, and designated one of the WMO/GAW global stations.

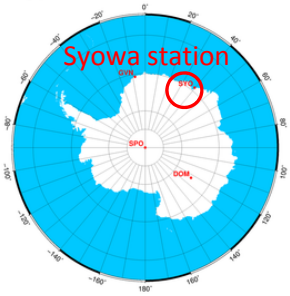
JMA operates 5 BSRN stations in Japan (Sapporo, Tsukuba, Fukuoka, Ishigakijima and Minamitorishima) and 1 station in Antarctica (Syowa). Observation data are reported regularly to WRMC every month. The exterior of domes or optical surfaces of each instrument is kept clean manually or automatically. The instruments are calibrated at least every 5 years to be traceable to the world radiation references such as WRR. JMA started observation of aerosols using sun/sky photometers (POM-02 Sky Radiometer, Prede Co. Ltd.) at Sapporo, Ishigakijima and Minamitorishima in 2018.

Antarctic station (SYO)

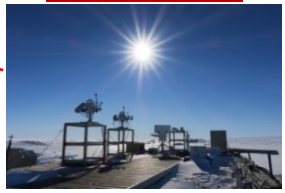
Upward flux



Running, planned, and closed BSRN Stations, March 2015



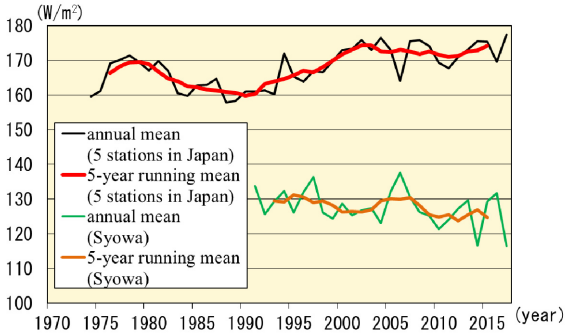
Downward flux



Syowa station was designated as a BSRN station in 1991, and has been conducting observation of the BSRN basic set of parameters. In addition, upward flux observation started in 1998. At present, observation data from 1991 to September 2017 are available at WRMC. Instruments for downward radiation were relocated from Meteorology building to Atmospheric observation building (300m apart to the east of Meteorology building and 10m above mean sea level) in January 2017. The height of instruments for upward radiation can be easily adjusted at appropriate height from the surface.

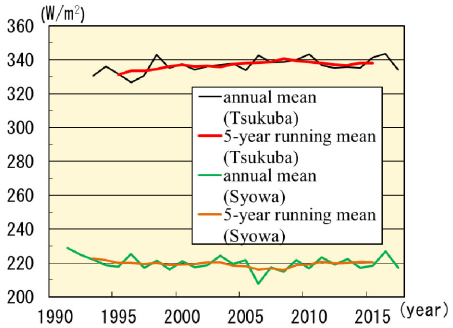
Time-series at Japanese BSRN stations

Global Solar



In Japan, global solar radiation declined rapidly from the late 1970s to around 1990 before increasing rapidly from around 1990 to the early 2000s. Since then, observations at the five stations show no obvious changes. These long-term variations are consistent with global trend. At Syowa, it has been gradually declining since the late 1990s on the contrary.

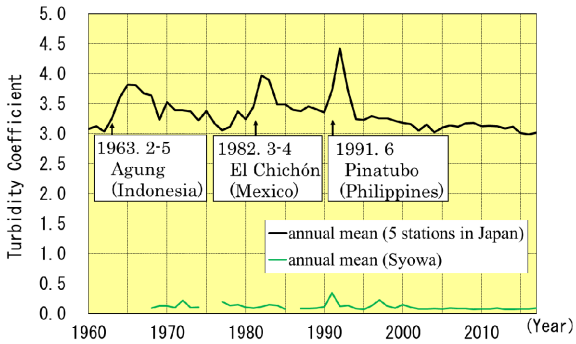
Downward Longwave



At Tsukuba, downward longwave radiation shows an increasing trend at a rate of about 0.3 W/m² per year during the period from 1993 to 2017. This is consistent with the trend seen in the results of analysis using data from 20 BSRN stations worldwide (+0.3 W/m2 per year during the period from 1992 to 2009) (*WCRP, 2010). At Syowa, there is no obvious changes on the other hand.

*WCRP, 2010: Summary Report from the Eleventh Baseline Surface Radiation Network (BSRN) Scientific Review and Workshop. WCRP Informal Report No. 08/2010, 21 pp.

Atmospheric turbidity



Time-series representation of annual mean atmospheric turbidity coefficients calculated from direct solar measurements (1960 - 2017 for 5 stations in Japan, 1968 - 2017 for Syowa).

Interannual variations in the atmospheric turbidity coefficient at five stations in Japan show sudden increase of stratospheric aerosols resulting from volcanic eruptions.