

Report on Baseline Surface Radiation Network (BSRN)/WCRP, GCOS

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First 15 years

BSRN started in January 1992 with three objectives to provide irradiances with clearly defined accuracies 1) to validate surface products from satellite radiometry; to evaluate GCMs and other models, and 3) to detect important changes in radiation in the climate system. The network was initiated first with seven stations, and soon substantiated with increasing number of stations presently counting 37.

The network has sufficient number of stations for the objectives, but with biased density of distribution. In terms of representativity of climatic zones, most major climates are represented, except high altitudes (H) and Mediterranean climate (Cs). There are certain number of stations which are too long pending (observations are done but without reporting data). There are fixed group of stations which stayed as candidate stations for very long periods. The project has reached the stage at which we must proceed selectively to choose the sites of future stations, in stead of accepting all proposed locations. It is necessary to form a small working group to identify urgently needed geographic sites, and to evaluate the suitability of the sites with respect to available financial, technological and personell conditions.

The data centre is responsible to evaluate the quality of the incoming minute data, to advise station scientists with possible errors, to place the data for scientific access, and to safeguard the original data for the future use. At the initial stage a difficulty was seen observations to be formatted in accordance with the proposed scheme, but most stations solved this problem. The majority of pending stations, however, stayed in this category, because the stations could not overcome this initial hurdle to format data in the BSRN scheme. The file system was adopted in 2002 to ease the data sending and access.

The number of users both in satellite and modeling groups increased rapidly, especially in last five years. During the last two years, the issue of the variability of radiation, both in short and long wavelengths ranges propelled the use of the BSRN radiation and ancillary data. The problem of radiation variability is only possible with the data of the BSRN quality, and simultaneously observed atmospheric characteristics, especially clouds, temperature and water vapour. Aerosol is another very important characteristics to influence shortwave radiation and clouds.

BSRN made an unexpected but vitally important contributions for improving radiometers and their installation methods. This was not foreseen at the start but turned out to be a very unique and necessary development to fulfill the objectives. The progresses in long-wave and diffuse sky radiation should especially be noted. The further progress and adoption of the window-less measurement of direct solar radiation was slow. There should be more progress in quest for the BSRN relevant albedometry.

Further progresses are awaited in spectral observations, including UV, PAR and AOD. The association of BSRN with GCOS received a very positive acceptance both for future development of the network and the data centre.

Global dimming and its origin

The fact that global radiation was decreasing in most regions of the earth from IGY to the late 1980s was reported by Ohmura and Lang (1989) during the IRS 1988. The similar

phenomenon was reported later by Stanhil and Cohen with respect to the Mid-eastern data and coined as "Global Dimming". During the 1990s more reports followed for many regions of the world. There is no doubt that this decrease of approximately 10 W m^{-2} happened at least for 30 years till late 1980s and this was associated with increase in aerosol and cloud amount for the same period. This phenomenon which was reported with good amount of documentations is met still now with certain skepticism or even rejections. This is owing to a long-lasting belief that radiative fluxes are stable and constant, originally conceived by M.I. Budyko, and still has a strong influence. As knowledge improves and understanding deepens we must be progressive enough to accept unused views. When Bill Rossow reported the end of the increasing trend of cloud in late 1980s and the reversal of the trend in the following years at the GEWEX Radiation Panel meeting in August 2002, the ETH group worked to supplement the works of Ohmura and Lang with the analysis of the data of the last 15 years which were not treated in earlier works. This will be reported by Martin Wild in this session later.

Need to absorb GEBA in WRMC

The BSRN data centre has increasing number of inquiries concerning the availability of non-radiative heat fluxes, such as sensible heat flux, latent heat flux, sub-surface heat flux and heat of melt. This is a natural development of radiation and model studies, as the climate system is maintained with total heat balance where radiation plays an important role. The World Radiation Monitoring Centre (WRMC) has been developing a database, Global Energy Balance Archive (GEBA) which contains the monthly mean instrumentally measured values of sensible heat flux, latent heat flux, sub-surface heat flux and latent heat of melt, in addition to all radiative fluxes. The important conditions for accepting data are 1) the fluxes must be measured by instruments and not just computed, and 2) the observation must last at least for a month over the land and two weeks over oceans. The data are accompanied with descriptions of methods of observations, deployed instruments, name and address of authors or workers. The source of fluxes are mostly 1) scientific journals, 2) data report, 3) unpublished data, and 4) from expeditionary campaigns. Presently, GEBA harbours about 250,000 station month data for about 1,600 sites globally including some ocean sites and glaciers. It is asked in the meeting if this effort together with WRDC should officially be granted as a part of activities at WRMC. The meeting recommended a motion of request to JSC.