

## **Baseline Surface Radiation Network (BSRN)**

**Reporting Period:** August 2006

**Chair:** E. G. Dutton, NOAA

**URL:** [www.gewex.org/bsrn.html](http://www.gewex.org/bsrn.html)

### **Project Overview**

The BSRN project continues to address its primary goals of obtaining best-possible, high-quality, continuous, long-term, representative, ground-based, observations of the surface radiation budget and select related quantities. Observational data streams from eight sites began in 1992 and have expanded to 36 sites by 2005 with another candidate 17 sites in various stages of development. Additionally, the BSRN is responding to the mandate for state of the art operational observations by advancing several aspects of the routine measurement capabilities ranging for the establishment of internationally recognized and maintained reference standards to an evaluation of the range of instrument environmental conditions encountered around the globe in order to revise and improve specifications for measurement methodologies. The project benefits from the active involvement of individuals from about 20 countries along with financial support, primarily for field observations, from most of those countries. The two largest contributors in personnel and resources are Switzerland and the US, although many of the other participants contribute in rough proportion to their countries resources.

### **Accomplishments**

BSRN has supplied a long list of accomplishments in the past and continues to build on those as well as add to them. Recent accomplishments and new projects include:

#### *AR4 GCM Comparisons*

Comparisons between BSRN surface infrared results and the array of GCMs comprising the suite included in the IPCC AR4 have been made and reported in last year's BSRN report to GRP. This work is being pursued primarily by M. Wild and shows a general improvement in the agreement between those models and observed values deriving largely from BSRN observations.

#### *Diffuse Solar Closure*

Analysis and results of a field campaign, sponsored by ARM with BSRN endorsement, intended to investigate the current ability to get closure between observed and modeled clear-sky diffuse solar irradiance were published, Michalsky et al., JGR, 2006. Those results showed agreement to within 2 Wm<sup>-2</sup> between an array of solar diffuse measurements and computations using 7 different readily available and widely used radiative transfer models. According to the authors, the keys to consistently achieving those results were, utilization of the current BSRN recommended diffuse measurement methods, correct and representative spectral surface albedo, and correct spectral aerosol optical properties. Of course, adequate values of other atmospheric constituents and proper RT codes are also required.

#### *Biennial Site Scientist Meeting, Lindenberg*

The biennial meeting of the BSRN site scientists and interested individuals was held in May at Lindenberg, Germany. Attendance from the participating countries was excellent with over 65 individuals in attendance for the full week-long meeting. These meetings serve as a core for interaction and exchange among the participants and is virtually the only internationally sanctioned meeting that deals directly and exclusively with ground-based observations of irradiance and their applications. The meeting was generously and capably hosted by the German Weather Service that operates the extensive atmospheric observatory located at that site.

#### *IR Reference Standards*

The progress has been made towards the establishment of a well-characterized consensus IR irradiance reference standard. An important step towards the sustainability of such a standard into the future is the institutionalization of the responsibility for the maintenance of the standard. That step was accomplished when the WMO asked the World Radiation Center Davos (WRCD) to take on this responsibility and WRCD accepted. In the past year, WRCD demonstrated the merit of that aspect of the sustainability

when a new individual, Julian Gobner, replaced Rolf Philipona in having the responsibility for the IR reference. The WMO Committee on Instruments and Meteorological Observations (CIMO) whose responsibility it is to sanction such radiation standards gave its approval for the current IR reference to be an Interim Reference until the time that remaining issues are resolved. The main unresolved issue is the need for multiple Absolute Sky-scanning Radiometers to form a consensus group of instruments similar to those the make of the World Reference Group for direct solar beam World Radiation Reference standard.

### ***Field Sites Status***

The network has experience steady and solid operations through out the year with some sites being timelier in their data submissions while others remain up to a few years behind. All members and most BSRN users agree that more timely data submission would be a greater benefit to everyone. Often, local resources and or difficulties with the archive formatting requirements are responsible for submission delays. One new BSRN station officially came on line this past year by having its data accepted by the BSRN archive. That site is Xianghe, China, which has been supported by Zhanqing Li the U of Maryland but essentially entire established and maintained by Chinese

### ***Direct Beam - Measurement issues***

BSRN originally recognized the shortcomings in direct solar irradiance observations using existing commercial pyrhemometers relative to the desired BSRN accuracies. This was in comparison to the capabilities of un-windowed electrical substitution cavity (UESC) radiometers. However, after a decade and a half, few UESCs had been adequately adopted for routine all-weather field deployment such as recommended by BSRN. The BSRN, therefore, maintains the accuracy of its operational direct solar measurements by regular and rigorous calibration transfer from the UESC to operational commercial pyrhemometers. Pyrhemometers have been shown to be remarkably stable over long time periods (decades) and provide excellent mean results meeting BSRN requirements. However, some pyrhemometers display and larger-than-desired ( $> 2 \text{ Wm}^{-2}$ ) sensitivity to ambient environmental fluctuations in wind, temperature, and IR irradiance. STOP Investigations directed toward characterizing and either correcting or compensating for these errors are underway at several institutions with connections to BSRN and with BSRN endorsement. The magnitude of these errors are typically within the manufacture specified bounds but are likely the source of error that resulted in the initial BSRN identification of pyrhemometer limitations.

### ***Project Issues and Emphases***

#### *Archive*

The current BSRN archive, hosted at the Swiss federal technical university in Zurich (ETHZ), will be re-considered with the pending retirement of its director within the next year. Planning has begun for the re-establishment of the archive either at ETHZ or elsewhere. The continued commitment to the archive activities is crucial to the future of the network. Several groups have expressed interest in potentially hosting the archive activity but we are awaiting further clarification on the potential for the archive to continue at ETHZ under new directorship.

#### *Delinquent Sites*

With the development and subsequent growth of the number BSRN field sites several sites have been proposed and then showed considerable interest and potential to become sites but have never followed through by providing observational data of the form and format required by BSRN. Several candidate sites have come and gone without much notice because of their short-lived support while others have stayed on the list for as longer than 10 years with no data results but in some cases valuable contributions of time and effort by related individuals on other network projects. During the past year the official BSRN member stations list on the web site has removed the remaining non-data producing sites. One other site, Solar Village, Saudi Arabia, has fallen far behind in data submission with little hope for recovery and faces being dropped also. In the meantime new stations with data actually beginning to flow have been added, Xianghe, China; Cocos Island, Australia; Alert, Canada, and Dome Concordia (Dome C) Antarctica. Sites removed from the candidate list for having never produced data are Albany, New York; Budapest, Hungary; and The Maldives. The current list of sites along with other pertinent information on the status of the observing sites and their data can be found at <http://bsrn.ethz.ch>

### *Oceanic Observations*

Oceanic sites or platforms for possible BSRN-like observations continue to be the focus of a thriving working group within BSRN. This group is looking into the potential for a variety of oceanic sites and the extent to which BSRN specifications and recommendations as to how measurements are made might have to change if there are ever to be a significant increase in representative and accurate measurements from the open ocean regions. The WG has yet to identify or promote an additional BSRN observing site.