

Baseline Surface Radiation Network - Station requirements overview, status 2017-04-01

Basic requirements		
Personnel	Proposal of site at a biennial BSRN Meeting, presentation of site/instruments/data...	
	Long-term involvement of an expert in surface radiation at each site (station scientist)	
	Station manned during workdays, preferably all days	
	Ability to create station-to-archive files (no software is offered, but other station scientist are willing to help and share software)	
	Data has to be quality checked and has to be submitted in regular intervals to the WRMC latest within one year	
Data/Instruments	Obligatory is the measurement of direct (DIR), diffuse (DIF), global (SWD) and downward long wave (LWD) radiation, air temperature, relative humidity, air pressure	
	For DIR, DIF, SWD and LWD, a sampling frequency of ~1Hz is recommended, at least 0.5 Hz is required; data submission of one minute-averages obligatory	
	Instrument accuracies of around 5 W/m ² or 3% (whichever is greater) for SWD and DIF; 2 W/m ² or 3% for DIR Normal and 5 or 2% W/m ² for LWD is highly desirable	
	Frequent cleaning/maintenance/check of instruments (e.g. daily cleaning of domes during workdays)	
	Ventilation of all radiation instruments, especially at sites with large temperature shifts is highly recommended!	
Calibration of instruments traceable to Davos standards is obligatory		
Site/Location	Site must allow reasonable access for frequent inspections and instrument service, reliable electrical power	
	The horizon has to be described and submitted to the WRMC (see LR0004 of station-to-archive file or e.g. https://doi.pangaea.de/10.1594/PANGAEA.743878)	

Recommended requirements		
Personnel	Willingness to participate in the biennial BSRN Meetings	
Data/Instruments	Measurement of upward radiation components (SWU, LWU) is highly recommended	
	Care should be taken that there is no interference of instruments with each other	
	For DIF measurements pyranometers should be used with a solar tracker and a shading ball (not a shading ring or band)	
	Measurements of ancillary data (synoptic observations, routine upper-air soundings, basic meteorological instrumentation, ceilometer data) which are also supplied to the WRMC are welcome	
	Pyranometers, pyrgeometers and pyrheliometers used at the moment at BSRN stations are generally rated as ISO-9060 secondary standards, or in some cases first class	
Site/Location	Site should be representative of a relatively large surrounding area for use in satellite validation, and/or of a climate/region/orographic regime underrepresented by BSRN	
	Horizon ideally flat, not too close to shading structures (buildings, trees etc.)	
	Ideally not near airports, major roadways/traffic or where pollution, heat emitting structures etc., adversely affect radiation	
	At least a basic security setup: no access of unauthorized persons or of wild animals which could damage or interfere with instruments	

References:

<http://bsrn.awi.de/en/stations/join-bsrn.html>

http://bsrn.awi.de/fileadmin/user_upload/bsrn.awi.de/Publications/McArthur.pdf

Consideration as a BSRN station:

Once an organization has established a surface radiation measurement site with quality instrumentation, and adopted operational practices as described/recommended for BSRN including plans for traceability of calibrations to world standards, representatives of the site contact the BSRN Project Manager (<http://bsrn.awi.de/contact-persons/>). The Project Manager will invite attendance at the next biennial BSRN Workshop in order for the representatives to present information about the site including such aspects as location, representativeness or uniqueness, climate regime, and any other information that they feel makes the site desirable for inclusion in the BSRN. The presentation needs to also include information about instrumentation, operational practices, organization background, qualifications of the person who will be the designated Station Scientist, and expected longevity of the site and support thereof.

Several factors are considered and balanced in the decision-making. There are currently many BSRN stations that make only downwelling measurements. If the site only proposes to include downwelling solar measurements, then only in rare cases is it likely to become a BSRN station. The BSRN is most interested in new sites providing both upwelling and downwelling radiative observations to document the complete surface radiative energy budget along with surface meteorological observations of air temperature, humidity, and air pressure. Sites proposing the full surface radiation budget measurements along with routine synoptic weather observations and upper air soundings are looked upon most favorably.

Another primary consideration is whether the site fills an underrepresented geographical area or climate regime for the network. Of particular interest are sites on small islands or ocean-based platforms that can be representative of the surrounding oceanic area. But a visual inspection of the current BSRN stations map (<http://bsrn.awi.de/nc/stations/maps/>) easily shows the areas of the globe that are underrepresented.

Finally, BSRN is intended as a long-term climate monitoring network. The reality is that no one can predict the long-term future. However factors such as the history of the proposing organization and support, as well as the intent that is associated with the proposed site with respect to longevity, need to be presented for consideration. Many of the founding BSRN stations have been operating since 1992-3, and are the benchmarks for what the BSRN strives for.

These all are part of the decision making process for newly proposed sites. There is no hard-set check list, but rather the entirety of a proposed site's factors are balanced and considered. What happens after the proposal is presented depends on the state of the site(s): is there already a several year high quality data record? What measurements are being made there and is there a nearby upper air station performing synoptic observations? If there's already well established site(s) with several years of data, then there have been votes by the BSRN membership on the last day of the meeting to accept the candidate site immediately. Else sometimes we have waited until the next BSRN meeting 2 years later for an update on status. This latter has happened for example when a group comes with in essence a PLAN to put together a site, but hasn't actually collected the data yet, or has collected some data but is still in the process of procuring the instrumentation, etc. In a nutshell, BSRN is intended to be a long-term measurement endeavor. So once data are collected, an initial several year delay in getting them available through the BSRN Archive is not a big deal. What is more of a concern

is having an organization get accepted, submit a few years of data, and then fall apart. Thus one of the important factors for consideration is the impression of commitment for long-term operations. If the proposal can indicate there is commitment it can certainly help.

Finally, a site is not officially a BSRN station until they have submitted data to the BSRN Archive and that data has passed the BSRN quality testing. It is now acknowledged that BSRN has become an internationally recognized and respected resource for the satellite, modelling, and climate communities. Several of the WMO organizations such as the GCOS, WCRP, and GDAP depend on BSRN for its reputed high quality surface radiation data. But with this recognition also comes responsibility, as now there are many organizations and efforts depending on the use of BSRN data. Thus we in BSRN have a serious responsibility to make the high quality data we collect available to the community. It does no good to collect data at a site, but then not submit it to the BSRN Archive so that the community of users can have access to it in a standard format, noted as one of the strengths of BSRN. Thus we have a responsibility for not only making high quality, continuous surface radiation observations, but also to submit the data in a timely manner to the BSRN Archive for community access. We have in the past welcomed a site as a provisional BSRN station, but then have never received any data. The few times this has occurred the provisional acceptance has been rescinded after several years, with an invitation to go through the entire site proposal process again should the group wish to do so and can convince the BSRN membership that efforts will surely be made to submit data to the BSRN Archive.