

Interactive comment on “Baseline Surface Radiation Network (BSRN): structure and data description (1992–2017)” by Amelie Driemel et al.

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Review ESSD-2018-08 BSRN

R: Data downloads easily from Pangaea. Random sample from TOR (1999, Toravere Estonia) looks clean, well-documented and easy to use. Many users will need to re-name the files from .tab to .tsv for easy use; okay for a few but I would not want to do this for 60 stations and multiple years/files. Authors have a suggestion?

= > The .tab files open in every program which opens txt files. However, if you want to bulk change the file extension there are various ways to do so, e.g. with the command:
ren *.tab *.txt

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Page 2, line 29: “McArthur, 2005, see also):” ‘see also’ leads nowhere?

= > Has been fixed

R: Page 3, line 15, radiometers measure at 1 Hz but data average up to 1 minute, for valid reasons. Do the data sources have a standard procedure for this, depending on response time of radiometers as operated? BSRN doesn’t specify local procedures, so long as they receive 1 minute data?

= > It is a standard average. The time stamp of the datapoint is supposed to represent the startpoint of the minute average.

R: Page 4, line 22: “2 for a visualisation of this data file.” Technically, Figure 2 shows year of operation of all stations, with note on downward only or downward and upward. But not information on the file structure?

= > I think you mixed Table 2 for Figure 2 here. Table 2 shows what you are describing, Figure 2 is a visualization of a monthly time series

R: Page 4, line 24: This sentence implies that each station has an individual station scientist attending to quality control, e.g. 59 different station scientists. But in fact, one person often oversees data from several or many stations?

= > Very good comment, thanks, we clarified this adding “(some scientists are responsible for more than one station)”

R: Page 5, line 1: In the data file for TOR 1999, I can view good documentation of

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changes in horizon views, instrument type, instrument calibration (referenced to WRMC procedures) etc., but how would a user know if that file represents a pre-2007 file accepted at AWI without alteration or a more recent replacement file? Presence or absence of quality control flags could provide a key indicator, but BSRN doesn't archive QC flags, only provides QC tools? How would a user know if and when the station scientist changed; need to look at subsequent files to see a name change? Perhaps a user can find all this on the Pangaea data viewer rather than trying to extract it from individual files?

= > Thanks, again very good hint. Actually, it is quite easy to recognize an old file: If it is data from pre-2007, and has the version number 1 (in the station to archive file line 1 last number) OR in PANGAEA if it has 2007 as publication year. We added the following sentence to clarify this also to the reader: "Old files can be distinguished from new ones quite easily: If it is data from pre-2007, and has the version number 1 in the station to archive file (line 1 last number) OR if it has 2007 as publication year in PANGAEA it is an old file."

R: Page 5, AWI QC procedures: Does a user know how many station scientists actually use and apply the toolbox? Does BSRN / AWI know? After the more-recent AWI checks, do the files go back to the station scientist for correction followed by re-submission, and/or do the data remain in the Pangaea system but identified by QC flags?

= > Not every station scientist uses the BSRN Toolbox, some use other QC which take into consideration various issues related to their environment. There are different things to consider in humid, cold or very hot climate regimes. BUT as every files gets checked by the Data Curator with the help of the Toolbox QCs there is a uniformity in QC that allows direct comparison of the data quality. And yes, suspicious values are sent back to the station scientist for correction, we talk about this in chapter 3.2 but will

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add another sentence to clarify this more.

R: Page 5, line 12: "algorithms (Iqbal 1983, Solpos with refraction and Solpos without refraction, Michalsky)": this is supposed to represent a reference to Michalsky or to the names of pull-down position options in the Toolbox?

= > The first three are options within the Toolbox, the fourth is another one not yet implemented. We added a reference to more detailed information of those tests Iqbal, M.: Introduction to Solar Radiation, Academic Press New York, 1983. Michalsky, J. 1988. The Astronomical Almanac's algorithm for approximate solar position (1950-2050). Solar Energy 40 (3), 227-235.

R: Page 5, line 28: "nighttime values >-4 W m⁻² can just be removed"; I think you mean values more negative than -4 W m⁻² (e.g. -5 W m⁻²) but the phrasing as written seem somewhat confusing?

= > absolutely right, sentence was changed accordingly.

Page 5, line 30, negative bias also occurs but is not 'evident' rather than 'visible'?

= > has been changed

R: Using the QC Toolbox and the data viewer, users can generate their own quality filters? This represents both an advantage and a disadvantage. The advantage arises because that user could focus only daytime data or only on data for a certain sun elevation angle or on only clear sky max SWD data (e.g. to match clear-sky satellite images). But, unless that initial user reports QC filter settings, subsequent users can

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not check those results? E.g. the possibility arises of researchers extracting slightly different versions from the raw data? BSRN loses its quality control in these cases?

= > The Toolbox does not allow for the selection of "clear sky" etc. It only allows to check the quality of the whole data. Any user that work with the data has to document which steps he takes in the processing of BSRN data.

R: Page 5, line 31, here again each BSRN user decides how to deal with IR loss to clear nighttime skies but, unless that user clearly documents the assumptions and treatments, BSRN has again lost control of the QC?

= > here again, the users are responsible for how they further process BSRN data, BSRN offers the complete dataset, but it is up to the interests and focus of the user how he processes that data further

R: Page 6, riming on sensor domes - indeed a problem! BSRN seems to step back, reference Lanconelli and Matsui? E.g. a user can not and should not expect that BSRN data will identify and flag this problem; rather each user will need to develop and implement their own identification and correction schemes?

= > all identified riming problems are removed within the dataset, the methodology and equipment for mitigating/reducing contamination of ice in the measurements is the responsibility of the station scientist. There is a chance that some riming events were not detected, but these are the limits of science. BSRN is working to formulate recommendations for the network

R: Page 6, registration for data access: a user gets a clear and valid justification here for why BSRN insists on registration, but this seems to violate at least in spirit the fully open access goals of ESSD?

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= > it is indeed open access, as nobody is refused access. We do hope that the reviewer understands the need for pointing out to users the need for correct citation of the data, which still is a big issue.

R: Figure 1: Interesting, useful, Asia remains a serious gap. In their discussion of the volunteer nature of the BSRN network, and of the necessarily - and much-welcomed - relatively high data quality standards, can the authors identify which factors (instrumentation, long-term operation, or station scientist effort) represent the limiting factor in most cases? E.g. what would it take to establish a BSRN station on the Tibetan Plateau? Has somebody estimated, in one of the cited papers perhaps, what we actually need (a global target coverage?) for surface BSRN-quality sites, both number and location? E.g. the oceanographers have done a network specification for ARGO (e.g. something like 3000 floats with 2 week reporting times covering 60N to 80S on x degree by y degree average spacing in order to properly resolve upper ocean mesoscale features) which they then use as both justification in their proposals and as an operational metric, how close have they come to their desired coverage. Perhaps in the founding documents for BSRN someone already did a similar estimate, but if so the authors should tell users how close (or not) BSRN has come to initial coverage targets?

= > At the BSRN meeting in Boulder (July 2018) we discussed exactly this point, and we are trying to identify gaps e.g. by asking the "satellite community" where they think more ground data is required. However, not only financial, but also on-site operational, and often political issues decide on the feasibility of operating, and maintaining a BSRN station. It also needs to be emphasized that BSRN is a completely volunteer organization, dependent on individual countries and organizations to develop the desire and funding to propose to establish a possible BSRN site. BSRN itself has no funding to establish, operate, or man any sites. Thus while there is desire to "fill in the gaps" there is at present no funding mechanism to do so. There is only the identification of the gaps and informing the community, in the hopes of motivating organizations to establish the

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desires long-term, high quality sites traceable to the world SI standards.

R: Figure 3: The Toolbox “flags values” but the station database does not permanently record those flags? E.g. each user needs to run these tools? Could the Pangaea data system support for BSRN a user log, so users could share notes and advice? No information about which station these data come from? Deliberately kept anonymous by the authors?

= > We probably were not clear enough here. The right part is an example of the quality control mechanism within BSRN. These values were found to be suspicious, so the file was sent back to the station scientist and the three days of wrong values (instrument failure) were removed before being archived within the WMRC. We changed the sentence to: “Right: three days of instrument failure shown by data points far below the 1:1 line. These values were reported back to the station scientist and were removed before the file was archived in the WMRC“

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