Review ESSD-2018-08 BSRN

Agree with the authors about importance of this data for satellite validation, climate modeling and long-term monitoring of radiation fluxes at the ground. Good international effort. Several comments and suggestions below but overall a good product for ESSD.

Many comments below relate to the dispersed nature of quality control, e..g to staff scientists associated with nearly 60 sites, and to the relatively hands-off practice of BSRN with respect to data quality flags, etc. Possibly unique to BSRN, related to the volunteer aspect, and perhaps fundamentally an asset of the network and the data, but different in substantial ways to other global data monitoring efforts (e.g. mention of ARGO, below). Perhaps users of station radiation data don't care, but should the authors - particularly given their experience within AWI and with Pangaea - comment on the overall strengths and weaknesses of this network model?

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 rename 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?

Page 2, line 29: "McArthur, 2005, see also):" 'see also' leads nowhere?

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?

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?

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?

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

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 resubmission, and/or do the data remain in the Pangaea system but identified by QC flags?

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?

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?

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

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 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?

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?

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?

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?

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?

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?