SURFRAD monthly average files

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Use the following references in any publications that use SURFRAD data:

Augustine, J. A., J. J. DeLuisi, and C. N. Long, 2000: SURFRAD—A national surface radiation budget network for atmospheric research. *Bull. Amer. Meteor. Soc.* **81**, 2341-2357.

Augustine, J. A., G. B. Hodges, C. R. Cornwall, J. J. Michalsky, and C. I. Medina, 2005: An update on SURFRAD—The GCOS surface radiation budget network for the continental United States, *J. Atmos. And Oceanic Tech.*, **22**, 1460–1472.

See the end of this document for "Fair use" data practices and licensing policies that pertain to SURFRAD data.

DATA DISTRIBUTION

Monthly average text data files for all years may be downloaded from GML at the following location:

https://gml.noaa.gov/aftp/data/radiation/surfrad/averages/

All stations' annual mean monthly data files are at this location.

FILENAMES:

Filenames of the monthly average SURFRAD files are of the form [STA]yy.spr, where STA is the station three-letter identifier (e.g., bon for Bondville, sxf for Sioux Falls), yy is the two-digit year (e.g., 00 for 2000, and 99 for 1999), and the extension (.spr) represents "spreadsheet," because these files spreadsheet-like and thus are easily loaded into programs such as Excel. For example, the file "sxf03.spr" contains monthly averages for the Sioux Falls station for 2003.

FILE STRUCTURE:

The file structure of the SURFRAD monthly average files is a header line containing column labels, followed by 12 lines of monthly average data. The first line is for January, and the last line is for December. The columns represent the following:

Column	Label	Quantity	Units
1	month	number of month	unitless
2	dpsp	downwelling short wave	W/m^2
3	upsp	upwelling short wave	W/m^2
4	nip	direct solar	W/m^2
5	par	photosynthetically active radiation	W/m^2
6	uvb	erythemal ultraviolet irradiance	$milliW/m^2$
7	diffuse	diffuse short wave	W/m^2
8	dpir	downwelling long wave	W/m^2
9	upir	upwelling long wave	W/m^2
10	netsolar	dpsp-upsp	W/m^2
11	netir	dpir-upir	W/m^2
12	totalnet	netsolar+netir	W/m^2
13	convfac	conversion factor (par/dpsp)	unitless
14	trans	transmission (dpsp/solar constant)	unitless
15	tc	air temperature (C)	deg. C
16	rh	relative humidity	%
17	speed	wind speed	m/s
18	albedo	upsp/dpsp	unitless
19	q	specific humidity	g/Kg
20	pres	station pressure	hPa
21	virtual_t		virtual temperature deg. C

Average calculation:

The averages in the SURFRAD monthly average files represent the average of all measurements during one month. This type of average is easily interpreted for meteorological measurements such as temperature and wind speed, however the irradiance averages need explanation. The irradiance averages in the SURFRAD average files are reported as an average instantaneous flux in Wm^{-2}, and include all data

from the month, including the nighttime values. Thus, for the solar parameters, the average includes all nighttime zero values. Another popular way of presenting average radiation data is to integrate over the period of interest to compute a dose, which would have units of J/m^2. Doses are not reported in the SURFRAD monthly average files. Also note that the average UVB irradiance is reported in $milliW/m^2$.

The average for downwelling shortwave (dpsp) is computed with the best data possible. That is, if the direct and diffuse solar measurements are available, they are combined to represent the most accurate downwelling total short wave measurement. If either the direct or diffuse short wave is unavailable for a particular time, the global short wave measurement is used.

The values used for the calculation of average transmission, albedo, and conversion are limited to measurements when the solar zenith angle is less than or equal to 75 degrees. In other words, no data collected when the sun is within 15 degrees of the horizon is used in those calculations.

If less than 70% of the possible data for a particular parameter are available for a month, then an average is not computed, and a missing value is reported. Missing values are represented by -9999.9000

Fair use policy, license, etc.:

Findable and Accessible:
SURFRAD data are archived in many places including international archives and within NOAA at the NOAA Centers for Environmental Information (NCEI). Our data are freely available to users both from NCEI and on our GML web-site (e.g. GML web-site, GRAD ftp data access). The NCEI archive assigns a DOI to the data-sets including the radiation data from our networks.

Fair Use:
These data are made freely available to the public and the scientific community in the belief that their wide dissemination will lead to greater understanding and new scientific insights. To ensure that GML receives fair credit for their work please include relevant citation text in publications (see below). We encourage users to contact

the data providers, who can provide detailed information about the measurements and scientific insight. In cases where the data are central to a publication, co-authorship for data providers may be appropriate.

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