Geophysical Research Abstracts,
Vol. 11, EGU2009-2693-1, 2009
EGU General Assembly 2009


# A satellite-derived climate data record of global radiation: how do we get there?

R. Stöckli (1), R. Posselt (1), B. Dürr (2), R. Müller (3), and J. Trentmann (3)

(1) Climate Services, Climate Analysis, MeteoSwiss, Krähbühlstrasse 58, 8044 Zürich, Switzerland , (2) Sunergy GmbH, Rosengasse 6, 9470 Buchs SG, Switzerland , (3) Climate and Environment, DWD, Frankfurter Strasse 135, 63067 Offenbach, Germany

Satellite-derived surface incoming shortwave (SIS) radiation has been used in climate science and by the solar energy community for more than two decades. However, no continuous and consistently validated climate data record (CDR) suitable for climate variability and change studies has been available so far. We present our strategy to create a 25 year long SIS CDR for METEOSAT 3-9 as part of EUMETSATś Satellite Application Facility for Climate Monitoring (CM-SAF). The objective of CM-SAF is to exploit satellite measurements with state of the art algorithms to derive essential climate variables (ECVś) defined by the GCOS framework.

It is shown how current Heliosat-based SIS algorithms can be improved over complex terrain such as the Alps. Special attention is given to the radiative influence of snow. Especially the near-infrared and infrared channels of the modern Meteosat 8 and 9 satellites (in operation since 2004) are valuable to derive a cloud index that accounts for radiation reflected from snow in addition to attenuated radiation due to clouds. Terrain effects like shadowing are corrected with the help of a digital elevation model (DEM) based on SRTM (Shuttle Radar Topography Mission) data. As an intermediate result the complete 2004-2008 SIS dataset is now available for Switzerland at 15 minute temporal and 2 km spatial resolution.

Long term ground observations of SIS from the Baseline Surface Radiation Network (BSRN) and the Alpine Surface Radiation Budget (ASRB) network are the foundation for evaluating such satellite retrieval algorithms. The satellite-derived SIS further complements ground observations with spatial variability. For instance, SIS from Meteosat 8 and 9 satellites is of higher accuracy than ground observations for locations that are more than a few km away from measurement sites.

There are however still many remaining biases and uncertainties in the presented dataset. For instance, SIS retrival depends on a concurrent exploitation of surface reflectivity and atmospheric transmittance from a single narrow-band satellite channel. Further, empirical clear sky formulations using the atmospheric turbidity cannot account for the diverse effects of molecular absorption and scattering on separate direct beam and diffuse radiation components. On the other hand, there is a lack of temporally and spatially varying boundary conditions for physically-based radiation transfer formulations. Finally, the quality of the self-clibration method applied within Heliosat will need to be monitored and optimized.

Our ultimate aim is to investigate these issues, correct for them, and to provide a full-disk (Europe+Africa) 1983-2008 SIS CDR with known uncertainty to the climate analysis and climate modeling community.