

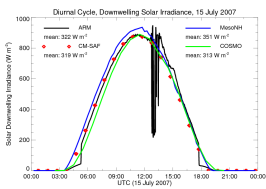
Motivation

The incoming solar radiation is the driving force of atmospheric diurnal cycles. An accurate representation of solar radiation in NWP models is mandatory. In addition, the radiation budget is an GCOS Essential Climate Variable (ECV).

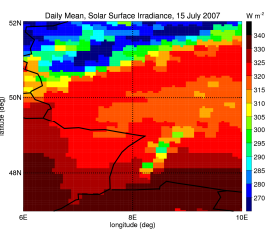
The Climate Monitoring – Satellite Application Facility (CM-SAF) has the mandate to generate long-term validated, homogeneous and consistent data sets of ECVs at high space-time resolution based on satellite data.

Here, we present an evaluation of the downwelling solar radiation derived from MSG observations using the measurements obtained by the ARM Mobile Facility at Supersite M (Murgvalley) within COPS.

Case Study: 15 July 2007



Under clear sky conditions (e.g., on 15 July 2007) the satellite-derived downwelling radiation compares well with the in-situ measurements. Also the radiation predicted by the COSMO-DE compares well with the observations, while the MesoNH overestimates the incoming solar radiation for this location. The distribution of the CM-SAF daily mean incoming surface radiation depicts spatial variability induced by cloud cover.



Conclusion

- The satellite-derived CM-SAF product of the incoming solar radiation (SIS) compares well with surface measurements obtained from the ARM Mobile Facility during COPS. The mean bias is -6 W m^{-2} , the mean absolute difference is 12 W m^{-2} .
- CM-SAF SIS radiation data are well suited for model evaluation (NWP and climate models)

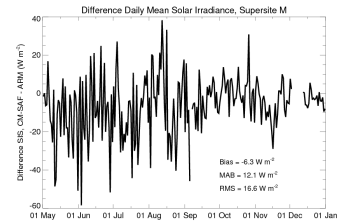
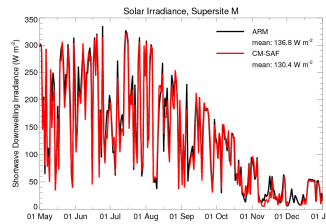
CM-SAF data

Product group	Resolution	Instrument	Availability
Cloud parameters	(15 km) ²	AVHRR, SEVIRI	since 09/2005
Humidity products	(90 km) ²	ATOVS	since 01/2004
Surface radiation	(15 km) ²	AVHRR, SEVIRI	since 09/2005
TOA radiation	(45 km) ²	GERB/CERES	since 02/2004

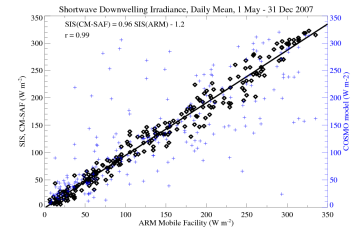
All data are available as daily and monthly means, instantaneous products at pixel resolution are available upon request.

Further information and product ordering:
www.cmsaf.eu

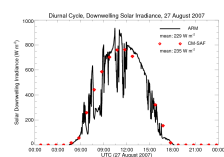
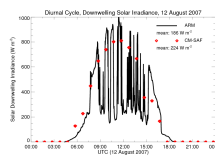
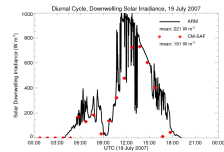
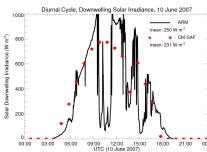
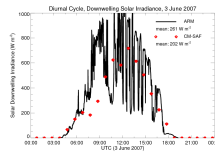
Evaluation with ARM measurements



The daily mean satellite-derived incoming solar surface radiation is highly correlated ($r = 0.99$) with the measurements obtained by the ARM mobile facility. The mean bias is -6.3 W m^{-2} , the mean absolute bias is 12.1 W m^{-2} , and the RMS equals 16.6 W m^{-2} . The daily mean SIS from the COSMO-DE forecast is also correlated with the surface measurements, but the deviation from the observation is substantially larger.



Examples of Diurnal Cycles



Changes in cloud cover induce variability in the surface radiation that can lead to substantial differences between the surface measurements and satellite-derived radiation.

Examples of Monthly Mean Solar Radiation Data

Examples of the monthly mean solar incoming radiation product from CM-SAF. The spatial and temporally inhomogeneity of the solar radiation is clearly visible. Local minima of the incoming solar radiation can be found over the mountainous regions (Black Forest, Vosgues), probably due to enhanced cloud cover.

