

Estimation of surface radiation from METEOSAT and the ECMWF forecast model



Bart van den Hurk*, Dirk Meetschen+, Felix Ament+ and Matthias Drusch+

*Royal Netherlands Meteorological Institute, PO Box 201, 3730 AE De Bilt, The Netherlands. hurkvd@knmi.nl
 + Meteorological Institute University of Bonn, Aug dem Hügel 20, Bonn, Germany

For the European Land Data Assimilation Project (ELDAS) surface radiation estimates are used to drive a soil moisture data assimilation system. The surface radiation estimates are generated by the so-called ELDORADO system, which merges METEOSAT data and limited area forecasts using the ECMWF physical parameterization. Validation is carried out using ground measurements from 2 BSRN stations and a routine shortwave radiation network in The Netherlands.

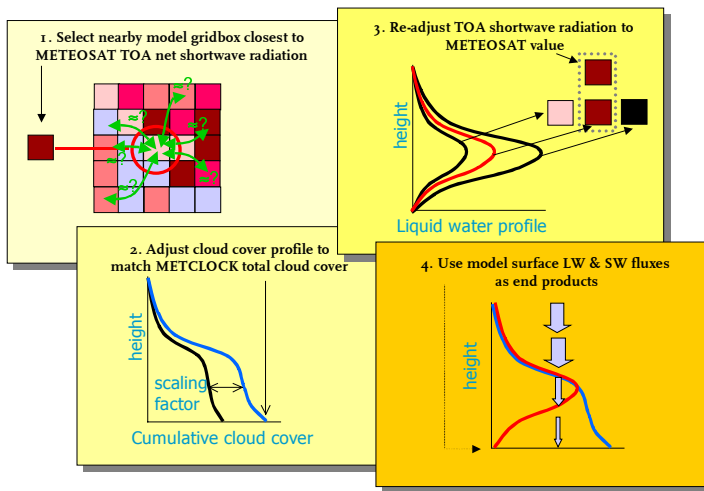


Figure 1: schematic layout of ELDORADO

1. ELDORADO

The ELDas Radiation system adjusts vertical profiles of partial cloud cover and liquid water content in a limited area (LAM) model (3hrly, ±16km resolution) using the ECMWF physical package. The first guess profiles are interpolated from ERA40. The profiles are adjusted using TOA net shortwave radiation from METEOSAT and METCLOCK cloud cover (based on METEOSAT shortwave and thermal data) (see figure 1).

2. Examples

Figure 2 shows examples of TOA net radiation and cloud cover obtained from a first guess NWP model (LAM) with ECMWF physics, and the ELDORADO results.

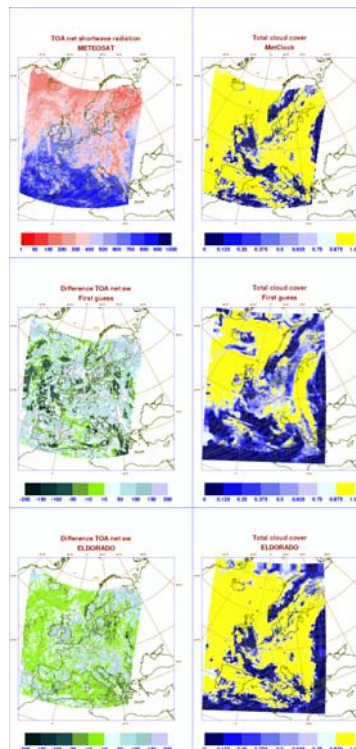


Figure 2: Examples of TOA net shortwave (left) and cloud cover (right) for 5 October 1999, from observations (top), first guess LAM forecasts (middle) and ELDORADO (bottom).

3. Surface verification

Surface radiation measurements were used from an operational network in The Netherlands (>30 stations, shortwave downward) and 2 BSRN stations (Lindenberg and Payerne, longwave and shortwave) (figures 3-5).

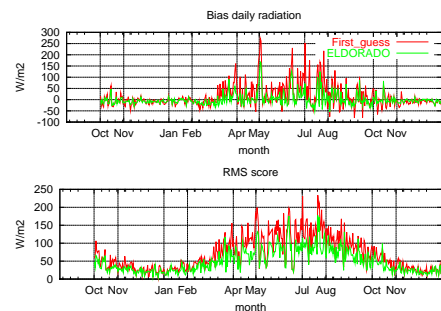


Figure 3: daily/areally averaged bias and rms-score of surface shortwave radiation in The Netherlands

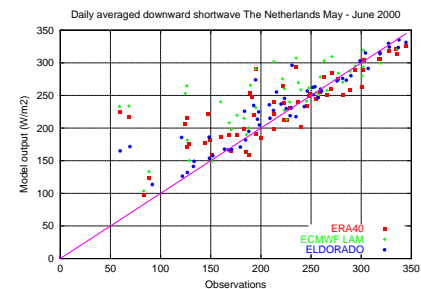


Figure 4: observed and simulated shortwave radiation in The Netherlands (May-June 2000) from ERA40, the LAM and ELDORADO.

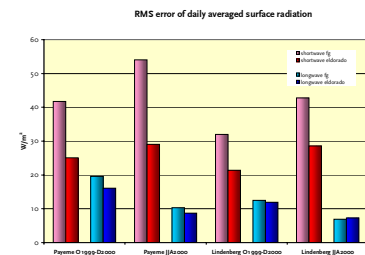


Figure 5: rms scores of shortwave and longwave daily averaged radiation for 2 BSRN stations for Oct 1999-Dec 2000 and JJA2000.

6. Conclusion

The ELDORADO scheme can provide a realistic radiative forcing for the ELDAS soil moisture assimilation project. Assimilation of METEOSAT products improves the surface radiation from a LAM.

Koninklijk Nederlands Meteorologisch Instituut