



Clear sky downwelling longwave radiation at the surface. Simulations and measurements at Girona, Spain.

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In this study we analyze the behaviour of Downwelling Longwave (atmospheric, infrared) Radiation (DLR) at the terrestrial surface, during clear sky conditions. This irradiance is estimated by using the unidimensional radiative transfer model SBDART (Ricchiazzi et al, 1998) and afterwards compared with measurements taken at Girona, NE of the Iberian Peninsula.

The radiometric measurements at Girona (41.26°N, 2.83°E, 110 m asl) were provided by a Kipp & Zonen (KZ) CG1 pyrgeometer that measures the infrared component (4-45 μm) of downwelling radiation. In addition, two KZ CM-11 pyranometers and a KZ CH1 pirheliometer provided the global shortwave (solar) radiation, and its diffuse and direct components. The pyrgeometer and one pyranometer were mounted on a sun tracker provided with shadowing devices that removed the direct solar contribution.

The clear sky conditions to be used in the comparison exercise were chosen from one year (June 2005 - June 2006) of radiometric measurements. We used an automated method based on shortwave irradiance measurements (Long, C. N. et al., 2000) for daylight periods, besides visual screening of LDR evolutions, particularly for night-time periods. The site is characterized by cold winters and hot summers. For this reason we selected two complete days corresponding to each season.

Because the strong dependence of LDR on atmospheric vertical profiles (mainly on temperature and water vapor content), and since there are no soundings available at the

same site, we used soundings launched at Barcelona (90 km southwards). As only two soundings were available per day, a methodology was developed to create hourly profiles by interpolating temperature and water vapor content between the ground level values (measured at the site) and the values at 1000 m agl from the Barcelona sounding.

Agreement between model and measurements depends on season. Also, agreement is different for daytime and nighttime periods. For the whole set of data the mean absolute difference between model estimations and measurements is 10 W/m^2 . In winter nights, however, the model tends to underestimate by more than 15 W/m^2 ; while during the daylight hours, both in summer and winter, mean differences are around 5 W/m^2 .

References:

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