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Surface Cloud Radiative Forcing in the South of Portugal

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Clouds constitute the most important factor regulating the Earth's radiation budget because they absorb and scatter solar radiation and absorb and emit terrestrial radiation. Therefore, the characterization and understanding of their radiative effects are extremely important tasks.
The work aims at retrieving the cloud optical thickness and estimate the cloud radiative forcing from ground-based irradiance observations. The irradiance data used were measured with a MultiFilter Rotating Shadow-band Radiometer (MFRSR), which is installed in the Atmospheric Physics Observatory of the University of Évora Geophysics Center - CGE (38°34'N, 7°54'W, 300 m above mean sea level) since August 2003. The MFRSR is a field instrument that provides automatic measurements of global, direct and diffuse components of the spectral (415, 500, 615, 673, 870 and 940 nm) and broadband (300 – 1100 nm) solar irradiances, with a temporal sampling of 1 minute.
The cloud optical thickness is retrieved from the ground-based spectral irradiance measurements, for 7 years of observations available at Évora, and its spatial representativeness is analyzed through comparisons with independent remote sensing retrievals from MODIS, onboard Terra and Aqua satellites. The surface cloud radiative forcing is estimated from the ground-based broadband solar irradiance measurements for the same period and its temporal variability is examined. An investigation of the surface cloud forcing efficiency (cloud radiative forcing per unit of cloud optical thickness) is also presented.
The cloud radiative forcing attained is also compared, for selected cases, with modelling results obtained from numerical simulations with the MesoNH mesoscale atmospheric model. The selected cases will take into account the simultaneous occurrence of aerosol events over the area of study (detected by complementary instrumentation installed at the CGE observatory) and the corresponding cloud radiative forcing is analyzed. This is done in order to explore possible aerosol indirect radiative effects.

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