



The diurnal cycle of coastal cloudiness over west Iberia using the CM-SAF cloud data record (CLAAS) and a WRF regional climate simulation

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In the western coast of Iberia, and typically in the summer, stratocumulus decks are ubiquitous and frequently extend over land during the night, causing overcast and foggy conditions in coastal regions. The cloud cover diurnal cycle is analyzed here using a satellite climate data record of fractional cloud cover based on 9 years of Meteosat Second Generation observations. The dataset, distributed by the EUMETSAT's Climate Monitoring Satellite Applications Facility, consists of hourly monthly means of cloud fraction, allowing the description of the cloud cover diurnal cycle in the area of interest. To explain the observed variability, a long-term regional climate model (WRF) simulation over Iberia was used. A comparison of the observations against model output for the common period between observations and simulation shows that although the model generally underestimates cloudiness, it is able to represent the diurnal variability in a realistic manner. It is shown that the observed cloud variability is linked to the thermal circulations generated by the land-sea contrast and orography. The extent to which the cloud deck penetrates inland is closely related to the orography: although smaller hills tend to enhance cloudiness, larger mountains block the progression of the marine boundary layer further inland as it behaves as a density current. Larger mountains also produce katabatic flow and a rather strong subsidence aloft during the night. The warming due to this subsidence helps the blocking of the cloud deck as it is partially used to evaporate clouds, as shown by a potential temperature budget analysis.