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Quantifying development of shallow/warm marine cumulus clouds from geostationary observations

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In our study, we track shallow/warm marine cumulus clouds in the trade wind zone centred around the Canary Islands in August 2015. Tracking was performed in the CLAAS-2 data record (CM SAF CLOUD property dAtAset using SEVIRI, [1]) which is based on time-resolved geostationary measurements with the Spinning Enhanced Visible and InfraRed Imager (SEVIRI) aboard Meteosat Second Generation. The retrieval of cloud trajectories allows for the calculation of the cloud lifetime distribution, the horizontal cloud size distribution and to characterize temporal changes in cloud properties. Cloud physical properties are available in the daytime. Filtering for daytime and low-level clouds we found about 65 thousand trajectories. For the considered period and domain, the lifetime distribution follows a power law. Most frequent are clouds which live on a time scale of tens of minutes. In the horizontal cloud size distribution, we detected two intervals following an exponential law but with different scaling. The first interval includes cloud sizes smaller than 30 km² and the second interval includes cloud sizes equal to or larger than 30 km² but smaller than 1000 km². Clouds having a mean horizontal cloud size of approximately 30 km² are most frequent. Furthermore, we present time series' of cloud physical properties, as cloud droplet effective radius at cloud top r_e , cloud optical thickness, cloud water path and cloud droplet number concentration. For comparison of the trajectories, we choose r_e as a measure. If r_e reaches a certain value the trajectories have been centred at this specific relative time.

References

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