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A study of the life cycle of shallow convective cloud ensembles using high resolution Meteosat SEVIRI data

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The realistic parameterization of convective clouds and a correct representation of their life cycle in numerical models is an unsolved challenge. Shallow convective clouds contain low amounts of liquid water and play an important role in the earth's energy balance. To investigate their physical and geometrical properties as well as to evaluate models, observations covering a large domain at a high resolution in both time and space are needed. Geostationary satellite imagers offer an invaluable source of information to observe the temporal evolution of convective cloud ensembles. However, the relatively coarse spatial resolution of geostationary satellite images is often insufficient to fully resolve relevant scales.

Meteosat SEVIRI does have a high resolution visible channel (HRV) with a nadir resolution of 1x1 km2. This channel will be used in our study in order to better resolve small-scale shallow cumulus cloud structures. We study the temporal evolution of physical and geometrical properties of moving convective cloud ensembles. Two tracking methods are contrasted, based on atmospheric motion vectors and model winds to characterize the life cycle in a Lagrangian reference frame. The differences between the Euler and the Lagrange perspective are discussed. The tracked cloud life cycle is quantified by means of geometrical and physical cloud properties. Therefore an object based cloud identification method is introduced to describe the change of the resolved cloud characteristics. This is done by a threshold-based cloud mask using the HRV channel. Finally, it will be discussed which additional information can be gained by the HRV channel for these shallow cumulus attributes.