Geophysical Research Abstracts
Vol. 20, EGU2018-18147, 2018
EGU General Assembly 2018
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Sea Surface Temperature Gradients and Convective Aggregation

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Convective Aggregation, meaning the clustering of convective clouds, is a key element in tropical dynamics. It manifests in phenomenas like the Intertropical Convergence Zone and the Madden-Julian-Oscillation and is also a prerequisite to the formation of tropical cyclones. Numerical modelling studies have shown that convective aggregation occurs also in homogeneous boundary conditions, mainly given through a domain-wide constant sea surface temperature (SST), and is then referred to as convective self-aggregation. Still, in nature, equatorial waves, low-level convergence and SST-gradients, are the main reasons for convective aggregation.

In this numerical modelling study we investigate the differences of convective self-aggregation to convective aggregation that is forced through a SST-gradient. We use the ICON spherical limited area model with deep convection permitting resolution and four different SST-profiles. Further we test the sensitivity of the two forms of convective aggregation to cloud radiative effects.

We compare the degree and temporal evolution of aggregation, and the structure of circulation and clouds among the different experiments.