Project: **1001** Project title: **Marine Stratocumulus Cloud Cover and Climate (MSCCC)** Project lead: **Tom Goren** Report period: **1.7.2018 – 30.6.2019**

The reporting period has seen the successful completion of the MSCCC project. It led to one publication on the coupling of boundary-layer clouds to the surface as visible also in satellite observations (Goren et al., 2018). The key idea is to implement a simple diagnostic on how the coupling can be diagnosed (Fig. 1). With this method, now, clouds in models and in satellite retrievals can be analysed.

A key result is shown in Figure 2: Coupled clouds that precipitate tend to have significantly smaller cloud fraction, an indication of cloud breakup (Goren et al., 2018).

Similar analyses have been performed in various model configurations, which are still being analysed.

References

Goren, T., D. Rosenfeld, O. Sourdeval, and **J. Quaas**, Satellite observations of precipitating marine stratocumulus show greater cloud fraction for decoupled clouds in comparison to coupled clouds, Geophys. Res. Lett., 45, 5126-5134, doi:10.1029/2018GL078122, 2018.



Figure 1: Schematic view of how the surface-coupling and -decoupling of clouds in the boundary layer can be assessed using moist (within the cloud; Γ_w) and dry (below the cloud; Γ_d) adiabatic temperature gradients in comparison to sea surface temperature (SST). From Goren et al. (2018).



Figure 2: Cloud fraction and radar reflectivity of coupled (blue) and decoupled (red) clouds. The number of observational cases for each cloud fraction/radar reflectivity pair is given. From Goren et al. (2018).