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The influence of aerosol and dynamics on orographic mixed-phase clouds

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Mixed-phase clouds describe clouds consisting of super-cooled liquid water droplets and ice crystals. The coexistence of the three phases vapor, liquid and ice is thermodynamically unstable caused by a lower saturation vapor pressure with respect to ice compared to water. Consequently mixed-phase clouds are supposed not to be long living. Nevertheless mixed-phase clouds are frequently observed in orographicaly complex regions for several hours, because orographic forcing can stabilize mixed-phase clouds.
Due to the three phases a high number of processes act in mixed-phase clouds influenced by aerosol and dynamics. With a comprehensive set of 1 km-scale simulations using the regional climate model COSMO over the Swiss Alps we distinguish the impact of dynamics from microphysics. Variations in microphysics are applied by changing cloud condensation nuclei and ice nucleating particles concentrations in a physical feasible range based on observation taken at the Jungfraujoch. Dynamical perturbations are represented by modifying the horizontal wind field resulting in changed vertical winds due to continuous flow assumption. First simulations show, that the dynamics affect the number of ice crystals and cloud droplets as well as the liquid and ice water path the most. The variation of ice nucleating particles in the physical feasible range changes the composition of the cloud stronger than variations of cloud condensation nuclei. It will be analysed which processes are responsible for the observed changes in the model. Furthermore the impact of the cloud changes on their radiative properties and precipitation distribution will be analysed.