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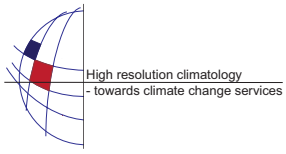

Influence of a future climate on the radiative properties of orographic cirrus clouds

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Mountains strongly influence the formation of clouds. If vertically propagating orographic gravity waves are excited, orographic cirrus clouds can form in the upper troposphere. The formation of gravity waves depends, among others on the horizontal wind speed, the mountain height and the Brunt-Väisälä frequency. In a future climate a change of the wind speed and the atmospheric stability due to warmer temperatures and changes in specific humidity can be expected. These changes can in turn change the properties of orographic gravity waves like amplitude and vertical velocities. As the formation of ice clouds strongly depends on the vertical velocities the optical and radiative properties of these clouds are affected as well. In this study a cloud resolving model is used in order to investigate the changes in the radiative properties of orographic cirrus clouds from the current to the future climate. Therefore, the simulations are initialized with wind, humidity and temperature profiles taken from an IPCC ECHAM5 scenario. As in the model a detailed ice microphysics is implemented, the whole chain of processes from the formation of vertically propagating gravity waves until the formation of clouds and their radiative impact has been investigated. The dynamical and thermodynamical changes strongly influence the reflected shortwave as well as outgoing longwave radiation of the orographic cirrus clouds in a future climate and therefore have the potential to modify the radiative budget over mountainous terrain.