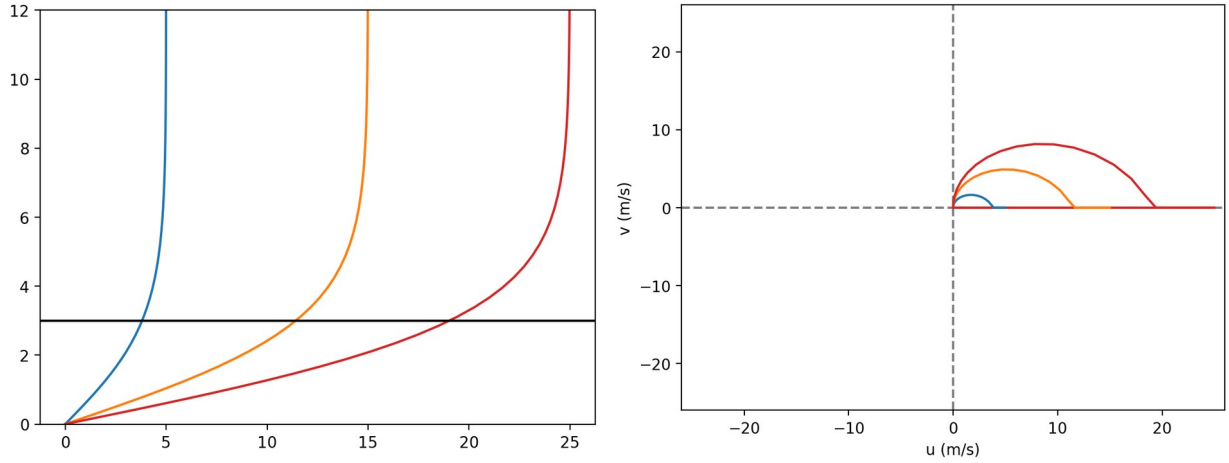
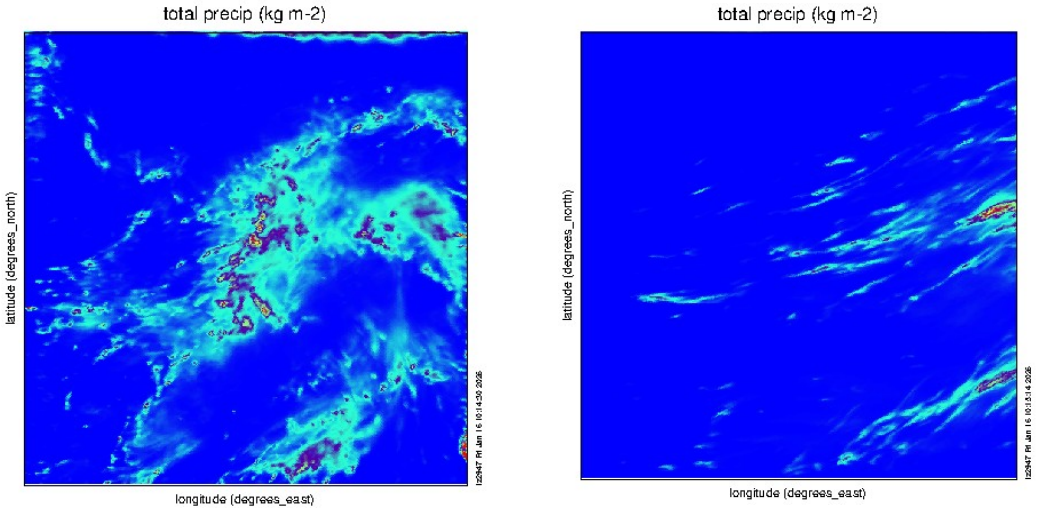
Impact of wind shear on atmospheric deep convection and aerosol-cloud interactions

Aerosol-cloud interactions are determined by a variety of microphysical and thermodynamic processes. The activation of cloud droplets, i.e., the formation of cloud droplets on aerosol particles present in the atmosphere, is one of the important aerosol-cloud interaction processes occurring in the atmosphere. Aerosol particles that can be activated to form cloud droplets are referred to as cloud condensation nuclei (CCN). Previous idealized simulations suggest that wind shear is a decisive parameter in determining whether precipitation at the ground increases or decreases with rising CCN concentration. In general, aerosols suppress convection intensity in strong wind shear, but enhance it in weak wind shear until an optimum aerosol load is reached. Realistic simulations for three cases showed a non-systematic response with respect to the wind shear impact, but the strength of wind shear and also the presence of directional wind shear varied between cases. In this study, semi-idealized numerical simulations shall be performed in which the atmosphere is initialized homogeneously with one single profile, but with a real model grid covering the complex topography of Germany.



A set of 48 model runs will be performed where speed and directional shear will be varied using four different CCN concentrations each. The aim of this work is to make new and, as far as possible, generally valid statements on the influence of wind shear on convection development and aerosol-cloud interactions for semi-realistic simulations.



Prerequisites:

- Interest in atmospheric convection and cloud processes
- Interest in numerical modeling
- Working with Linux systems
- Experience with Python
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