EGU21-13571, updated on 06 Dec 2022
https://doi.org/10.5194/egusphere-egu21-13571
EGU General Assembly 2021

The role of updrafts in the scaling of extreme precipitation in mid-latitudes

Falco Bentvelsen[1], Geert Lenderink[1,2], and Pier Siebesma[1,2]
[1]Geoscience & Remote Sensing, Delft University of Technology, Delft, Netherlands (f.p.bentvelsen@student.tudelft.nl)
[2]Royal Netherlands Meteorological Institute (KNMI), De Bilt, Netherlands

We investigate the hypothesis that invigoration of convective updrafts under warming conditions contributes to the stronger than Clausius-Clapeyron (CC) scaling. Focus is on a mid-latitude case of extreme precipitation, based on idealised forcing conditions derived for the Netherlands, with strong surface forcing as well as strong forcing from large-scale rising motion associated with the passage of a synoptic scale low pressure or frontal system. Various Large Eddy Simulations (LES) of this composite case have been performed on a 192x192 km domain. By systematically perturbing the atmospheric temperature profile, a large response of cloud dynamics to warming with larger and more vigorous cloud structures in the warmer runs has been found.*

Here, we study these cloud dynamics further by investigating the vertical wind velocity in the cloud (cores). Updrafts play a key role in rain formation by transporting moisture upward in the clouds. We will demonstrate how the distributions of these vertical velocities near the surface and at different levels in the clouds respond to warming in this mid-latitude setting and how they relate to cloud properties as cell size and buoyancy.

**Lochbihler, K., Lenderink, G., and Siebesma, A. P. (2019). Response of extreme precipitating cellstructures to atmospheric warming. Journal of Geophysical Research: Atmospheres*