



Sub-kilometre resolution climate model data

Added benefits in the representation of extreme precipitation?

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Sub-kilometre resolution climate model data: Added benefits in the representation of extreme precipitation?

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Climate change impact on extreme precipitation is of great importance to society. Small-scale, short-term events can have massive social and socioeconomic consequences. The present study analyses a new sub-kilometre (750 m) HARMONIE-Climate¹ model simulation driven by ERA5 reanalysis data. The new sub-kilometre climate model data (750 m) is compared to NorCP data² from climate models in 3, 5, and 12 km grid spacing, rain gauge station data and reanalysis data in 31 and 79 km resolution. The study examines a case area covering Denmark for five cloudburst seasons (April – October). The study aims to analyse how convective events are represented in the climate model data across grid resolution, and if an added benefit can be identified moving to sub-kilometre resolution.

Extreme convective events are analysed across datasets with respect to diurnal cycle, intensity levels and spatial structure. This is done at both hourly and sub-hourly scales. The 750 m climate model performs better for most metrics. However, climate models with 3 and 5 km grid spacing also perform well. The added computational and storage cost of the sub-kilometre scale experiments, thus only results in limited added benefit for this specific model set-up. Analysing hourly and sub-hourly temporal scales shows that the model performance varies between different temporal scales. The convection-permitting models, in general, represent hourly extremes much better than sub-hourly extremes. The sub-hourly scale is, therefore, essential to analyse to assess the model performance of convective events.

¹ Belušić D, De Vries H, Dobler A, Landgren O, Lind P, Lindstedt D, Pedersen RA, Carlos Sánchez-Perrino J, Toivonen E, Van Ulft B, et al (2020) HCLIM38: A flexible regional climate model applicable for different climate zones from coarse to convection-permitting scales. *Geosci Model Dev* 13:1311–1333. <https://doi.org/10.5194/gmd-13-1311-2020>

² Lind P, Lindstedt D, Kjellström E, Jones C (2016) Spatial and Temporal Characteristics of Summer Precipitation over Central Europe in a Suite of High-Resolution Climate Models. *J Clim* 29:3501–3518. <https://doi.org/10.1175/JCLI-D-15-0463.1>

