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Lightning and convection parameterisations – uncertainties in global modelling

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Abstract. The simulation of convection, lightning and consequent NO_x emissions with global atmospheric chemistry models is associated with large uncertainties since these processes are heavily parameterised. Each parameterisation by itself has deficiencies and the combination of these substantially increases the uncertainties compared to the individual parameterisations. In this study several combinations of state-of-the-art convection and lightning parameterisations are used in simulations with the global atmospheric chemistry general circulation model ECHAM5/MESSy, and are evaluated against lightning observations. A wide range in the spatial and temporal variability of the simulated flash densities is found, attributed to both types of parameterisations. Some combinations perform well, whereas others are hardly applicable. In addition to resolution dependent rescaling parameters, each combination of lightning and convection schemes requires individual scaling to reproduce the observed flash frequencies. The resulting NO_x profiles are inter-compared, however definite conclusions about the most realistic profiles can currently not be drawn.

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