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Predicting the number and area of thunderstorms over Africa

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One of the difficulties in predicting changes in future thunderstorm activity in a warmer climate is first knowing the climate parameters (in models), in the present climate, that are best related to thunderstorm activity. In addition, climate models supply only large scale parameters for use in their simulations, with no cloud microphysical details. Hence, any parameterization needs to use the available output of the climate model. Considering these limitations, we have used the NCEP/NCAR reanalysis product to investigate the large-scale parameters that are best related to thunderstorm activity over Africa. For the thunderstorm observations we use the WWLLN lightning detections, clustered into thunderstorm cells according to Mezuman et al. (2014). Comparisons between these thunderstorm clusters and the NCEP climate parameters revealed two significant large-scale parameters that predict thunderstorm activity over Africa: surface specific humidity (g/kg) and the LI lifted index (K). Using these two parameters we built an empirical model to predict both number and areal coverage of thunderstorms over Africa in any given month. This empirical model predicts the thunderstorm distribution of Africa with considerable skill. The next step will be to use this parameterization in climate models to study the changes in thunderstorm characteristics in a warmer climate.

Mezuman, K., C. Price and E. Galanti, 2014: On the spatial and temporal distribution of thunderstorm cells, Environ. Res. Lett., 9, doi:10.1088/1748-9326/9/12/124023.