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The representation of (severe) thunderstorm environments in Europe using different reanalysis datasets.

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CFSR (0.5° resolution) and ERA-Interim (0.75° resolution) reanalyses (1979 - 2014), are used to develop a climatology of thunderstorm parameters over Europe, such as CAPE and 0-6 km bulk shear. For example for CAPE there are pronounced differences. ERA-Interim shows generally higher values of CAPE over the sea than CFSR, while CFSR produces lower CAPE values over the higher elevations than ERA-Interim.

A product of CAPE and 0-6 km bulk shear is used to represent the potential of environment to support severe weather. A threshold of this product, as suggested by Brooks et al. (2003), is used to calculate the number of potentially severe environments for each grid point. Again, there are notable differences between the reanalyses and between the two versions of CAPE. For example, CFSR shows more potentially severe environments in the regions surrounding the Alps than ERA-Interim, while ERA-Interim shows more potentially severe environments over southern France and eastern Spain. Using MUCAPE in this product yields many more potentially severe environments over the Mediterranean than using MLCAPE, because it is much higher over the sea surface.

Even in situations with high CAPE and shear, a lack of convective initiation may prevent severe weather occurrence. Therefore, we calculated the fraction of potentially severe environments featuring non-zero convective precipitation in the subsequent 3 hours. We call this fraction severe weather environment efficiency. The lowest efficiency over Europe is observed over the southern Mediterranean Sea, which is comparable to the Midwest of USA. The efficiency is higher over continental Europe, especially close to the mountains, where most of the potentially severe environments are accompanied by precipitation.