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Characterisation of convective organizations in Germany

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This study identifies observational signatures of convective organizations in Germany during the summer of 2014 and 2015 and evaluates their representation in high resolution model simulations. The convective organizations were identified in observations of radar and satellite and characterized by means of organization indices. Two indices were used to characterize the degree at which the clouds are organized. The first one counts the number of clouds or precipitation cores within a certain distance and combines this number within the typical distance of all objects in the fixed neighborhood. The second index is based on nearest neighbor cumulative distribution function and is able to distinguish among regular, random and organized spatial arrangements. Furthermore, the shape of the organizations was also characterized by an area-perimeter-based index. About 98 % of the convective clouds or precipitation cores presented some degree of organization in both years. The random and regular spatial arrangements were identified at only 2 % of the time. The elliptical form is the dominant shape of the clouds. The representation of the observed convective organizations was evaluated in the ICON-LEM simulations with 625m, 321m and 156m spatial resolution. To this end, synthetic radar and satellite data were derived from the model simulations using forward operators. The organization indices were then applied to the synthetic datasets. The degree of organization and the dominant shape of the convective clouds simulated by ICON is in good agreement with the observations. These results are very promising and further analysis might contribute to a better understanding of the role of convective organizations and to the development of new parameterizations for incorporating their effects in model simulations.