Abstract

Lightning activity is considered a severe meteorological hazard that needs to be studied, monitored as well as predicted. This thesis focuses on the prediction of lightning activity by the Lightning Potential Index (LPI) in the COSMO numerical weather prediction (NWP) model that comprises 1- and 2-moment (1M and 2M, respectively) cloud microphysical schemes. The objective of this thesis is to investigate the correlation between the predicted lightning activity and the detected one (by the European network for lightning detection EUCLID). Events of the years 2018 and 2019 that recorded significant lightning activity over Czechia are considered for the analyses. For the first time over Czech region, the prognostic values of LPI calculated for each event are verified. In particular, the spatio-temporal distribution of the predicted vs. detected lightning activity is evaluated. Both spatial characterizations and diurnal course of detected lightning activity correspond well to the theoretical knowledge. Thus, spatial (horizontal) and temporal approaches are applied to verify the lightning activity prediction. The results of this thesis successfully verify the LPI prognostic values both in space by comparing the LPI values with the proximity of detected lightning flashes, and in time by contrasting the time course of predicted and detected lightning activity. Moreover, the results indicate that the 2M cloud microphysics is more applicable than the 1M cloud microphysics. This thesis thus confirms that the LPI is a suitable predictor of implicit lightning forecasting.

Keywords

lightning activity, prediction, Lightning Potential Index, numerical weather prediction model, COSMO