



Analyses of spatial and temporal distribution of thunderstorms in Slovakia using lightning-detection data

Jozef Pecho, Gabriela Ivaňáková, Peter Kajaba, Ladislav Méri, Katarína Mikulová, Pavel Šťastný, and Maroš Turňa

Slovak Hydrometeorological Institute, Climatological Service Department, Bratislava, Slovakia (jopecho@gmail.com)

An analysis of the spatial and temporal occurrence of lightning strokes in Slovakia and neighbouring areas over 2011-2017 is presented. In the paper we analyze monthly, seasonal and annual total number of lightning strokes as well as its derived characteristics (e.g. thunderstorm day) using LINET gridded dataset. The analysis on a high-resolution grid with spatial resolution of less than 100 m allows assessing the local risk of lightning and studying local effects, e.g. the influence of orography on the occurrence of thunderstorms. LINET is lightning detection network based on low-frequency sensors originally developed for lightning detection in Germany but since then has been continuously extended. Currently, the LINET consist of more than 100 sensors and covers most of Europe, including Slovakia (since 2011). The main user of lightning data is the operational weather forecasting, which uses lightning data to pinpoint the thunderstorm areas, estimate their movement and threat level. Besides forecasters, also aviation, defense, and authorities are users of lightning data, and also for example insurance companies need information of located flashes. The analysis reveals spatial and temporal patterns: the highest number of lightning strokes occurs in the mountainous regions in the central and eastern Slovakia, some another local maxima exists in lowland regions in the southern Slovakia. The lowest number of lightning strokes occurs in areas of the Danube lowland in the western part of Slovakia. The number of ground flashes per year, and the derived ground flash density, varies largely from year-to-year. Typically, a major fraction of the annual strokes are induced by few intense thunderstorm days, which tend to occur for late May until August, with the most frequent occurrence in July. Thunderstorms occur also outside the summer months, even in the mid-winter, but these storms produce typically only very small amount of lightning strokes, so their effect to the thunderstorm day incidence statistics is negligible. The results are compared with observed occurrence of thunderstorms in synoptic stations and discussed is the temporal and spatial variability of annual number of days with thunderstorms in last decades.