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Investigation of the lake-effect on the local thunderstorm activity around the Lake Fertő, Hungary

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Natural and artificial lakes are able to change the climate of their surroundings. These modifications are collectively known as lake effects and range from microscale to synoptic scale. The presence of the lake can cause negative effect on the local thunderstorm activity in summertime decreasing the convection and precipitation over lakes due to the greater stability created by the lower atmosphere and the colder surfaces of the lake [1, 2]. However, it also can have a positive impact on thundercloud generation when the temperature difference between air in 850 mb height and near earth's surface is more than 13 C causing instability in the atmosphere [3].

The main objective of the present study is to investigate the impact of Lake Fertő (Neusiedler See, located in Hungary and Austria) on local thunderstorm activity by applying statistical analysis on meteorological and lightning data and event studies. Data of the Blitzortung lightning location network, local meteorological data (temperature, precipitation) measured at stations around the lake, water temperature measured at Fertőrákos and temperature measured at 850 mb in Vienna station were used for the analysis. The local thunderstorm activity was investigated during summertime (May - September) in 2015, 2016 and 2017. Lightning distribution maps above and around the lake for the investigated period have been determined based on the Blitzortung data.

According to the lightning distribution maps we can not observe any positive impact of the lake on the lightning activity when water temperature was higher than the air temperature around the lake. Furthermore, we can not conclude that there is a clear negative effect of the lake on the lightning activity based on the lightning distribution maps when the air temperature is higher than the water temperature. Nevertheless, there are some months when it seems a clear border between the lightning activity measured above the lake and at the coast (e. g. in June and July 2015, June 2016). The negative effect also seems to appear in some cases of the investigated local individual thunderstorms, namely the thunderstorm activity is larger above the surrounding surface than directly above the lake. This seems to strengthen the hypothesis that "Deep convection is not often formed in summer above the lakes, and existing storms dissipate

significantly when moving above the lakes due to the greater stability created by the lower atmosphere and the colder surfaces of the lake" [1].

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