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Using Meso-NH atmospheric model to study the lake breeze at a large reservoir

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Big natural lakes and artificial reservoirs could have an impact on weather regime and meteorological parameters of surrounding area. One of the aspects of such impact is the daily breeze that appears in the morning and dissipates in the late afternoon due to the changes of the air temperature and heat fluxes over the lake surface. Usually it is difficult to track all the aspects of this process and evaluate its magnitude. In this work we study the impact of the Alqueva reservoir on local weather parameters, formation of the lake breeze, and related phenomena. Alqueva reservoir located in the South-East of Portugal is one of the largest artificial lakes in Western Europe. This work is focused on a case study of the 3 days period of 22-24 July 2014 which were part of the ALEX (ALqueva hydro-meteorological Experiment) campaign. To assess the formation and development of the breeze induced by the reservoir, two simulations using the mesoscale atmospheric model Meso-NH coupled to FLake freshwater lake scheme has been performed: one with and another without Alqueva reservoir. Comparing the results of the two simulations datasets we can evaluate the raw lake impact on the meteorological conditions over the lake and surrounding area. Magnitude of the impact on the air temperature, relative humidity, and other atmospheric parameters is shown in the work. Daytime lake breeze (5-7 m/s) can be felt on the distances up to several km away from the shores and up to 300 m over the lake surface. The breeze system induces a downward air stream over the reservoir, which advects dry air from the upper levels of the boundary layer.