EMS Annual Meeting Abstracts
Vol. 16, EMS2019-382, 2019

Micro-Scale Properties of Different Bora Types

Vinko Šoljan (1), Andreina Balušić Vozila (1), Kristina Šarović (2), Irena Nimac (3), Stjepana Brzaj (3), Jurica Suhin (1), Martin Belavić (3), Željko Večenaj (4), and Branko Grisogono (4)

(1) Croatia Control Ltd., 10410 Velika Gorica, Croatia, (2) EKONERG—Energy and Environmental Protection Institute, 10000 Zagreb, Croatia, (3) Meteorological and Hydrological Service, 10000 Zagreb, Croatia, (4) Department of Geophysics, Faculty of Science, University of Zagreb, 10000 Zagreb, Croatia

Bora is a gusty downslope wind blowing from the northeast in the lee of the Dinaric Alps and other dynamically similar parts of the world. It is dynamically generated by the interaction of airflow and orography. With respect to the synoptic setup, three types of bora have been identified in the past: cyclonic, anticyclonic, and frontal. Both cyclonic and anticyclonic bora can be either deep or shallow, depending on the depth of synoptic flow over the mountains. It is known that bora depth has major influence on its mesoscale characteristics (i.e. wave breaking, pulsations, and gusts). In this research we used 20 Hz wind measurements on three levels (2, 5, and 10 m) to investigate the differences in micro-scale properties of different bora types, i.e. deep and shallow bora with further subdivision to cyclonic and anticyclonic bora cases. Using Fourier spectral analysis, we investigated a suitable turbulence averaging scale and bora gust pulsations. The obtained data set was further used to test the surface layer stratification, the behavior of the terms in the prognostic turbulence kinetic energy equation, and the wind profiles. One of our main goals was to identify possible micro-scale differences between shallow and deep bora types because of the possible different mountain wave dynamics in those flows. We found that a turbulence averaging scale of 30 min is suitable for this location (Maslenica Bridge, Croatia) and is in agreement with previous bora studies. The wind speed power spectral densities of all selected bora episodes showed pulsations with periods of 2–8 min. This suggests that mountain wave breaking was present in all cases, regardless of flow depth and synoptic type. The stability parameter analysis confirmed the near-neutral thermal stratification of bora; a consequence of intensive mechanical mixing. No significant differences related to bora type were observed in other micro-scale parameters.