EMS Annual Meeting Abstracts
Vol. 16, EMS2019-730, 2019

Nocturnal boundary-layer characteristic at a coastal site using long-term sodar data

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The coastal Atmospheric Boundary Layer (ABL) structure is the subject of research in many areas due to the fact that many cities and industrial activities are located on the shores of the seas, oceans or large lakes. Mean characteristics of ABL at a Bulgarian Black Sea coastal site are obtained based on long-term (August 2008 - October 2016) acoustic remote sensing measurements. The differences between two main types of nocturnal air flows (marine and land air masses) are studied. Exploring data of wind and turbulence profiles with high spatial and temporal resolution (output at every 10 minutes presenting running 20-minute averages with vertical resolution of 10 m from 30 to 700 m above ground) from Scintec MFAS sodar revealed typical for the investigated area parameters such as the heights of Internal Boundary Layer (IBL), the height of the marine boundary layer and ABL structure details for air flow from land. Averaging the measured profiles of more than 12 output parameters of the sodar, as well as calculated Buoyancy Production (BP) mean profiles are a basis for climatological studies of the vertical structure of wind and turbulence in that coastal area near the town of Ahtopol in Southeast Bulgaria. These analyses are deepened by exploring seasonal variability of coastal ABL characteristics. The reported results can be used for verification of various theoretical, mesoscale and air quality models. The study contributes to the understanding of wind regime and turbulent structure in a region with modest observation networks, especially for nocturnal vertical profiles of meteorological parameters.