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Averaged coastal boundary-layer profiles derived from acoustic sounding and sonic data

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Investigation of the vertical structure and evolution of the coastal PBL is a key element in accumulation of knowledge on the meteorological characteristics in coastal areas. The recent developments of ground-based integrated observing systems is an indispensable basis for studying the regimes of local circulation, extreme events, air quality data, renewable energy sources, etc.
The technical equipment for the vertical structure climatological studies at the Bulgarian Black Sea coast station Ahtopol consists of SCINTEC MFAS sodar for wind and turbulence profiles and ultrasonic anemometer at height 4.5 m above ground. The investigated time period is nearly five years. The presented analysis aims to reveal the profiles at different types of flow (marine and land) and at different atmospheric stability conditions. As first step, average for the 5 years monthly profiles during the day and at the night of 12 output parameters of acoustic sounding system and their dispersions are calculated depending on the direction of the air masses in height (from land or sea). The evolution of the height and the characteristics of the convective boundary layer (CBL) is reviewed based on nocturnal marine air profiles during the months from May to November and on air masses from the land during the day for the months March, April, May, October and November. The mean monthly characteristics of the stable boundary layer (SBL) are obtained from March to November through the Sodar's data over the night and air masses coming from the land. For that SBL's cases the time series of extracted Sodar's data for May are obtained and compared with MK15's data for availability. Available data from MK15 on this comparison is used to calculate vertical profiles of wind speed, its dispersion and dispersion of vertical wind speed following the parameterizations suggested by COST710. The calculated and the measured profiles have been compared through monthly averaged values. In addition, the analysis allows assessing the fraction of time when theoretical profiles can be used in coastal areas.