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Boundary layer structure during sea breeze conditions at Ahtopol, Bulgaria

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Continuous sodar (Scintec MFAS) and ultrasonic anemometer (Typhoon – Obninsk make) measurements were initiated in summer 2008 at the meteorological observatory of Ahtopol at the Black Sea coast (south-east Bulgaria) under a Bulgarian-Russian collaborative programme. These observations of high resolution form the basis for studies of the atmospheric boundary layer turbulence and vertical structure at a coastal site. This sodar is unique in Bulgaria and provides the first continuous high resolution data on the wind profile up to 400 – 500 m above the ground. In addition, the continuous turbulence parameters monitoring allows atmospheric boundary studies needed for different applications.

The meteorological observatory at Ahtopol is under development as a background atmospheric composition station in coastal area and the wind data are essential for the studies of gases exchange under breeze conditions.

The measurements revealed quite different sea breeze seasons during the years 2008 to 2011 and within the individual seasons, a number of different sea breeze types were identified depending on the interaction of local and larger-scale forcing.

In this study we investigate the turbulence parameters and the vertical structure of the boundary layer related to only to sea breeze conditions. We also study the wind profile within the first 400 - 500 m above the ground. For the surface layer, we test the free convection theory against the sodar observations.