

The use of SODAR to monitor the lower Atmosphere

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Abstract

The ability of the Acoustic Sounder (SODAR) to measure the mean and the turbulent characteristics of the wind flow as well as the thermal structure of the Atmospheric Boundary Layer (ABL), that extends in the first 1500-2000m of the atmosphere, with high time and space resolution is well known. The SODAR provides information on the horizontal wind speed and direction, the temperature structure parameter (C_T^2) as well as the atmospheric stability and the mixing height. Furthermore, the estimation of the vertical and the two horizontal wind components, the Turbulent Kinetic Energy (TKE) and the momentum flux profiles is possible. It should be mentioned that the spatial average of the determined atmospheric parameters is often more appropriate than single point measurements in studies of the ABL. It is well understood that such real-time information is valuable in a wide range of meteorological and air pollution applications, while the corresponding statistical information is useful in environmental policy planning.

In this invited talk a review regarding the operating parameters, the advantages and disadvantages of SODAR systems will be given. Examples demonstrated the feasibility of SODARS operating over land, the ocean, a small island or on the shoreline, under different meteorological and environmental conditions will be presented. Information on the main characteristics of the mean and turbulent vertical structure of the ABL, based on recent results from major experimental campaigns, will be given. This information reveals the variation and the evolution of the boundary layer, its turbulence characteristics, the shear forcing and the development of wind maxima as well as the transport of momentum and TKE, in response to the background flow and the topography of the experimental area. Finally the correlation between the estimated mixing height from the SODAR, using the most recent and accurate methods and the air pollution patterns over urban environments, especially during the transitional periods of the day, will be given.

Key-Words: SODAR, Atmospheric Boundary Layer, turbulence, mixing height, air pollution.