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Estimation of stable boundary-layer height using variance processing of backscatter lidar data

Umar Saeed and Francesc Rocadenbosch

Universitat Politècnica de Catalunya (UPC), Signal Theory and Communications (TSC), Barcelona, Spain (umar.saeed@tsc.upc.edu)

Stable boundary layer (SBL) is one of the most complex and less understood topics in atmospheric science. The type and height of the SBL is an important parameter for several applications such as understanding the formation of haze fog, and accuracy of chemical and pollutant dispersion models, etc. [1].

This work addresses nocturnal Stable Boundary-Layer Height (SBLH) estimation by using variance processing and attenuated backscatter lidar measurements, its principles and limitations. It is shown that temporal and spatial variance profiles of the attenuated backscatter signal are related to the stratification of aerosols in the SBL. A minimum variance SBLH estimator using local minima in the variance profiles of backscatter lidar signals is introduced. The method is validated using data from HD(CP)^2 Observational Prototype Experiment (HOPE) campaign at Jülich, Germany [2], under different atmospheric conditions.

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