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Analysis of mixing-layer height retrieval methods using backscatter lidar returns and microwave-radiometer temperature observations in the context of synergy

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Mixing Layer Height (MLH) is an important parameter in many different atmospheric and meteorological applications. However, there does not exist a single instrument or method which provides accurate and physically consistent estimates of MLH. Instead, there are several methods for MLH estimation based on the measurements of different atmospheric tracers using different instruments [1, 2]. In this work, MLH retrieval methods using backscattered lidar signals and Microwave Radiometer (MWR)-retrieved potential-temperature profiles are compared in terms of their associated uncertainties. The Extended Kalman Filter (EKF) is used for MLH retrieval from backscattered lidar signals [3] and parcel method [4] is used for MLH retrieval from MWR-retrieved potential-temperature profiles. Measurement and retrieval errors are revisited and incorporated into the MLH estimation methods used. Uncertainties on MLH estimates from the two methods are compared along with a combined MLH-retrieval discussion case. The uncertainty analysis is validated using long-term lidar and MWR measurement data, under different atmospheric conditions, from the HD(CP)^2 Observational Prototype Experiment (HOPE) campaign at Jülich, Germany [5]. MLH estimates from a Doppler wind lidar and radiosondes are used as reference.

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[1] S. Emeis, Surface-based Remote Sensing of the Atmospheric Boundary Layer. 978-90-481-9339-4, Springer, 2010.

[2] P. Seibert, F. Beyrich, S.-E. Gryning, S. Joffre, A. Rasmussen, and P. Tercier, “Review and intercomparison of operational methods for the determination of the mixing height,” Atmospheric Environment, vol. 34, pp. 1352–2310, 2000.

[3] D. Lange, J. Tiana-Alsina, U. Saeed, S. Tomás, and F. Rocadenbosch, “Atmospheric-boundary-layer height monitoring using a Kalman filter and backscatter lidar returns,” IEEE Transactions on Geoscience and Remote Sensing, vol. 52, no. 8, pp. 4717–4728, 2014.

[4] G. Holzworth, “Estimates of mean maximum mixing depths in the contiguous United States,” Monthly Weather Review, vol. 92, pp. 235–242, 1964.

[5] U. Löhnert, J. H. Schween, C. Acquistapace, K. Ebell, M. Maahn, M. Barrera-Verdejo, A. Hirsikko, B. Bohn, A. Knaps, E. O’Connor, C. Simmer, A. Wahner, and S. Crewell, “JOYCE: Jülich Observatory for Cloud Evolution,” Bull. Amer. Meteor. Soc., vol. 96, no. 7, pp. 1157–1174, 2015.