

## **Comparison and Synergy of MWR and Doppler lidar for ABL retrievals**

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Atmospheric Boundary Layer (ABL) is an important parameter for different atmospheric and meteorological applications including Numerical Weather Prediction (NWP) models. However, there does not exist a single instrument or method which provides accurate and physically consistent estimates of the ABL under different atmospheric conditions and times of the day.

In this work, we aim to study the capabilities as well as perform an inter-comparison between Microwave Radiometer (MWR) and Doppler Wind Lidar (WL) in the context of ABL retrieval. Strengths and limitations of the two instruments are highlighted for the mixed layer as well as the nocturnal stable boundary layer retrieval. Aerosol backscatter from ceilometer is also considered for analysis purposes.

Whereas WL is capable of directly measuring the turbulence in the boundary layer, MWR is able to provide the strength of convection and thermal stability of the atmosphere through the retrieved temperature profile. Therefore, on one hand, WL is able to provide information about the mixed layer under convective and wind shear conditions, though it is not able to identify the underlaying phenomenon responsible for the mixing process. On the other hand, MWR is able to identify the presence/absence of convection-driven mixing as well as the nocturnal temperature inversions albeit with poor vertical resolution. Moreover, other atmospheric quantities retrieved from MWR measurements, such as Integrated Water Vapor (IWV), Liquid Water Path (LWP), and relative humidity (RH), can be used to detect and locate boundary layer clouds.

A synergetic framework for the retrieval of ABL, exploiting the strengths of different instruments, is also proposed. A cross-comparison and combination of these instruments and methods is expected to provide better retrieval of the ABL. As a result, it is expected that the proposed method for synergetic ABL retrieval will be more reliable and better suited for operational use. Validation on long-term data from the HOPE campaign at Jülich, Germany is performed.

References

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