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Independent wind measurements in the middle-atmospheric gap region

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It is recognised that stratospheric and mesospheric dynamics can substantially influence tropospheric weather and climate patterns, which is one of the reasons why numerical weather prediction models have extended their lids towards higher altitudes. Direct observational assessment of the dynamics at these altitudes is, however, challenging as wind observations between 35 and 70 km altitude are extremely scarce. Nevertheless such information would also be relevant for a multitude of applications, especially in the context of gravity wave and infrasound propagation.

In the last years, efforts were made to bridge this gap. Recently developed observation approaches are based on passive Doppler microwave radiometry and on active Doppler lidar technology. While the first offers near-continuous observations, the latter provides high temporal and vertical resolution. Wind radiometers (e.g., WIRA) are single sideband low noise heterodyne receivers with high frequency resolution whereas the lidar is a twin Rayleigh system using single-edge iodine absorption spectroscopy (DoRIS). These are, besides occasional rocket soundings, the only operational approaches capable of providing measurements of middle-atmospheric wind profiles.

In the framework of the project ARISE2 these independent instruments are run in co-location at ALOMAR observatory (69.3 N, 16.0 E) since April 2016. For the first time cross-validations of nighttime and daylight wind observations by the radiometer and the lidar from this one-year data set will be presented. Additionally, intercomparisons with co-located rocket soundings will be shown. Using radiometer and lidar data, the representation of the middle-atmospheric dynamics in numerical weather prediction models and re-analyses will be studied.