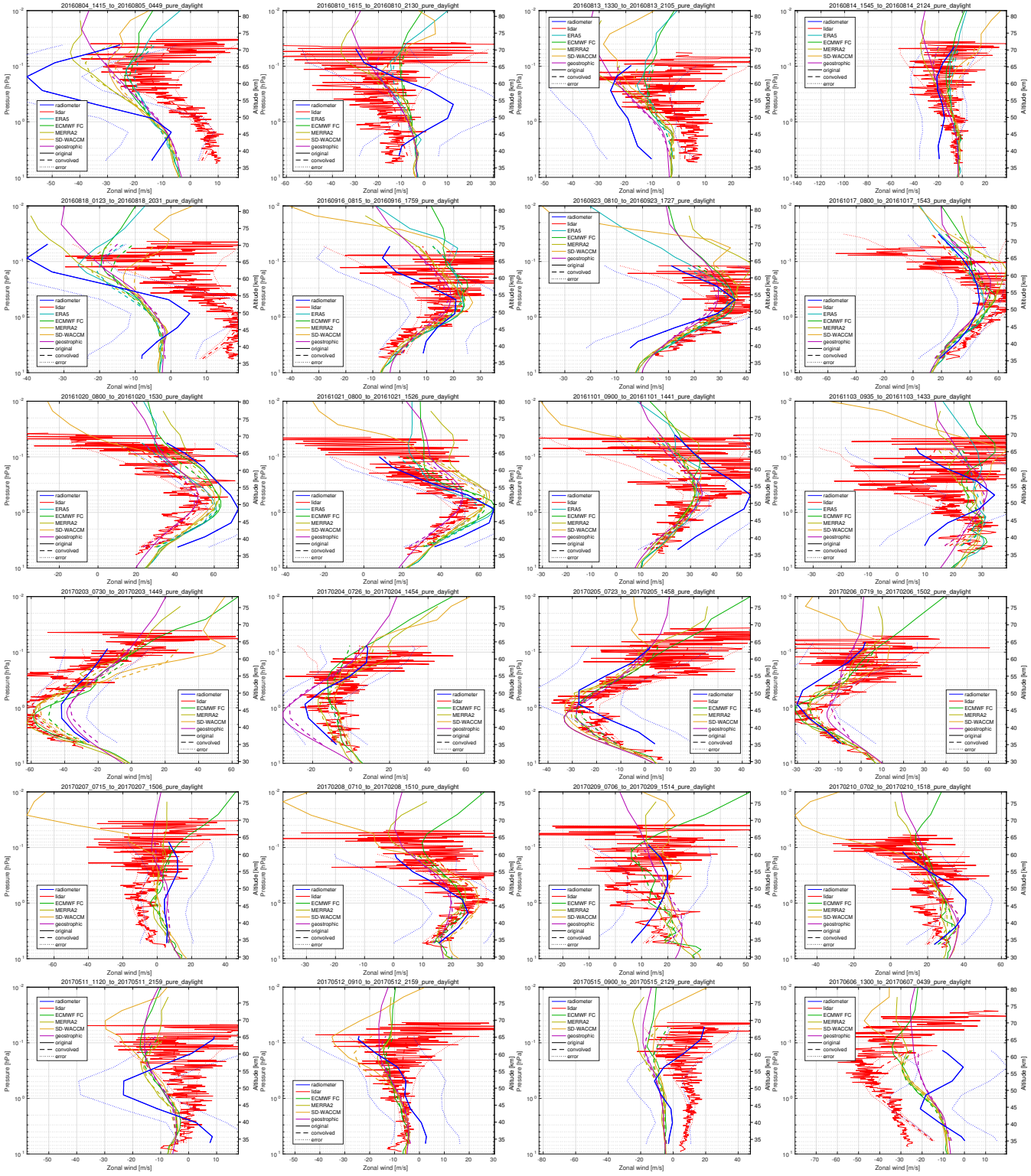

Figure S1. Zonal wind profiles for observation times when both the wind radiometer WIRA and the RMR lidar were in daylight mode.

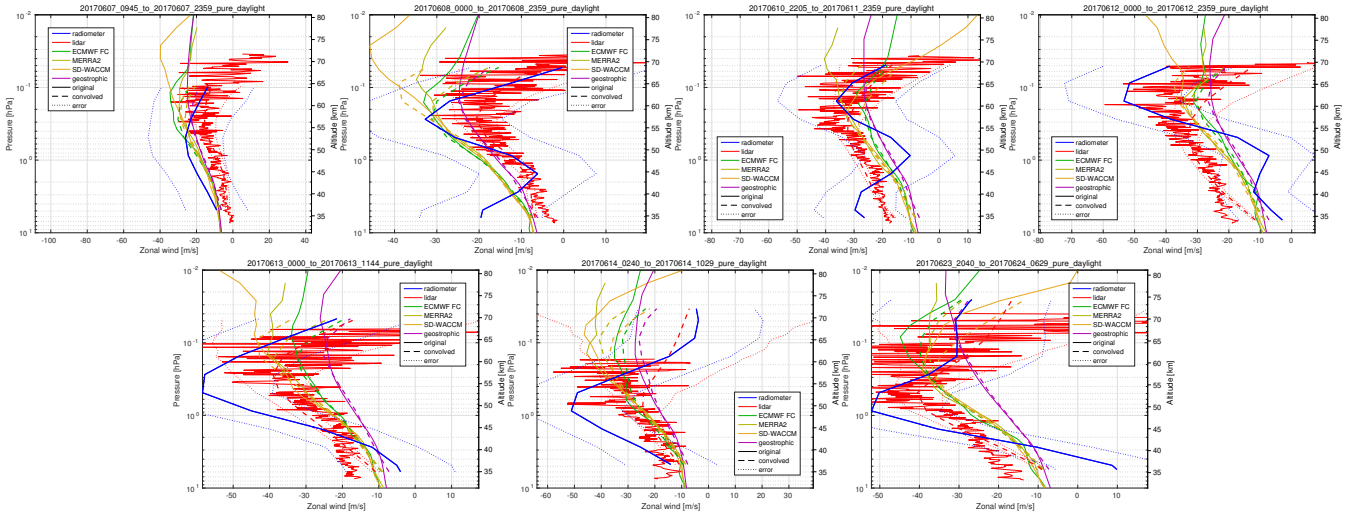

Figure S1 (Cont.). Zonal wind profiles for observation times when both the wind radiometer WIRA and the RMR lidar were in daylight mode.

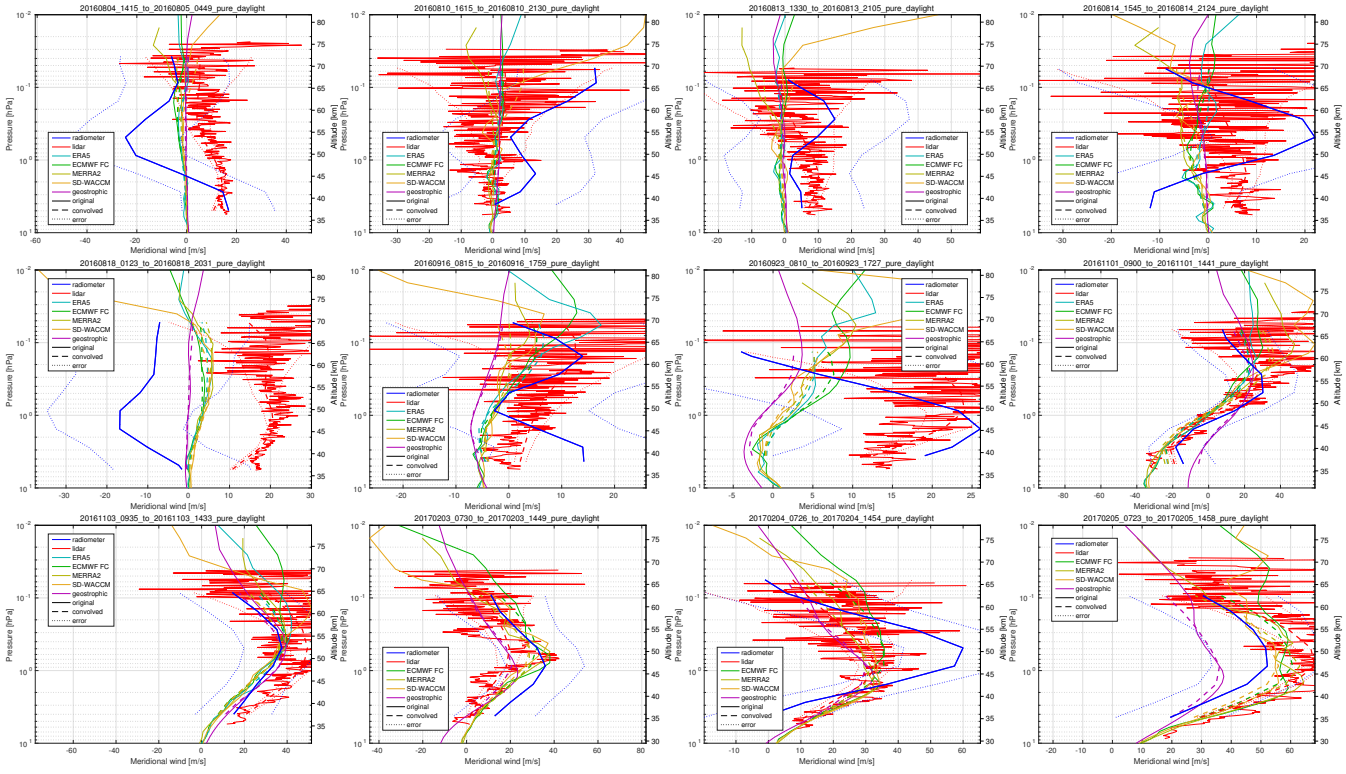

Figure S2. Meridional wind profiles for observation times when both the wind radiometer WIRA and the RMR lidar were in daylight mode.

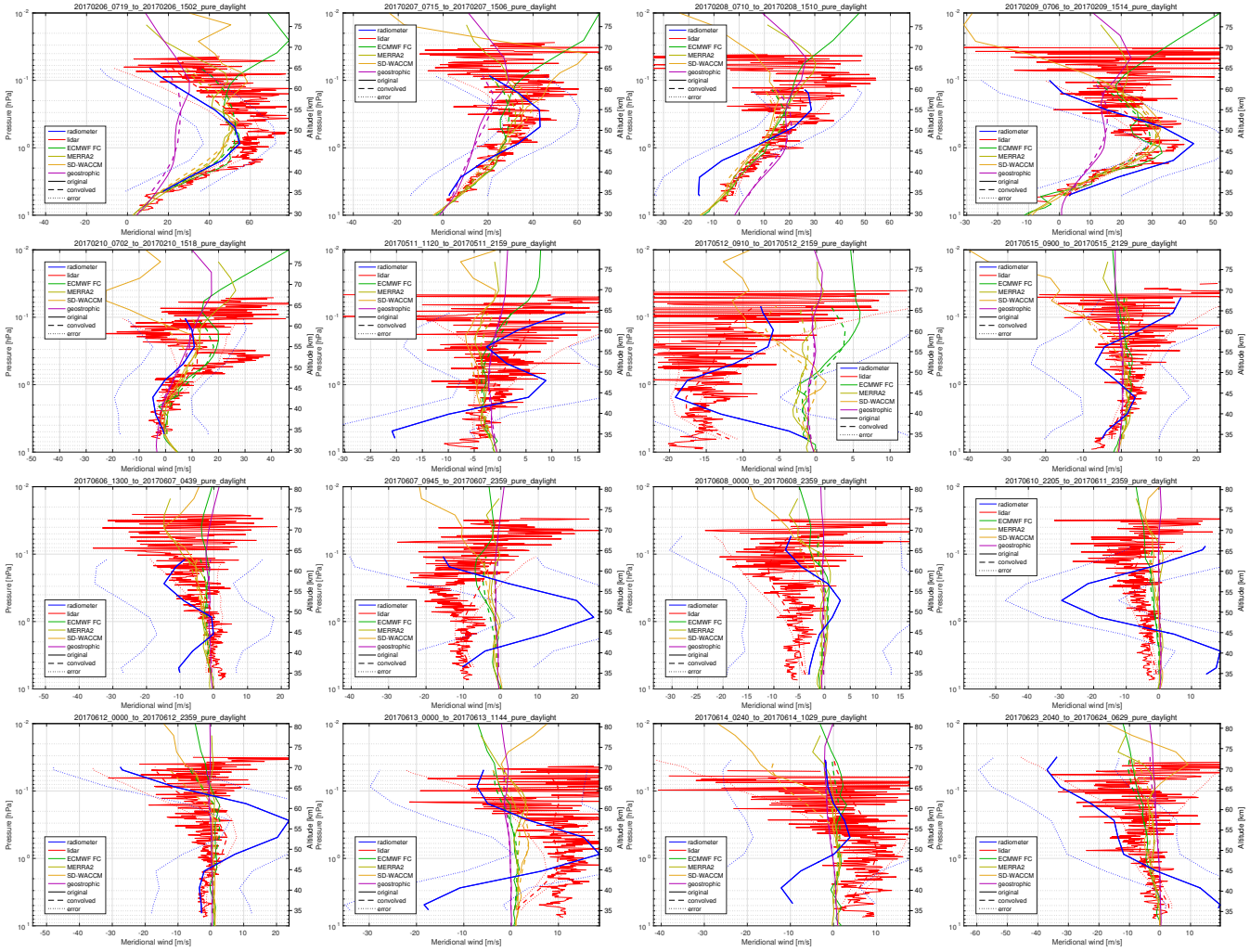

Figure S2 (Cont.). Meridional wind profiles for observation times when both the wind radiometer WIRA and the RMR lidar were in daylight mode.

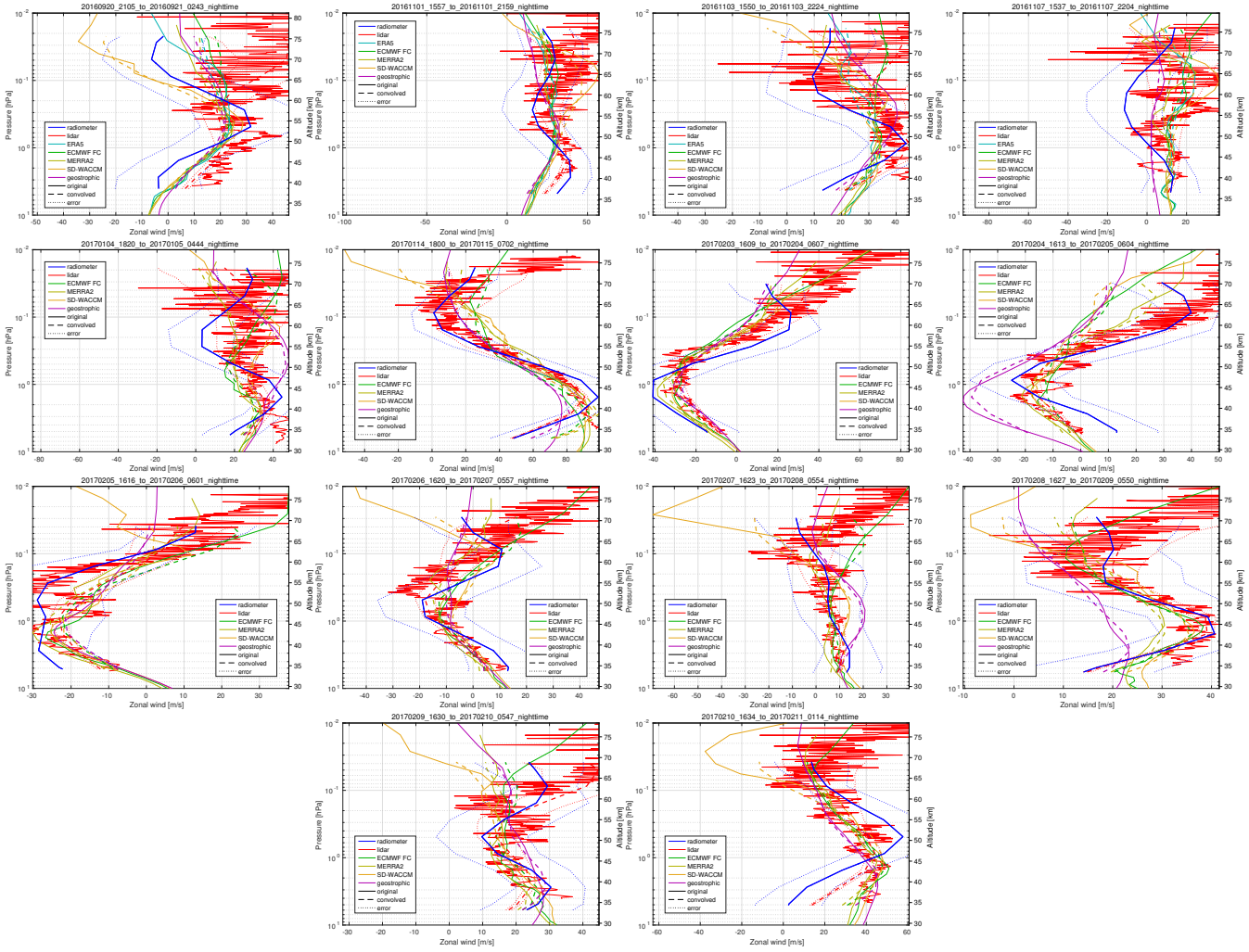

Figure S3. Zonal wind profiles for observation times when both the wind radiometer WIRA and the RMR lidar were in night mode.

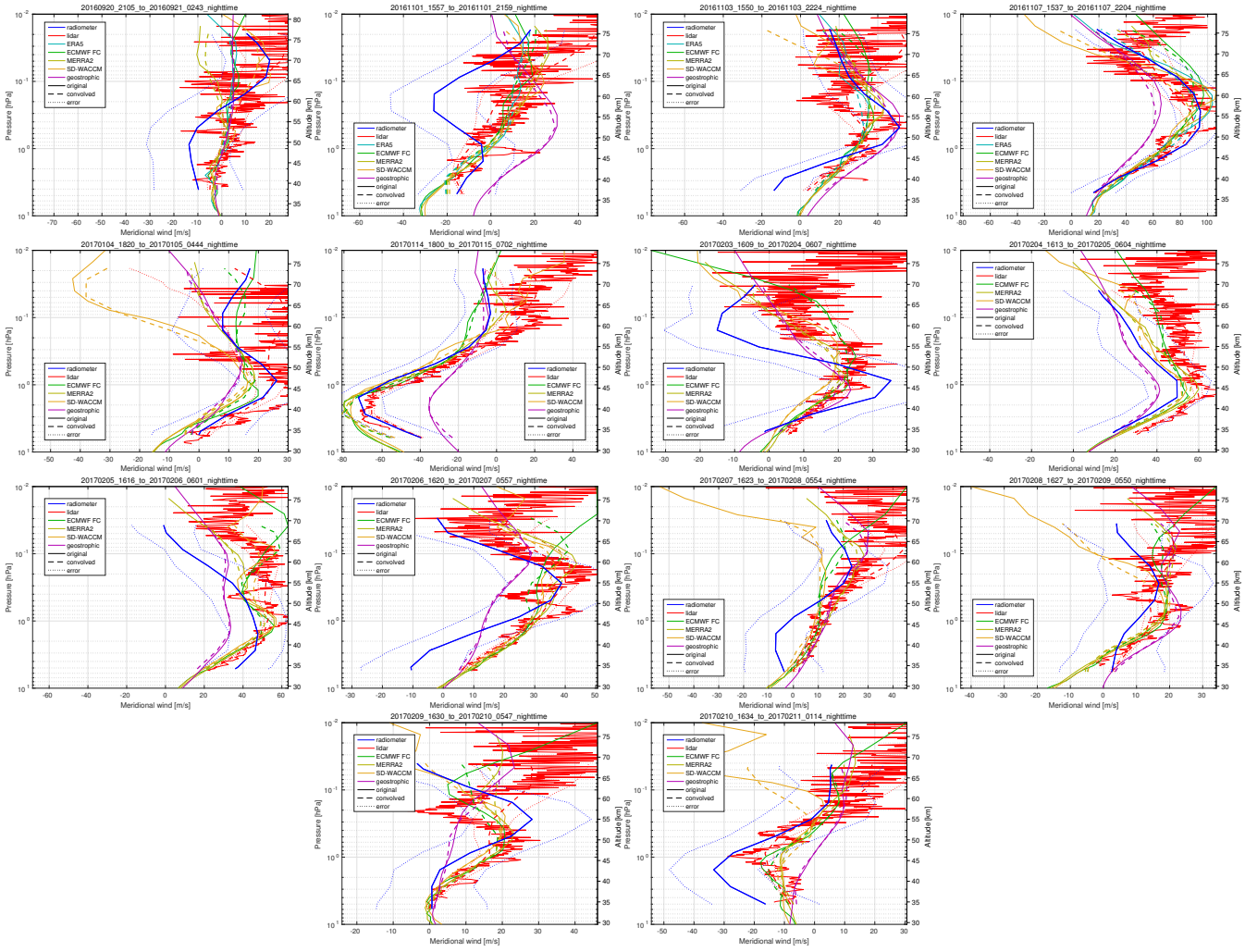

Figure S4. Meridional wind profiles for observation times when both the wind radiometer WIRA and the RMR lidar were in night mode.

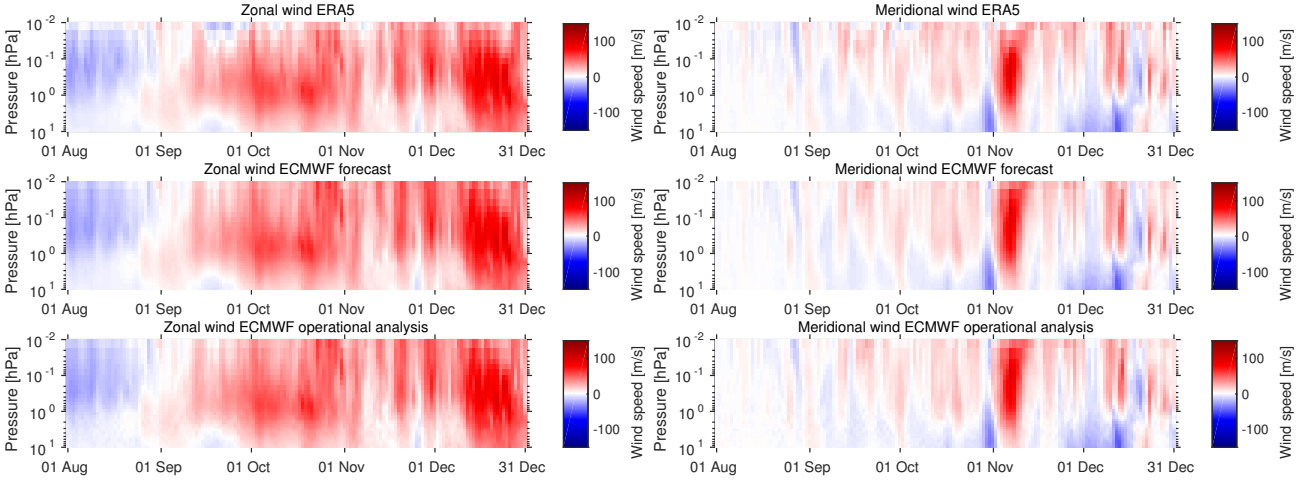

Figure S5. Time series of middle-atmospheric zonal and meridional wind between 1 August and 31 December 2016 from the ERA5 reanalysis, the forecast and the operational analysis data from ECMWF.

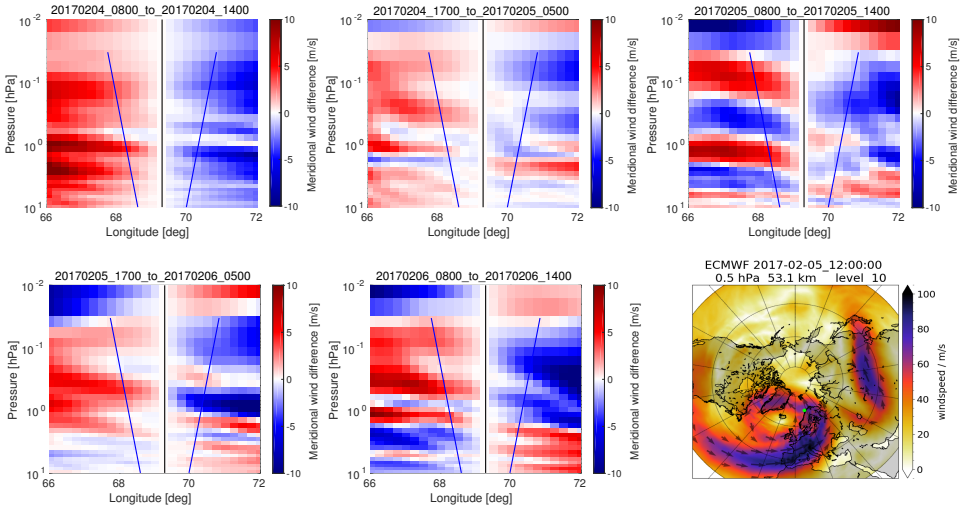

Figure S6. Latitudinal distribution of meridional winds relative to the wind speed at Andenes (black horizontal line) according to ECMWF forecast data. The blue lines represent the lines of sight of the wind radiometer WIRA. The panels represent the time periods of coincident radiometer and lidar observations for the day of 4 February 2017 (top left), the night of 4/5 Feb (top centre), the day of 5 Feb (top right), the night of 5/6 Feb (bottom left) and the day of 6 Feb (bottom centre). For the actual measurements see Figs. S2 and S4. The last panel shows the horizontal wind field around Andenes (green dot) for 5 February noon at stratopause level. Even in this particularly dynamic situation with strong wind gradients around Andenes measurement artefacts induced by the limited horizontal sampling of WIRA do not exceed 0.25 m/s.