

Verification of Vertical Profiles at UGM

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The operational upper-air verification at UGM uses a set of seven TEMP stations over Italian area to verify the vertical structure of atmosphere forecasted by LAMI. The parameters analysed are the geopotential height (ZZ), Temperature (T), Dew Point Temperature (TD), wind direction (WD) and wind speed (WS) averaged for all seven stations for the period June-December 2003, except for Dew Point Temperature averaged from October to December 2003.

Geopotential height, Fig. 2, shows a general positive bias in the medium-high troposphere: generally negative bias occurs in the last forecast ranges at low levels. Careful is needed in geopotential error interpretation since radio-sonde instrumental error amplitude is comparable to typical forecasted error, Fig. 1.

Temperature vertical profiles, Fig. 3, show an error independency with forecast ranges; generally positive bias occurs, 0.3-0.7 °C, except near the ground where a negative bias of about 0.5 °C is observed. Absolute accuracy seems increase with height until 200 hPa where MAE has a rapid increment.

Dew Point Temperature, Fig. 4, presents a general positive bias, that increases with height; a discontinuity in ME with a negative bias occurs only at 200 hPa, at tropopause proximity.

Wind direction vertical profiles, Fig. 5, are characterized by high absolute accuracy especially above boundary levels (low MAE values) but decreasing in function of forecast ranges, while wind speed, fig. 6, presents a negative bias for all model output and a small increment of MAE values in function of time steps. Absolute wind error increase with height but it is consistent with the high wind speed reached at this levels.

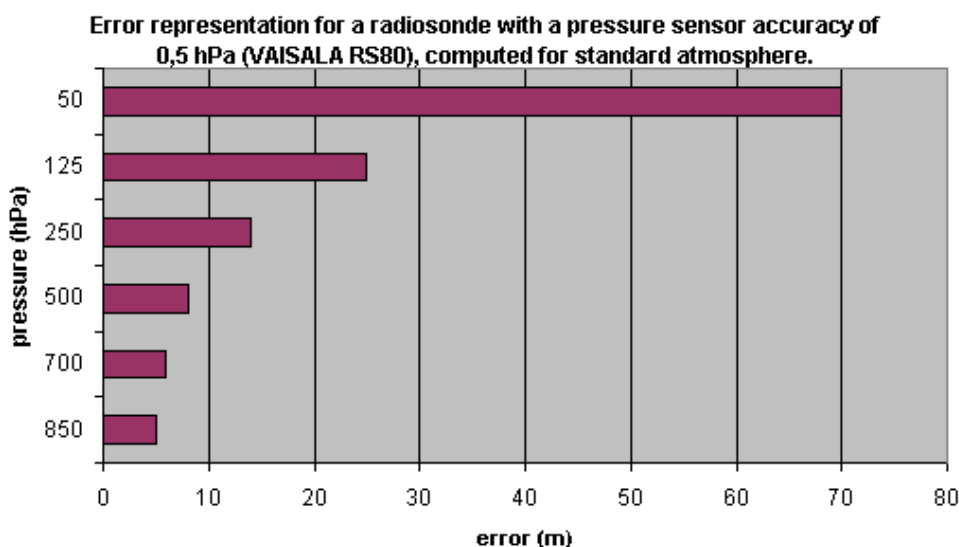


Figure 1: Error representation for a radiosonde with a pressure sensor accuracy of 0.5 hPa (VAISALA RS-80), computed for standard atmosphere.

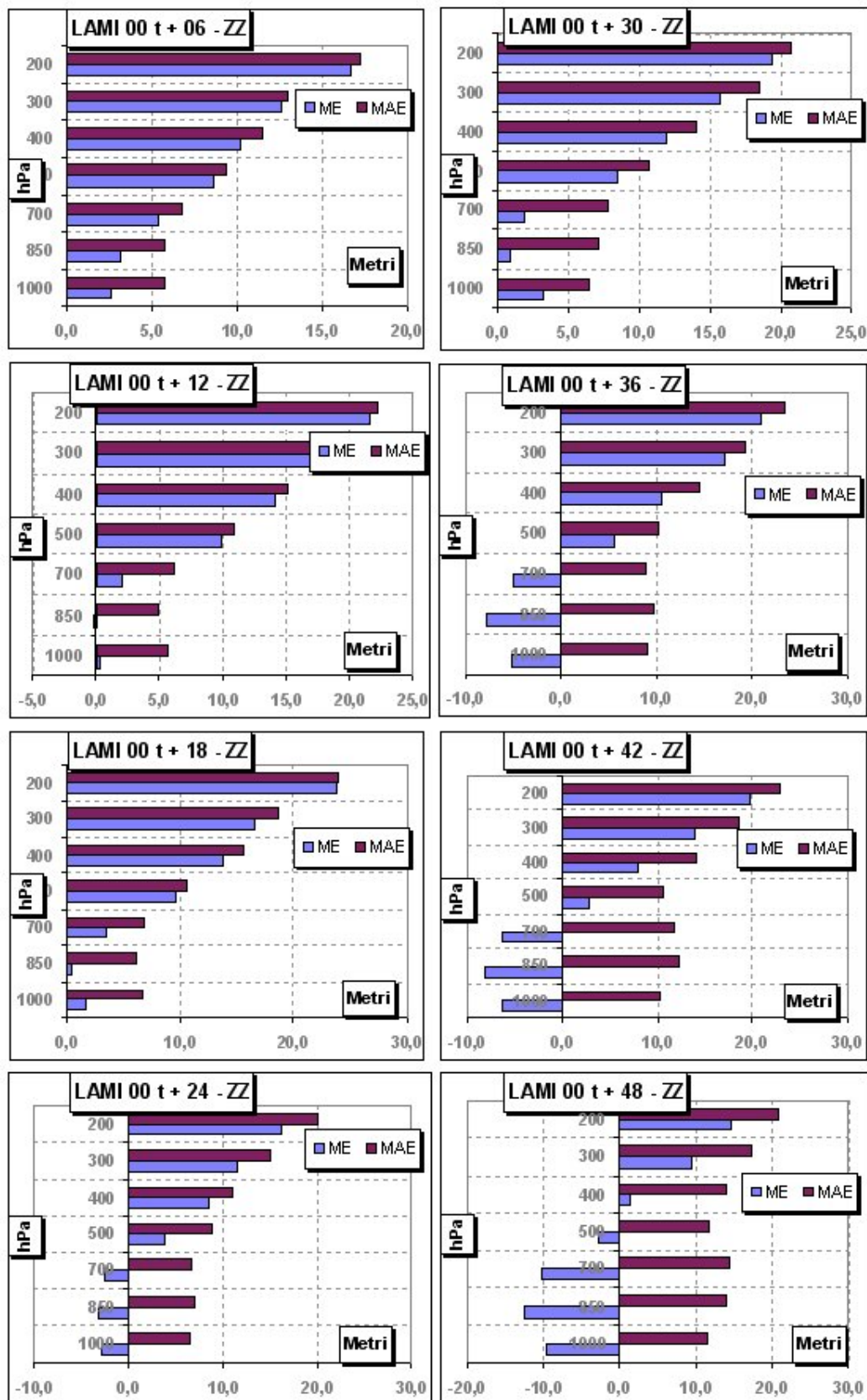


Figure 2: Median Error and Mean Absolute Error for geopotential.

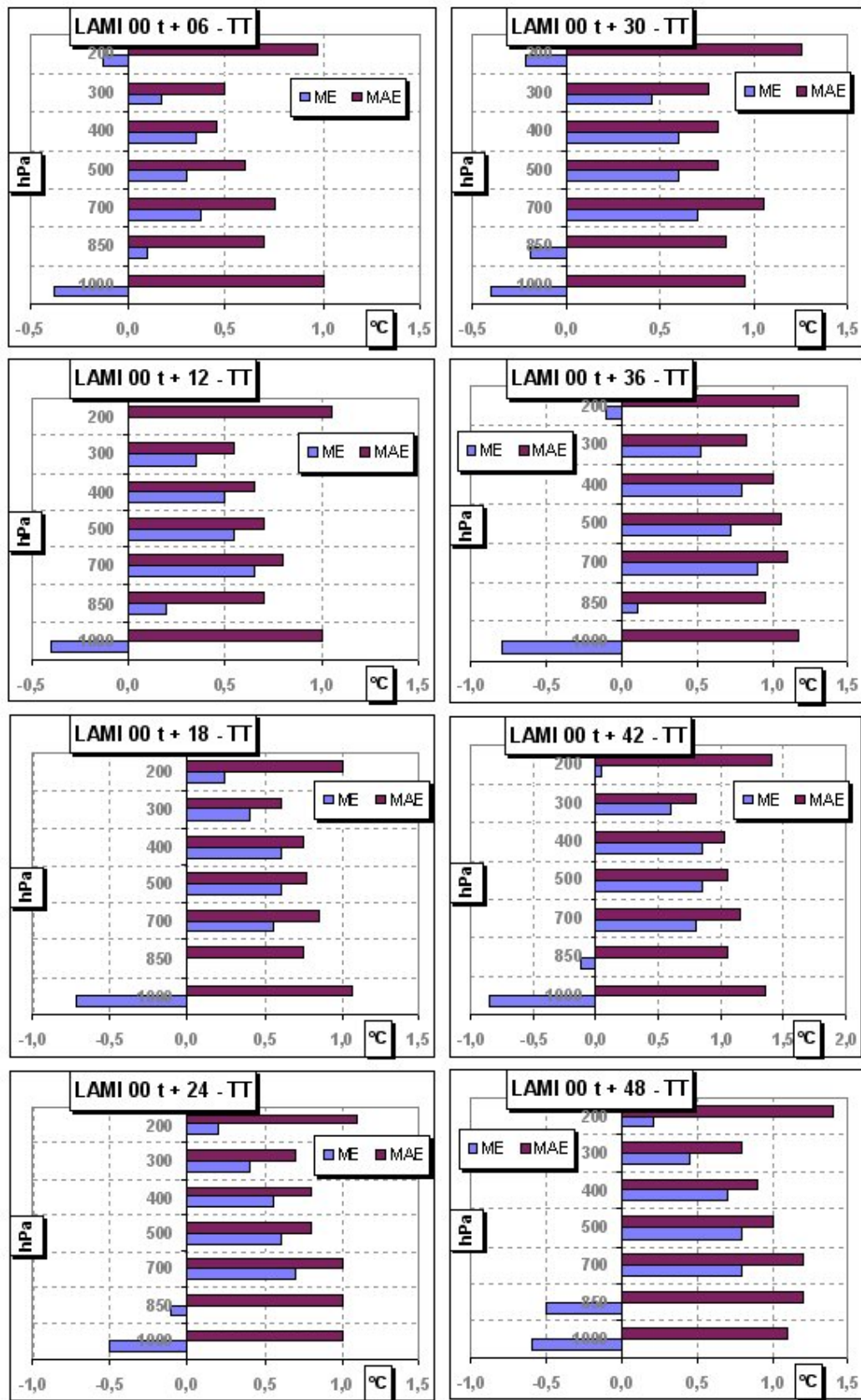


Figure 3: Median Error and Mean Absolute Error for temperature.

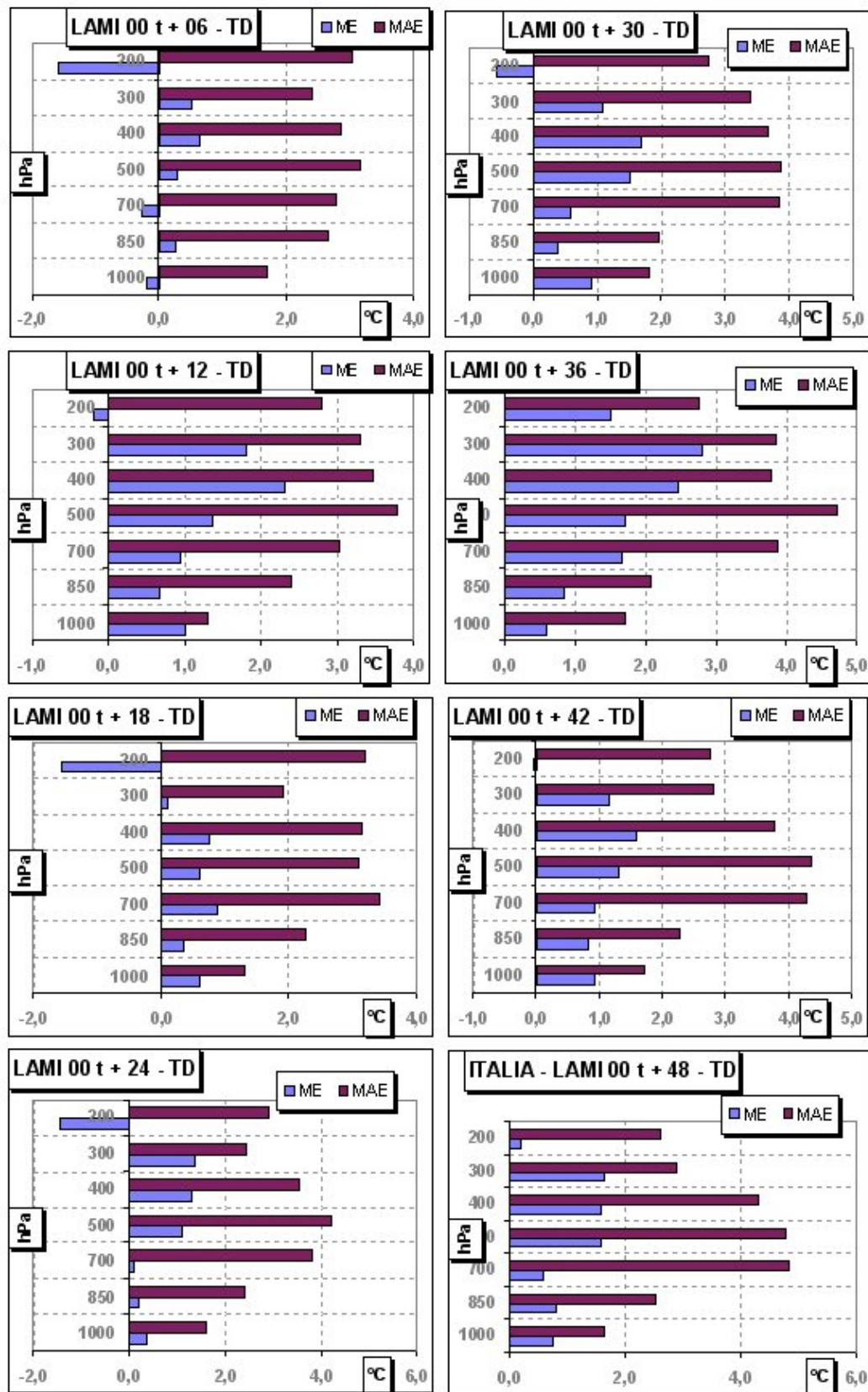


Figure 4: Median Error and Mean Absolute Error for dew point temperature.

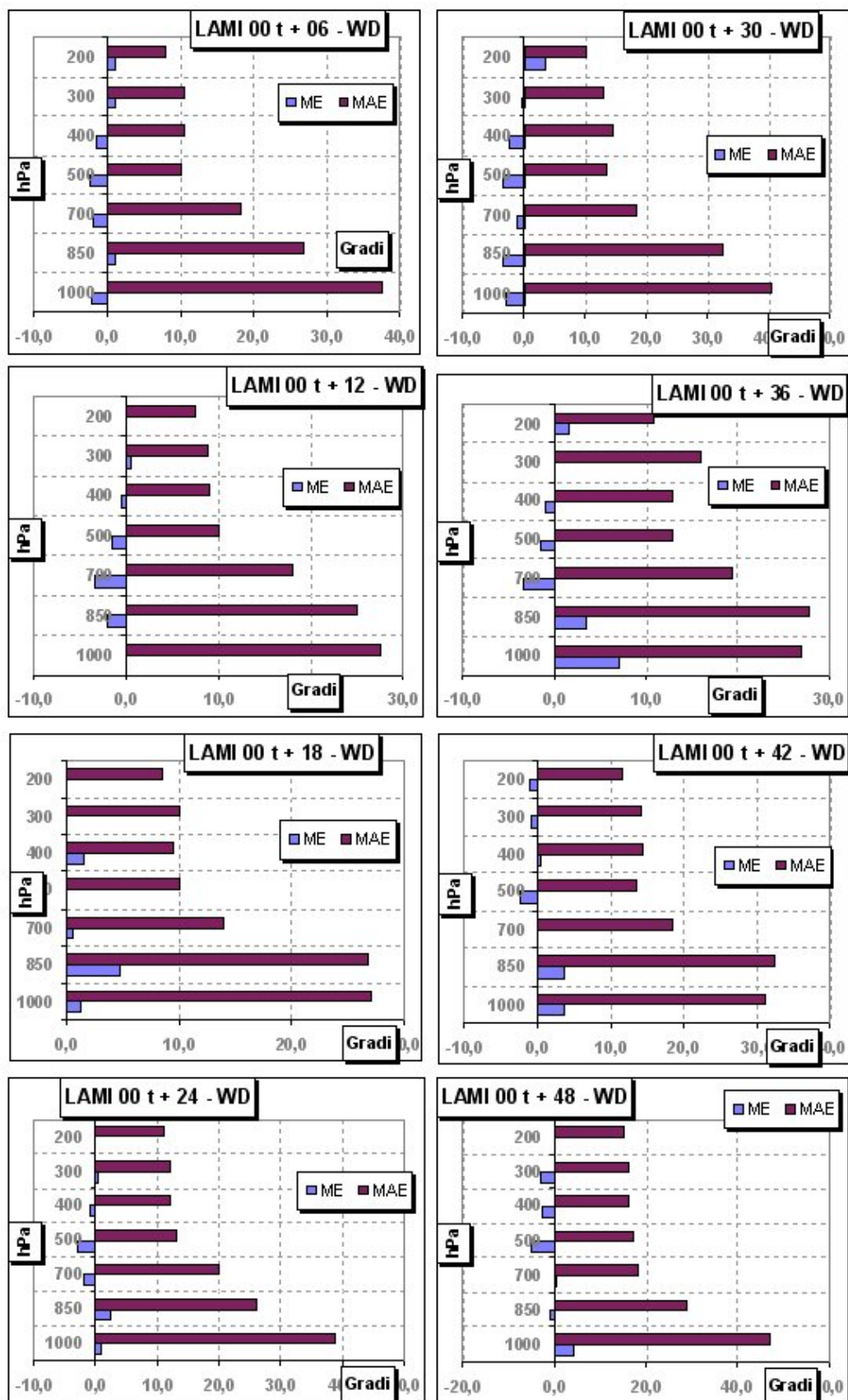


Figure 5: Median Error and Mean Absolute Error for wind direction.

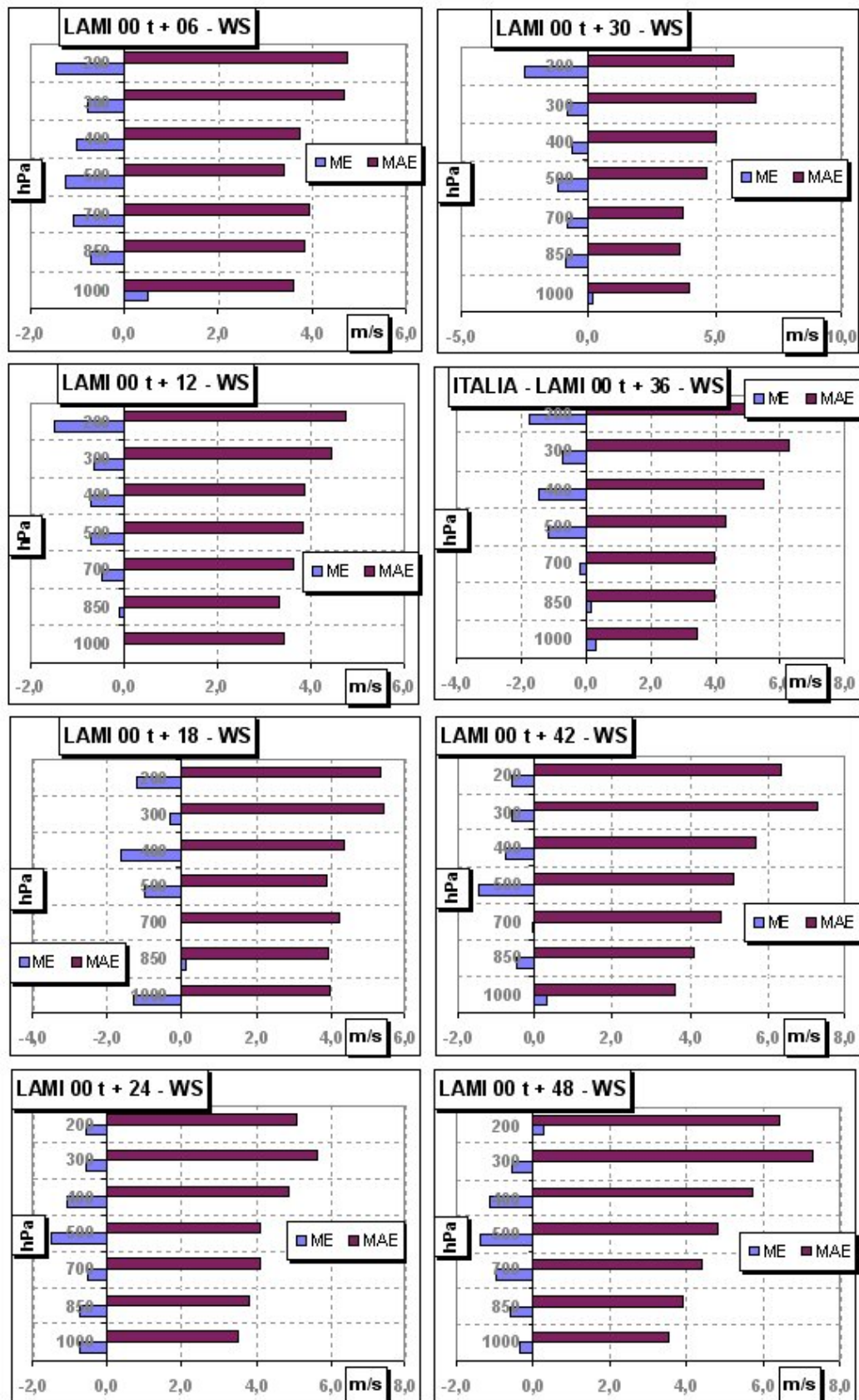


Figure 6: Median Error and Mean Absolute Error for wind speed.