

On the meteorological circumstances of the occurrence of clear air echoes

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During the Hymex SOP in summer/autumn 2012 a Doppler lidar and a 35 GHz cloud radar were collocated at a supersite in Corte on the French island of Corsica. In absence of hydrometeors both instruments receive signals from small particles which are passively transported with the air as aerosol, insects or "atmospheric plankton", i.e. animals or plants or parts of them. Obviously, these scatterers are in the optical regime for the lidar and in the Rayleigh regime for the cloud radar. So the lidar detects a huge amount of small scatterers, whereas the radar recognizes a few comparable large particles.

We were surprised to observe that variations of maximum measuring range of lidar and radar occurred not always in the same sense. Sometimes the lidar does not receive any signal, whereas the radar reports plausible velocities throughout the boundary layer, and vice versa. This observation led to the question: "Which meteorological conditions provide strong (weak) clear air echoes for radar (lidar), respectively?"

The investigation is supported by additional meteorological measurements at supersite Corte performed with an energy balance station, a 20 m meteorological tower, and a radiosonde.