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Can we estimate the fog-top height from atmospheric turbulent measurements at surface?

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The knowledge of the fog-top height (fog thickness) can be very meaningful for aircraft maneuvers, data assimilation/validation of Numerical Weather Prediction models or nowcasting of fog dissipation. However, its value is usually difficult to determine and it is sometimes approximated with satellite data, ground remote-sensing instruments or atmospheric soundings. These instruments are expensive and their data not always available. In this work, we show how the fog-top height shows a linear correlation with atmospheric turbulent variables measured close to the surface. This relation is statistically calculated from observational data of several radiation-fog events at two research sites: The Research Centre for the Lower Atmosphere (CIBA) in Spain and the Cabauw Experimental Site for Atmospheric Research (CESAR) in The Netherlands. Thus, surface friction velocity and buoyancy heat flux are presented as potential indicators of fog thickness. These methods are also evaluated over a long-lasting radiation-fog event at CESAR. The proposed methods could be operationally implemented for providing a continuous estimation of fog-top height through the deployment of a sonic anemometer close to the surface.