EGU2020-4987
https://doi.org/10.5194/egusphere-egu2020-4987
EGU General Assembly 2020

A new method for the detection of incompressible turbulence as a deviation from the hydrostatic balance assumption

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This study aims at introducing a simple and physically consistent method for identification and analysis of turbulent layers in the free atmosphere that can supplement the traditional methods (Richardson number criterion, Thorpe scale). The method is based on differences between the observed and hydrostatically derived (with floating level of initialization) pressure. In the paper we derive the method analytically from the Navier Stokes equations and propose a methodology how to isolate information on turbulence from an internal gravity wave and atmospheric structure signal in the pressure differences. Finally we apply the methodology on high vertical-resolution radiosonde data to demonstrate the utility of the novel method by contrasting the results with traditional diagnostics.

How to cite: Šácha, P. and Pišoft, P.: A new method for the detection of incompressible turbulence as a deviation from the hydrostatic balance assumption, EGU General Assembly 2020, Online, 4–8 May 2020, EGU2020-4987, https://doi.org/10.5194/egusphere-egu2020-4987, 2020