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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Change in turbopause altitude at 52 and 70 N" *by* C. M. Hall et al.

Anonymous Referee #2

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The manuscript reports a long-term trend of turbopause height at Tromsoe (70N, 19E) and Saskatoon (52N, 107W) estimated from MF-radar measurements by applying technique by Hall et al. (2008). This manuscript is an update to the Hall et al.'s (2008) paper and does not show new findings.

Unfortunately, the manuscript itself does not contain a proper description of methods and observations. As I understand, authors use the characteristic fading time of the signal observed by an MF radar. The energy dissipation rate is inversely proportional to the square of fading time. To convert the fading time to energy dissipation rate, the buoyancy frequency is required. Authors used an empirical model (NRLMSISE-00) to derive buoyancy frequency. Thus, the obtained energy dissipation rate profile is not an observation but rather a combination of observations and empirical model.

The next step: authors compare obtained results with a minimum of energy dissipation

rate, obtained from the empirical model. Thus, authors cannot exclude an influence of the empirical model on the trend analysis. Hall et al. (1998) showed altitude profiles of the observed and the estimated energy dissipation rates for demonstration of this technique (their Fig. 6). Those plots reveal an increase of the energy dissipation rates (i.e., decrease of characteristic fading time) below ∼100 km. Above the 100 km height the characteristic fading time increases with altitude.

From my point of view, the quantity used by the authors for the trend study includes too many uncertainties which can and must be avoided. I would rather use the altitude of the minimum of the characteristic fading time since this value is a direct observation.

From technical point of view values observed by an MF radar above approx. 100 km height may also be questionable due to radio wave propagation and ionospheric effects. Therefore, authors have to demonstrate, that the FCA technique yields reliable results even above 100 km altitude.

I see two open questions here: 1. Are there independent observations that confirm such a behaviour of the energy dissipation rate (fading time) profile above ∼100 km? 2. Which process dominates the observed behaviour above 100 km: The neutral air turbulence or a plasma dynamics.

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 20287, 2015.