Variability of the Brunt-Väisälä frequency at the OH*-layer height

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The Brunt-Väisälä frequency is an important parameter in gravity wave theory. It is not only the highest possible frequency for gravity waves, it is also necessary when calculating different gravity wave parameters such as the density of wave potential energy.

In and near the Alpine region, the most dense sub-network of identical NDMC instruments (Network for the Detection of Mesospheric Change, https://www.wdc.dlr.de/ndmc/) can be found: five stations are equipped with OH*-spectrometers which deliver a time series of mesopause temperature each cloudless or only partially cloudy night. These measurements are suitable for the derivation of the density of gravity wave potential energy, provided that the Brunt-Väisälä frequency is known. However, OH*-spectrometers do not deliver vertically-resolved temperature information, which is necessary for the calculation of the Brunt-Väisälä frequency. Co-located measurements or climatological values are needed.

We use satellite-based data (TIMED-SABER, 2002–2015) to deduce information about height and thickness of the OH* layer. This is used for the calculation of the Brunt-Väisälä frequency averaged over the OH*-layer. Between 43.93–48.09°N and 5.71–12.95°E, we investigate the inter- and intra-annual variability of the Brunt-Väisälä frequency and provide a climatology based on 14 years of data. The analyses are repeated for a global data set.