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Trend analysis of the radiosonde relative humidity measurements at Uccle, Belgium

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Water vapour trend analysis suggests that the stratospheric water vapour increased at a rate of 1%/yr over the past 45 years. There is also evidence for global increases in tropospheric specific humidity over the past two decades, which is consistent with the observed increases in tropospheric temperatures and the absence of any change in relative humidity (IPCC 2007).

We dispose of a uniform time series of radiosonde humidity profiles at Uccle (Belgium, 50°48'N, 4°21'E, 100 m asl) since January 1990. These humidity profiles have to be first corrected for a dry bias (due to instrumental artifacts) and a time lag error. We investigated two different correction methods and set up a small intercomparison campaign of different Vaisala radiosonde types. Additionally, we compared the integrated water vapour (IWV) column values, calculated from the vertical relative humidity profiles, with the IWVs measured by a sun photometer and GPS. These (inter)comparisons gave us the opportunity to make an assessment of the uncertainties of the relative humidity profiles measured by radiosondes.

The more than 15 years of corrected vertical humidity profiles constitutes a unique data set, which allowed for trend and climatological analyses of the tropospheric and lower stratospheric humidity field above Uccle. We found a significant moistening of the troposphere until 2001, with no trend (LT) or drying (UT) afterwards. The tropopause dynamics did not show a significant change during whole the time period. The lower stratosphere, on the other hand, underwent a global drying since 1990, with an increased drying since the middle of 2004. Possible explanations for these trends

will be discussed.