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Analysis of global water vapour trends from satellite measurements in the visible spectral range

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Abstract. Global water vapour total column amounts have been retrieved from spectral data provided by the Global Ozone Monitoring Experiment (GOME) flying on ERS-2, which was launched in April 1995, and the SCanning Imaging Absorption spectroMeter for Atmospheric CHartography (SCIAMACHY) onboard ENVISAT launched in March 2002. For this purpose the Air Mass Corrected Differential Optical Absorption Spectroscopy (AMC-DOAS) approach has been used. The combination of the data from both instruments provides us with a long-term global data set spanning more than 11 years with the potential of extension up to 2020 by GOME-2 data on MetOp.

Using linear and non-linear methods from time series analysis and standard statistics the trends of H₂O columns and their errors have been calculated. In this study, factors affecting the trend such as the length of the time series, the magnitude of the variability of the noise, and the autocorrelation of the noise are investigated. Special emphasis has been placed on the calculation of the statistical significance of the observed trends, which reveal significant local changes from -5% per year to +5% per year. These significant trends are distributed over the whole globe. Increasing trends have been calculated for Greenland, East Europe, Siberia and Oceania, whereas decreasing trends have been observed for the northwest USA, Central America, Amazonia, Central Africa and the Arabian Peninsular.

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