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The sensitivity of the NO2 columns to the interannual variability of factors affecting photolysis rates compared to GOME retrievals

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The interannual variability of tropospheric trace gas composition is a major research issue, due to the influence that it exerts on the oxidizing capacity and the atmospheric trace gas abundances. Nitrogen oxides (NOx) are of specific interest, due to the influence on ozone concentration, especially in NOx-limited areas. Since tropospheric chemistry is heavily dependent on the photodissociation of trace gases, factors that control the radiative transfer (and thus the photolysis processes) would be expected to significantly influence the year to year variations in the composition. Here we run the global chemistry transport model (CTM) p-TOMCAT for 5 years (1996-2000) to examine the extent to which the interannual variability of column NO_2 is influenced by changes in cloudiness and the ozone column, both of which are factors strongly influencing photolysis processes. For the accurate and efficient simulation of the photochemistry, we have implemented the FAST-JX photolysis scheme (Wild et al., 2000) and used offline 6-hourly cloud water content data from the ECMWF analyses and ozone column data (with a 5 day resolution) from the stratospheric CTM SLIMCAT. The model results from this sensitivity study have been compared to NO_2 columns retrieved by GOME for a better interpretation of their features.