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A study of the effect of differing photolysis treatment on tropospheric chemistry simulations using p-TOMCAT 3-D chemistry transport model

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Atmospheric chemistry is mainly driven by the photodissociation of trace gases. p-TOMCAT currently uses a simple photolysis scheme whose main disadvantage is the poor handling of day-to-day variations in cloudiness. The FAST-J algorithm (Wild et al., 2000) was developed to calculate photolysis rates under both clear and cloudy sky conditions, without significantly increasing the computer run time. The scheme has been tested by comparisons to surface observations from Weybourne and to aircraft measurements from the ACSOE experiment, using ECMWF water content data to take cloudiness into consideration. Model calculated photolysis rates compare well with observations, which indicates that FAST-J is an accurate code to apply to p-TOMCAT. The updated version of the CTM with FAST-J has been used to assess how tropospheric chemistry is affected by changes in the amount of radiation reaching the troposphere imposed by stratospheric ozone column fluctuations.