A new version of the CNRM Chemistry-Climate Model, CNRM-CCM : description and improvements from the CCMVal-2 simulations

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We present a new version of the Meteo-France CNRM Chemistry-Climate Model, so-called CNRM-CCM. It includes some fundamental changes from the previous version (CNRM-ACM) which was extensively evaluated in the context of the CCMVal-2 validation activity. The most notable changes concern the radiative code of the GCM, and the inclusion of the chemistry on-line within the GCM. A 47-year transient simulation (1960-2006) is the basis of our analysis. CNRM-CCM generates satisfactory dynamical and chemical fields in the stratosphere. Several shortcomings of CNRM-ACM that resulted from an erroneous representation of the impact of volcanic aerosols as well as from transport deficiencies have been eliminated. Remaining problems concern the upper stratosphere (5 to 1 hPa) where temperatures are too high, and where there are biases in the NO2, N2O5 and O3 mixing ratios. In contrast, temperatures at the tropical tropopause are too cold. These issues are addressed through the implementation of a more accurate radiation scheme at short wavelengths. Despite these problems we show that this new CNRM CCM is a useful tool for chemistry climate applications.