Evaluation of the LMDz-INCA chemistry-climate model in the extratropical tropopause region

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LMDz-INCA is a coupled Climate-Chemistry model developed to study the interaction between dynamical, physical and chemical processes in the troposphere and stratosphere and to predict the upper troposphere and lower stratosphere. The stratospheric version uses 50 vertical levels from the surface to 76 km and a horizontal resolution of 2.5° in latitude and 3.75° in longitude.

Our reference simulation was to reproduce the 1990-2006 periods (Ref2 CCAM) simulations. This simulation is designed to reproduce the well-observed period of the last 25 years during which boundary conditions were well recorded, and allows for a more detailed investigation of the role of natural variability and other climatological changes important for both balance and trends. This reference simulation includes all anthropogenic and certain natural forcings based on changes in trace gases, and sea surface temperatures (SSTs), SSTs and emissions in this run are based on the HadSST1 and RCP6.2 databases used respectively. LMDz-INCA climatology is used to validate the results and the temperature.

In this study, we evaluate LMDz-INCA by making comparisons with in situ observations of ozone, carbon monoxide, water vapour and N2O profiles obtained, during 6 campaigns: POLARIS (1997), SPURT (1995-1997), SPURT (2001-2003), Crystal-Face (2002), STRAT (2006) and AMMA (2006). These related diagnostics are used to evaluate the chemical transport processes in the stratospheric upper troposphere and lower stratosphere (UTLS). The first diagnostic compares the observed and modeled UTLS tracer gas profiles in a relative altitude coordinate. The second one compares the observed and modeled UTLS tracer relationships. The third one compares observed and modeled thickness of the tropopause transition layer. These diagnostics were defined and used by L. Pan et al. (2004, 2007) to evaluate the extratropical tropopause region. Model data were selected in a ±5° lat-lon box around the coordinates and days observed to match the campaigns.

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Reference


Keynotes