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Evaluation of the capability of ECHAM-MESSY in the tropical tropopause layer: comparison with aircraft data

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The objective is to evaluate the capability of chemical circulation model ECHAM5-Messy to reproduce observed distributions of chemical species and tracers in the Tropical Tropopause Layer (TTL). The ECHAM-MESSY model is run at T42 resolution on 90 vertical levels and is forced by climatological SSTs. Two-years simulation is performed to cover a full QBO cycle.

We have used the in-situ profiles of water vapour and chemical tracers from measurements on board the M55 Geophysica aircraft during four tropical campaigns (THESEO (1998), SCOUT (2005), TROCCINOX (2005) and AMMA (2006).

The first task is to evaluate if measurements representative of one specific region can be used for this purpose; data are analysed using specific diagnostic that can be compatible with CCM outputs to infer average properties for each region. Each measurement campaign is considered representative of a monthly average for the sampled

region and compared directly to the daily output of the CCM for the same region and for similar QBO phase.

First results of the comparison exercise show that CCM is able to resolve water vapour and tracer distribution along the TTL with significant regional and temporal variability.

Analysis of H2O,CO and CO2 tape-recorder signals from CCM seems to correlate well with observed variability among different campaigns. Uncertainty remains on absolute values of water vapour, CO and N2O and possible explanations for that are proposed.