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Evaluation of the isentropic transport in the LMDz-REPROBUS chemistry-climate model: comparison with GRIPS general circulation models.

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Over the last ten years, there has been increasing recognition of the heterogeneous nature of stratospheric transport and mixing. It is now widely recognized that the stratosphere is divided into regions of rapid isentropic stirring separated by barrier regions in which stirring is weak and across which there is no, or relatively little, transport. Isentropic exchange of stratospheric air across those barriers has been a subject of considerable interest recently, particularly in relation to the attribution of part of the observed trends in midlatitude ozone to the isentropic transport of polar air into the midlatitudes. While stratospheric isentropic transport is commonly believed to be controlled by Rossby-wave breaking in the surf zone, a number of details remain unclear and need to be sorted out in order to obtain reliable estimates of cross-barrier mass transport and to improve its representation in climate models for long-term climate simulations. Another issue in assessing future climate change is the role of the Upper Troposphere/Lower Stratosphere (UTLS) in which isentropic transport operates on scales that are not resolved by the models. Aspects of the isentropic transport in the UTLS region as simulated by the LMDz-REPROBUS chemistry-climate model for the period 1980-2000, are examined using the effective diffusivity as a diagnostic tool. The model, which extends from the surface to about 65 km, consists of the stratospheric version of the LMDz General Circulation Model (GCM) coupled to the REPROBUS chemical-transport model. Comparisons with reanalysis and models (several GCMs participating to the SPARC-GRIPS project) are presented.