

Stratosphere-troposphere coupling: Characterizing intraseasonal variability with the annular modes

Edwin Gerber[†]; Thomas Reichler

[†]New York University, USA

Leading author: gerber@cims.nyu.edu

The intraseasonal variability and coupling between the stratosphere and troposphere in three multimodel data sets are evaluated through analysis of the annular mode patterns of variability. The seasonal and vertical structure of the annular mode variance, time scales, and vertical coherence allows us to quantify the connection between the troposphere and stratosphere in models and observations. We compare the fidelity of the annular modes in the CMIP5 models with reanalyses, the CMIP3 coupled models, and Chemistry Climate Models from the CCMVal2 activity. These latter models are forced with specified sea surface temperatures but better represent stratospheric processes. Targeted integrations with idealized General Circulation Models have suggested that increased stratospheric variability can increase the time scales of tropospheric annular modes. Of particular interest is whether better representation of stratospheric processes in CMIP5 coupled climate models leads to improved representation of the tropospheric annular modes. The CMIP5 models are divided into groups of models with a better represented stratosphere, comparable to the Chemistry Climate Models, and those with a more coarse representation of the stratosphere, more comparable with the CMIP3 models. Comparison between these two groups helps determine the role of the stratospheric processes in the annular mode coupling. Comparison between CMIP5 models with a well resolved stratosphere and the CCMVal2 models allows us to assess the importance of coupling between the ocean and the atmosphere on the annular mode variability.