There is observational evidence for an 11-year solar cycle influence on the tropospheric monsoon circulation. Simulations with chemistry climate models (CCM) provide the opportunity to study the processes that lead to the observed changes in the troposphere.

We present results from several CCMVal simulations with the EMAC-FUB CCM covering the period 1960 to 2005. The model was forced with a) observed sea surface temperatures (SSTs), b) modeled SSTs and c) observed SSTs that were band-pass filtered to exclude a possible influence of the 11-year solar cycle on the SSTs. Moreover, observed abundances of greenhouse gases and ozone depleting substances and three major volcanic eruptions were included. A multiple linear regression method is applied to analyse the model output.

We find an 11-year solar signal in the tropospheric monsoon circulation in EMAC-FUB in late southern winter when observed SSTs are prescribed to the model. Under solar maximum conditions there is stronger than average upward motion over the Arabian peninsula. Simultaneously, the upwelling in the Hadley circulation is weakened. A similar signal cannot be found with the modeled SSTs as lower boundary conditions. The solar signal in the simulation forced with the filtered SSTs is qualitatively similar to the case with unfiltered observed SSTs, but considerably weaker. This is an indication for solar cycle - SST interactions contributing to the observed solar signal in the monsoon.