

SPARC SOLARIS & HEPPA intercomparison activities: A comparison of the 11-year solar signal, the ENSO signal and the QBO signal in transient CCM simulations using filtered forcings

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The origin of the observed double peak structure of the 11-year solar signal in e.g. tropical ozone profiles and the related temperature response is still unknown and models have difficulties to simulate this structure. It may be due to nonlinear interaction between the 11-year solar cycle, the El Niño Southern Oscillation variability in sea surface temperatures (SST) and the quasi biennial oscillation (QBO). We present results from CCM simulations within the SPARC SOLARIS initiative with the EMAC-FUB model. The model was forced with observed greenhouse gases and ozone depleting substances. The intention was to make the SST-, the QBO- and the solar forcing linearly independent. To this end an observed SST time series was band pass filtered to retain periods from 0 to 2 years and from 3 to 7 years, and an observed QBO time series was filtered to retain periods between 0.75 and 4 years. Thus, decadal oscillations as well as possible mutual influences between the QBO and the SSTs are excluded. The filtered forcings were prescribed to the model simultaneously and in single-forcing simulations with only-solar, only-QBO and only-SST forcing. The period 1960 to 2005 was simulated. The results are analysed by means of a state-of-the-art multiple linear regression model. Thus, the footprint of the individually applied filtered forcings can be identified. Moreover, a comparison with the simultaneously forced simulation allows to assess the linear additivity of the individual contributions.