Solar cycle in the MERRA reanalysis: (non)linear attribution analysis

Ales Kuchar

Charles University in Prague, Faculty of Mathematics and Physics, Prague, Czech Republic (kuchaale@gmail.com)

This study is focused on the variability of temperature, ozone and circulation characteristics in connection with the eleven-year cycle in the stratosphere and lower mesosphere. Considering the nonlinear interactions between stratospheric phenomena, e.g. solar cycle and QBO in the equatorial region, the analysis is based on the attribution study using multiple nonlinear techniques in addition to traditional linear approach based on the multiple linear models. The analysis was applied for the period 1979-2013 on the current reanalysis data, including the MERRA reanalysis dataset (Modern Era Retrospective-analysis for Research and Applications, NASA reanalysis for the satellite era using a new version of the Goddard Earth Observing System Data Assimilation System). Relatively novel nonlinear approach supports suggested mechanisms of solar cycle's influence in the middle atmosphere, such as impact on the Brewer-Dobson circulation and Sudden Stratospheric Warmings. The study also provides comparison of the results acquired by the linear and nonlinear techniques.