

The thesis deals with the manifestation of coupling processes of various timescales in the middle atmosphere. Longer and shorter timescales are represented here by the 11-year solar cycle (SC) and orographic gravity waves (oGWs) considered on the intraseasonal timescale of the north hemisphere winter, respectively. The first two chapters deal with the application of rigorous attribution the variability of temperature, ozone and circulation characteristics in the stratosphere and lower mesosphere with regard to the SC using multiple nonlinear techniques (support vector regression and neural networks) besides the multiple linear regression approach. The aliasing of the SC with volcanic eruptions or the El Niño Southern Oscillation is qualitatively assessed and its impact on conclusions about the top-down coupling mechanisms discussed. The last chapter examines the role of parametrized oGWs in the lower stratosphere. The Himalayan hotspot reveals common features with sudden stratospheric warmings such as the residual circulation amplification leading to a warming and ozone enrichment in the polar latitudes of the lower stratosphere.