Response of the middle atmosphere to the 11-year solar forcing: role of the dynamic

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The search for an atmospheric response on the time-scale of the 11-year solar cycle requires high quality dataset. Several data sets will be described and analyses for the solar component. These measurements cover the upper stratosphere and the mesosphere, where the direct photochemical effect is expected. The analysis of the different data set is based on the same regression linear model and the method will be described. The 11-year solar temperature response observed presents a different behavior. However, an overall adequate agreement among the results, has been obtained, and thus the global picture of the solar impact in the upper stratosphere and lower mesosphere has been obtained and suggest the contribution of the dynamic. Results from mechanistic model simulations have been analyzed to examine the effect of the solar cycle, and in particular how the level of planetary wave activity changes the effect of the solar cycle. The model is a stratosphere and mesosphere model with detailed chemical, radiative and dynamical schemes. Some results have been obtained that illustrate the crucial role played by the planetary wave forcing in the solar cycle temperature signal. Despite some spatial differences, the simulations with a specific wave forcing show good qualitative agreements with observational results; The critical wave-forcing amplitude necessary to produce such an event is very sensitive to the initial state of the atmosphere and a small change of the mean wind, due for example to an enhancement of the solar forcing, can generate a large difference in temperature, depending on the level of the wave forcing. The numerical simulations presented here suggest a mechanism by which a small change induced by the solar forcing can generate a large atmospheric response. The extension of these works on a climate model is in preparation.