The analysis of long temperature data sets show that solar response at mid and high-latitudes shows a strong dynamical contribution. Numerical simulations reveal the role of planetary waves and associated Sudden Stratospheric Warming (SSW).

The investigations of the 10-days-means of the CCM LMDz-Reprobus report successive positive and negative responses during the course of the winter of the northern hemisphere. In the model, solar minimum conditions are generally associated with a stronger vortex in early winter while solar maximum conditions experience more early SSW, as illustrated by a stronger wave mean flow interaction and reduced zonal wind at mid-latitudes in the upper stratosphere. The study emphasises that the main temperature and wind responses in the northern hemisphere can be explained by a different timing of the occurrence of SSW according to systematic small changes of the planetary wave propagation induced by the solar conditions.

In the southern hemisphere, solar changes only affect the stretch of the vortex while no SSW occurs. The largest effect appears at the end of the winter while the wind reversal occurs. The vortex breakdown for solar minimum conditions occurs earlier, probably related to its weakness.