

### **Climate and Ozone Layer in the Future: Implications of Grand Solar Minimum**

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Global warming is one of the main threats to mankind. There is high probability that anthropogenic greenhouse gases have become the dominant factor, however natural factors such as solar variability cannot be neglected. Solar activity varies in regular 11-year solar cycles. Longer periods of decreased solar activity are called Grand Solar Minima.

We investigate the effect of proposed Grand Solar Minimum in the 21<sup>st</sup> and 22<sup>nd</sup> centuries on terrestrial climate and ozone layer. The model used is SOCOL-MPIOM, which is global climate model ECHAM5 with implemented MEZON chemistry, coupled with ocean model MPIOM. For greenhouse gases and ozone depleting substances we used RCP4.5 scenario. Three simulations were performed with the only difference in solar forcing: reference run (with repeated 11-year solar cycles) weak drop and strong drop in solar irradiance, for period of 200 years (2000-2200).

The results show an increase of global surface temperature in all solar scenarios. Average global temperature showed difference of about 0.6 K at the end of running period between reference run and strong-drop run. Ozone holes are recovering in all three solar scenarios. However, in case of weak or strong drop in solar forcing, total ozone column doesn't get recovered to 1960-1980 values at the end of the simulated period.