ROMIC - SOLCHECK

Observational and modeling studies indicate a significant influence of solar variability on climate and in particular on internal climate variability modes in the coupled atmosphere-ocean system. However, the understanding of the relevant processes as well as the quantification of solar contributions to global and regional climate change remains a difficult task due to the limited availability of observations and the non-linearity of the involved processes. SOLCHECK aims at significantly advancing the understanding and quantification of the solar contribution to past, present, and future climate evolution in the Northern Hemisphere from decadal to centennial timescales. The research questions of SOLCHECK will be addressed using German community models. In addition to the German decadal climate prediction system MiKlip, we will apply chemistry-climate models that account for atmosphere-ocean feedback processes and include advanced schemes for the ozone response to solar variability, partially developed in ROMICI. Our approach is unique in several aspects: 1) the realization of ensemble simulations with advanced chemistry climate models for different combinations of fixed or transient anthropogenic and solar forcing conditions provides an unprecedented statistical basis for the assessment of solar forcing contributions to decadal climate variability and climate change, 2) performing ensemble simulations with the MiKlip system with and without solar forcing provides for the first time a robust estimate of solar contributions to decadal climate prediction skill, and 3) a range of the potential impact of a future Grand Solar Minimum and other extreme solar events under different greenhouse gas scenarios will be provided. The outcome of SOLCHECK is highly relevant to the WCRP Near-term Climate Prediction Grand Challenge and the upcoming IPCC report, and will provide the German contribution to the international WCRP/SPARC-SOLARIS/HEPPA initiative.