Solar contribution to climate change on decadal to centennial timescales (SOLCHECK)

***T. Spiegl and U. Langematz**, Institut für Meteorologie Freie Universität Berlin*

In Short

- Solar-climate-connections
- Decadal to centennial variability
- Stratosphere-troposphere-coupling
- North Atlantic Oscillation

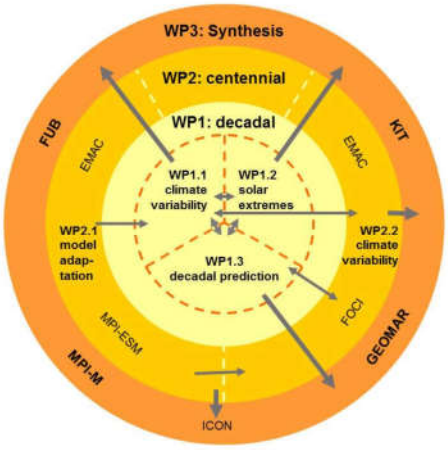

***Figure 1:** Overview on the work packages, partners and participating models in SOLCHECK. Grey arrows indicate exchange of data and/or knowledge.*

Observational and modelling 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 remain 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. As part of the project we will examine the most relevant chemical and physical processes for the transfer of the decadal solar signal, from the middle atmosphere to the surface, in large ensemble simulations with the participating SOLCHECK chemistry-climate models (CCMs). We will put emphasis on internal variability modes of the climate system such as the North Atlantic Oscillation (NAO) or the El Niño-Southern Oscillation (ENSO). This will be combined with an advanced analysis of the solar contribution to decadal climate variability in the German operational decadal prediction model system MiKlip developed at the Max-Planck-Institute for Meteorology, building on the expertise from FUB in the MiKlip-STRATO (bek00016) project. For the first time, the solar contribution to decadal climate prediction skill will be estimated which will improve decadal climate predictions in the Northern Hemisphere (NH) and therefore allow for a better planning of national mitigation strategies. SOLCHECK will also focus on the centennial timescale. The effects of long-term variations of solar activity on climate will be investigated and quantified, in particular potential counteracting effects of a future Grand Solar Minimum with anthropogenic climate change, a topic highly relevant for the 6th IPCC assessment report. As part of the process understanding in the middle atmosphere, we will implement and test computationally more efficient ozone chemistry schemes which might be used in future climate models and prediction systems for upcoming IPCC reports to better represent solar signals in climate. 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. SOLCHECK is a joint project of four partners: Prof. Dr. Katja Matthes,(GEOMAR Kiel), Dr. Miriam Sinnhuber (KIT), Dr. Holger Pohlmann (MPI for Meteorology) and Prof. Dr. Ulrike Langematz (FUB). SOLCHECK will be funded within the BMBF funding program Role of the middle atmosphere in climate II (ROMIC-II).

More Information

[1] https://www.geo.fu-berlin.de/en/met/ag/strat/index.html

Project Partners

FU Berlin, Institut für Meteorologie, Atmosphärendynamik