

## **VARIABILITY OF THE SUN AND ITS TERRESTRIAL IMPACT (VARsITI) – THE CURRENT SCIENTIFIC PROGRAM OF THE SCIENTIFIC COMMITTEE FOR SOLAR-TERRESTRIAL PHYSICS (SCOSTEP)**

**K. Georgieva, K. Shiokawa, N. Gopalswamy**

*SRTI BAS, Sofia, Bulgaria, kgeorgieva@bas.bg.*

The Scientific Committee on Solar Terrestrial Physics (SCOSTEP) is an interdisciplinary body of the International Council for Science (ICSU). Its principal task is to promote international interdisciplinary programs in solar-terrestrial physics, and to organize and coordinate such programs. The previous SCOSTEP's programs CAWSES (Climate and Weather of the Sun-Earth System), 2004-2008 and its continuation CAWSES II, 2009-2013, were devoted to discovering the important processes that connect changes at the solar surface with features in the geospace environment and ultimately with climate variability. Great progress was achieved towards this aim, and towards the possibility of the worldwide research community to access international data sets, distributed sensor networks, virtual observatories, advanced computational and visualization facilities, the most sophisticated Sun-to-Earth community models available, and to communicate with each other across discipline and national boundaries. However, during the last solar minimum in 2008-2009, the solar activity became extremely low. Then the next solar maximum of sunspot cycle 24 shows much lower activities compared with the previous two solar maxima in cycles 22 and 23, and in fact with any solar maximum since the beginning of the 20th century. This took most of the solar-terrestrial scientists by surprise, as the current solar dynamo theories are unable to predict the long-term solar activity variations. It is not clear whether the last deep solar minimum and the current low solar maximum may signal the end of the recent period of relatively high solar activity, and what long-term solar activity variations we can expect in the future. Moreover, it is not clear to which extent our present understanding of how the Sun influences the geospace, which is based on instrumental observations taken during only the recent period of possibly unusually high solar activity in the second half of the 20th century, will hold during periods of more moderate to low solar activity which may follow. And it is still more unclear how all this would affect global climate change. Four scientific projects are carried out in VarSITI: (1) Solar Evolution and Extrema (SEE), (2) International Study of Earth-Affecting Solar Transients (ISEST), (3) Specification and Prediction of the Coupled Inner-Magnetospheric Environment (SPeCIMEN), and (4) Role Of the Sun and the Middle atmosphere/thermosphere/ionosphere In Climate (ROSMIC). The goals of SEE are to reproduce the Sun's magnetic activity as observed in the sunspot and cosmogenic records in dynamo simulations, and to amalgamate the best current models and observations for solar spectral and wind output over the Earth's history; to estimate the future evolution of the solar activity, and to determine the size and expected frequency of extreme solar events such as flares and coronal mass ejections (CMEs). ISEST seeks to understand how CMEs and corotating interaction regions (CIRs) propagate and evolve, drive shocks and accelerate energetic particles in the heliosphere, and develop space weather prediction capability; to establish a database of Earth-affecting solar transient events including CMEs, CIRs, flares, and energetic particle events based on remote sensing and in-situ observations from an array of spacecraft, run observation campaigns, develop empirical, theoretical, and numerical models of CME propagation and prediction, validate models using observations. SPeCIMEN develops quantitative prediction and specification of the Earth's inner magnetospheric environment based on Sun/solar wind driving inputs through a combination of physical and statistical modeling, theory, and observations from various platforms. The task of ROSMIC is to understand the impact of the Sun on the terrestrial middle atmosphere/lower thermosphere/ionosphere and Earth's climate and its importance relative to anthropogenic forcing over various time scales from minutes to centuries.