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The ESA Virtual Space Weather Modelling Centre

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The ESA Virtual Space Weather Modelling Centre (VSWMC) project was defined as a long term project including different successive parts. Parts 1 and 2 were completed in the first 4-5 years and designed and developed a system that enables models and other components to be installed locally or geographically distributed and to be coupled and run remotely from the central system. A first, limited version went operational in May 2019 under the H-ESC umbrella on the ESA SSA SWE Portal. It is similar to CCMC but interactive (no runs on demand) and the models are geographically distributed and coupled over the internet.

The goal of the ESA project "Virtual Space Weather Modelling Centre - Part 3" (2019-2021) was to further develop the Virtual Space Weather Modelling Centre, building on the Part 2 prototype system and focusing on the interaction with the ESA SSA SWE system. The objectives and scope of this new project include maintaining the current operational system, the efficient integration of 11 new models and many new model couplings, including daily automated end-to-end (Sun to Earth) simulations, the further development and wider use of the coupling toolkit and front-end GUI, making the operational system more robust and user-friendly. The VSWMC-Part 3 project finished recently.

The 11 new models that have been integrated are Wind-Predict (a global coronal model from CEA, France), the Coupled Thermosphere/Ionosphere Plasmasphere (CTIP) model, Multi-VP (another global coronal model from IRAP/CNRS, France), the BIRA Plasma sphere Model of electron density and temperatures inside and outside the plasmasphere coupled with the ionosphere (BPIM, Belgium), the SNRB (also named SNB3GEO) model for electron fluxes at geostationary orbit (covering the GOES 15 energy channels >800keV and >2MeV) and the SNGI geomagnetic indices Kp and Dst models (University of Sheffield, UK), the SPARX Solar Energetic Particles transport model (University of Central Lancashire, UK), Spenvis DICTAT tool for s/c internal charging analysis (BISA, Belgium), the Gorgon magnetosphere model (ICL, UK), and the Drag Temperature Model (DTM) and operations-focused whole atmosphere model MCM being developed in the H2020 project SWAMI. Many new couplings have also been implemented and a dynamic coupling facility has been installed. Moreover, Daily runs are implemented of two model chains covering the whole Sun-to-Earth domain. The results of these daily runs are made available to all VSWMC users.

We will provide an overview of the state-of-the-art, including the new available model couplings and daily model chain runs, and demonstrate the system.

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