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Toward an updated empirical thermospheric models from additional thermospheric data and new geomagnetic indices: perspectives from the H2020 SWAMI activity

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Scientific Low Earth Orbiting (LEO) satellites monitor parameters that are relevant for space weather quantification and modelling. The missions provide global coverage and, thanks to their duration of several years, they also provide excellent opportunities for developing global empirical and physical models of the ionosphere and thermosphere.
This presentation includes perspectives from the H2020 project SWAMI (Space Weather Atmosphere Model and Indices) that started in January 2018. Within this activity, the CIRA thermosphere specification model DTM2013 will be improved by assimilating more neutral density data to reduce remaining biases due to incomplete modelling of solar activity and seasonal variations. These new data includes five more years of GRACE high-resolution observations from 2012-2016, the last year of the GOCE mission, Swarm mean density data, and mean neutral densities from 2010-2017 inferred from geodetic satellites at about 800 km.
In the early phase of the project, the DTM2013 model will be compared with these new density data to identify systematic errors. The model performance under geomagnetic storm conditions will be analysed and used as a benchmark for comparison with new models that are parameterized with a higher cadence (< 3 h) Kp index and empirical Kp predictions.
Within the SWAMI activity, the upper boundary of the Met Office Unified Model (UM) shall be extended from around 85 km to around 150-170 km. A key building block of this extended UM is the development of new radiation schemes in the ultraviolet and extreme ultraviolet parts of the spectrum. The DTM will then be coupled to the UM at around the 120-160 km altitude region in order to create a whole atmosphere model. The resulting model can be used for launch operations, re-entry computations, orbit prediction, and aeronomy and space weather studies.