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IMPLEMENTATION AND ASSESSMENT OF A NEW BLENDED WHOLE ATMOSPHERE MODEL IN REENTRY SERVICES FOR SPACE SURVEILLANCE & TRACKING OPERATIONS

Abstract

As part of the Horizon 2020 Space Weather Atmosphere Model and Indices (SWAMI) project, a new whole atmosphere model has been produced by combining and developing improved neutral atmosphere and thermosphere models. Deimos coordinates the activities of the consortium, in which CNES, the Met Office and GFZ-Potsdam are partners. Simultaneously, new geomagnetic activity indices with higher time cadence have been developed to enable better representation of thermospheric variability in the models, as well as their improved forecast.

The project aims to develop a unique new MOdel of the Whole Atmosphere model (MOWA), by extending and blending the Unified Model (UM), which is the Met Office weather and climate model, and the CNES Drag Temperature Model (DTM), which is a semi-empirical model that covers the 120–1500 km altitude range and is already the most accurate thermosphere model presently available, with relative errors in the 200–300 km altitude range between 5–10 %. A user-focused operational tool for satellite applications is being developed based on this, the MOWA Climatological Model (MCM). In addition, the improved geomagnetic index H_p is being introduced in DTM for enhanced nowcast and forecast capabilities.

MCM and DTM2020 are being developed and integrated into operational SST reentry services at Deimos, where its performance and capacities are going to be compared against other typical models used in these environments, like JB2008, NRLMSISE-00 or the previous DTM2013. This analysis will consider different values at LEO regime for altitude, eccentricity and inclination, at different epochs to cover a representative range of seasonal variations and solar activity, and different orbit lifetime estimations. This shall show the differences made in the nowcast and forecast of geomagnetic indices and in improved neutral atmosphere and thermosphere models, both products of the SWAMI H2020 project. We will also

use available data of past reentries to assess the quality of the aforementioned models.