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The empirical Drag Temperature Model 2020 (DTM2020) of the thermosphere

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Empirical thermosphere models are used in satellite orbit determination and prediction programs to compute the atmospheric drag force, as well as in upper atmosphere studies. They predict temperature and (partial) density as a function of the location (altitude, latitude, longitude, local solar time), solar and geomagnetic activities, and day-of-year. The first Drag Temperature Model, DTM78, was developed in the seventies, and it has been upgraded several times since. The most recent version, DTM2020, runs on the PITHIA e-science centre.

The DTM models are constructed by fitting to a density database to reproduce the mean climatology of the thermosphere. The model (spatial) resolution is of the order of thousands of kilometers. Therefore, density variations with smaller scales are sources of geophysical noise. The solar- and geomagnetic proxies limit the temporal resolution of these models to 1 day and 3 hours, respectively. As a result, small scale and high-frequency density perturbations, which are present mostly at high latitudes, contribute to the prediction uncertainty because they cannot be modeled. The model algorithm, the total and partial density and temperature observations, and the proxies, used in the construction of DTM2020 will be presented, followed by a demonstration on how to run the model on the e-science centre.



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