

# Use of two-line element data for thermosphere neutral density model calibration

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Traditional empirical thermospheric density models are widely used in orbit determination and prediction of low-Earth satellites and debris objects. Unfortunately, these models often exhibit large density errors. These translate into orbit errors, adversely affecting applications such as re-entry predictions and conjunction event analyses. The extensive database of Two-Line Element (TLE) orbit data contains a wealth of current and historical information on satellite drag. This data is available at a sufficiently high spatial and temporal resolution to allow a calibration of existing neutral density models in low degree and order spherical harmonics, at at least two altitude levels and with a temporal resolution and latency of around one day. We are therefore converting new TLE data for selected objects to satellite drag data automatically on a daily basis, taking special care of data editing. The resulting drag data is then used in a daily adjustment of calibration parameters, which modify the output of an existing empirical density model. Using this method, the model accuracy can be increased beyond the limits imposed by the traditional use of solar and geomagnetic activity proxies.