

## Atmospheric Effects Topical Group

key questions :

- 1 - What are the scales (time and space) of the density and wind variability due to EUV/UV radiation, geomagnetic disturbances, and forcing due to disturbances propagating from lower altitudes?
- 2 - Which indices should be used to represent solar EUV/UV and geomagnetic activity?
- 3 - What is the accuracy of upper atmosphere density and wind (empirical or first-principle) models?
- 4 - What is the accuracy of solar and geomagnetic activity forecasts?
- 5 - Which density data sets are pertinent to use in this study, i.e., for analysis and to improve models, and which information is missing (i.e., is there a key question we cannot address presently)?
- 6 - How should we compute the drag coefficient?

## Atmospheric Effects Topical Group

Point 5: data are very sparse (in time and space)

Point 3: models are currently not accurate enough for SSA service; modeling effort going on in GB and F (so far as I know of)

Processing of radar tracking data and subsequent propagation of thermosphere model corrections, in near real time, is a skill we do not possess in Europe for now.

ESA general study: Air Density Models

## Studies in Europe

Air density models derived from multi-satellite drag observations (AO/1-5394/07/NL/HE)

### Objectives:

The main objective of this study is to derive algorithms and methods to retrieve thermospheric density using continuous and contemporaneous measurements from a constellation of satellites equipped with an accelerometer and GPS. The study shall provide an assessment whether (and by how much) the constellation analysis improves to

- validate, assess, and calibrate existing air density models,
- calibrate the accelerometers on board of the satellites,
- derive air density gradients and air density maps for the thermosphere,
- estimate, or evaluate the impact of, thermospheric winds,
- geophysically interpret the spatial-temporal evolution of the thermosphere in response to solar and geomagnetic activity

***compared to a single satellite modelling.*** The algorithms shall be tested using real data from existing satellites, namely CHAMP, GRACE-A and GRACE-B under different geomagnetic conditions. Furthermore, tests using simulated data for the Swarm constellation shall be conducted.

FINAL REPORT: Spring 2009