1) In test_HPOP, we define global variables: const (astronomical and mathematical constants), Cnm (normalized gravity field coefficients), Snm (normalized gravity field coefficients), AuxParam (struct that represents model parameters and time for orbit propagator), eopdata (Earth orientation parameters), swdata (space weather data for nrlmsise00 model), SOLdata (solar storm indices for JB2006 & JB2008 models), DTCdata (geomagnetic storm indices for JB2008 model) APdata (Ap data for JB2006 model), PC (planetary coefficients for JPL ephemerides computation).

2) Download Earth orientation parameters from the following link (if it is out of date).

https://celestrak.org/SpaceData/EOP-All.txt

3) Download space weather data from the following link (if it is out of date).

https://celestrak.org/SpaceData/SW-All.txt

4) If you want to use the JB2008 or JB2006 model, update SOLFSMY.txt, DTCFILE.txt, and SOLRESAP.txt from the following link (if they are out of date):

http://sol.spacenvironment.net/jb2008/indices.html

5) The initial state vector and model parameters are read from InitialState.txt. Then the initial state vector is transformed from ECEF coordinate system to ECI. After that, Ephemeris.m is called to start integration. In Ephemeris.m, Accel.m is called for computation of the state vector's derivative.

6) In Accel.m, IERS.m is called to interpolate Earth orientation parameters. Then the matrix E is computed for ICRS to ITRS transformation. After that, JPL_Eph_DE440.m is called for the calculation of planetary positions. Afterward, accelerations of perturbing forces are computed.

7) Ephemeris.m successfully finishes calculations, and satellite state vectors in the ECI (slightly different from J2000) coordinate system are printed in SatelliteStates.txt. Finally, ECEF state vectors of the satellite (Eph_ecef) are computed, and their discrepancy with the precise orbit (True_Eph) is calculated and plotted.

Note that the precise orbit of the Envisat is produced by observations and its accuracy is at the centimeter level.

High Precision Orbit Propagator