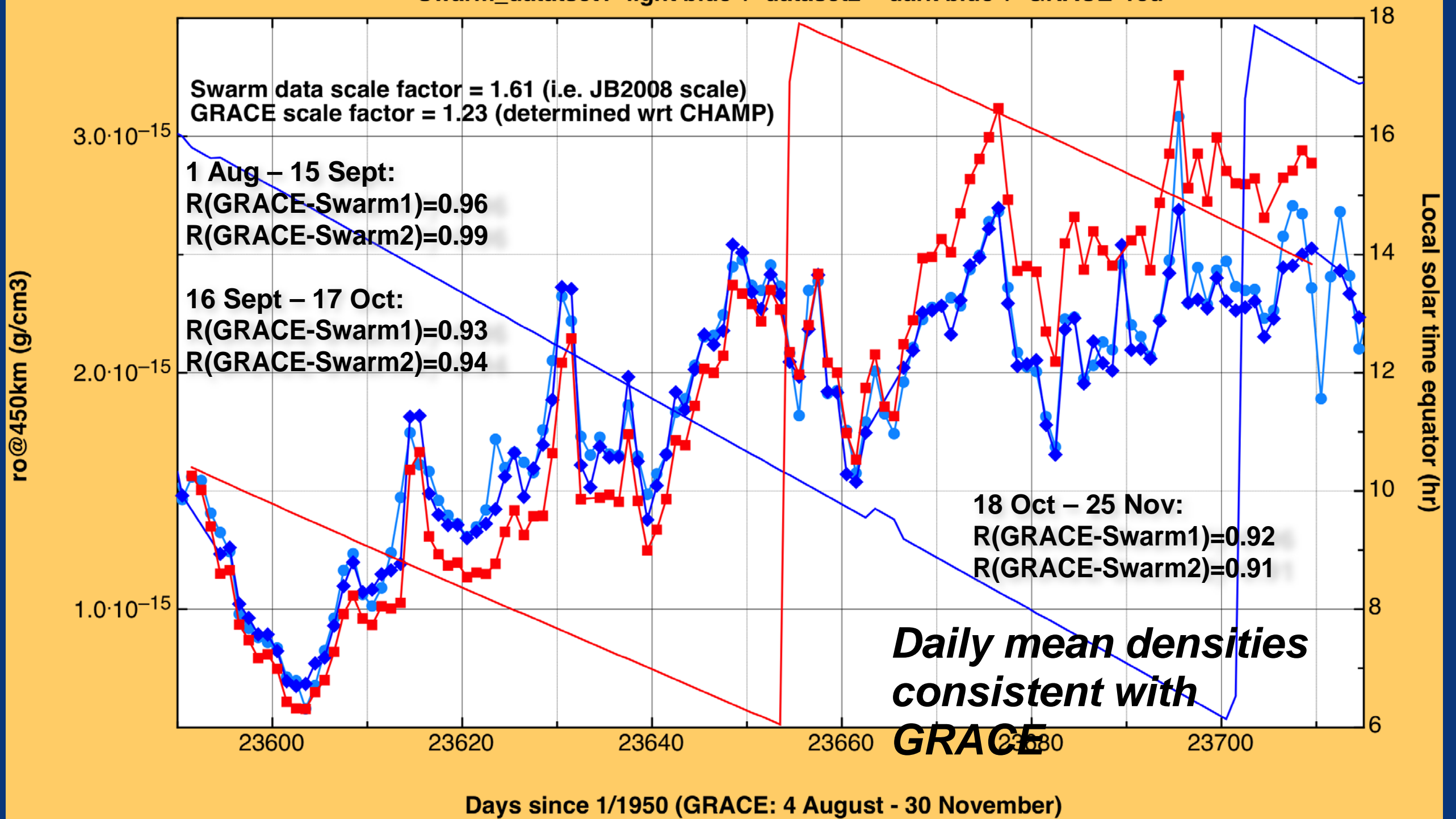# Atmospheric effects

- Swarm

- ITT ESA: GOCE reentry

- NASA living with a star: LEO drag

Swarm-C densities: Comparison with GRACE densities

Daily mean densities@450 km (normalized with JB2008)
Swarm_datatset1=light blue / dataset2 = dark blue / GRACE=red

Swarm data scale factor = 1.61 (i.e. JB2008 scale)
GRACE scale factor = 1.23 (determined wrt CHAMP)

1 Aug – 15 Sept:
R(GRACE-Swarm1)=0.96
R(GRACE-Swarm2)=0.99

16 Sept – 17 Oct:
R(GRACE-Swarm1)=0.93
R(GRACE-Swarm2)=0.94

18 Oct – 25 Nov:
R(GRACE-Swarm1)=0.92
R(GRACE-Swarm2)=0.91

Daily mean densities consistent with GRACE

ro@450km (g/cm3)

Local solar time equator (hr)

Days since 1/1950 (GRACE: 4 August - 30 November)

Detailed Proposal to ESA

for the ITT

Benchmarking re-entry prediction uncertainties
(PREGO)

The objective of this activity is to improve the capacities on re-entry prediction thanks to a complete analysis of the outstanding data set related to the GOCE re-entry occurred in October/November 2013. This analysis and its applicability to other re-entering objects are the main activities to be undertaken.
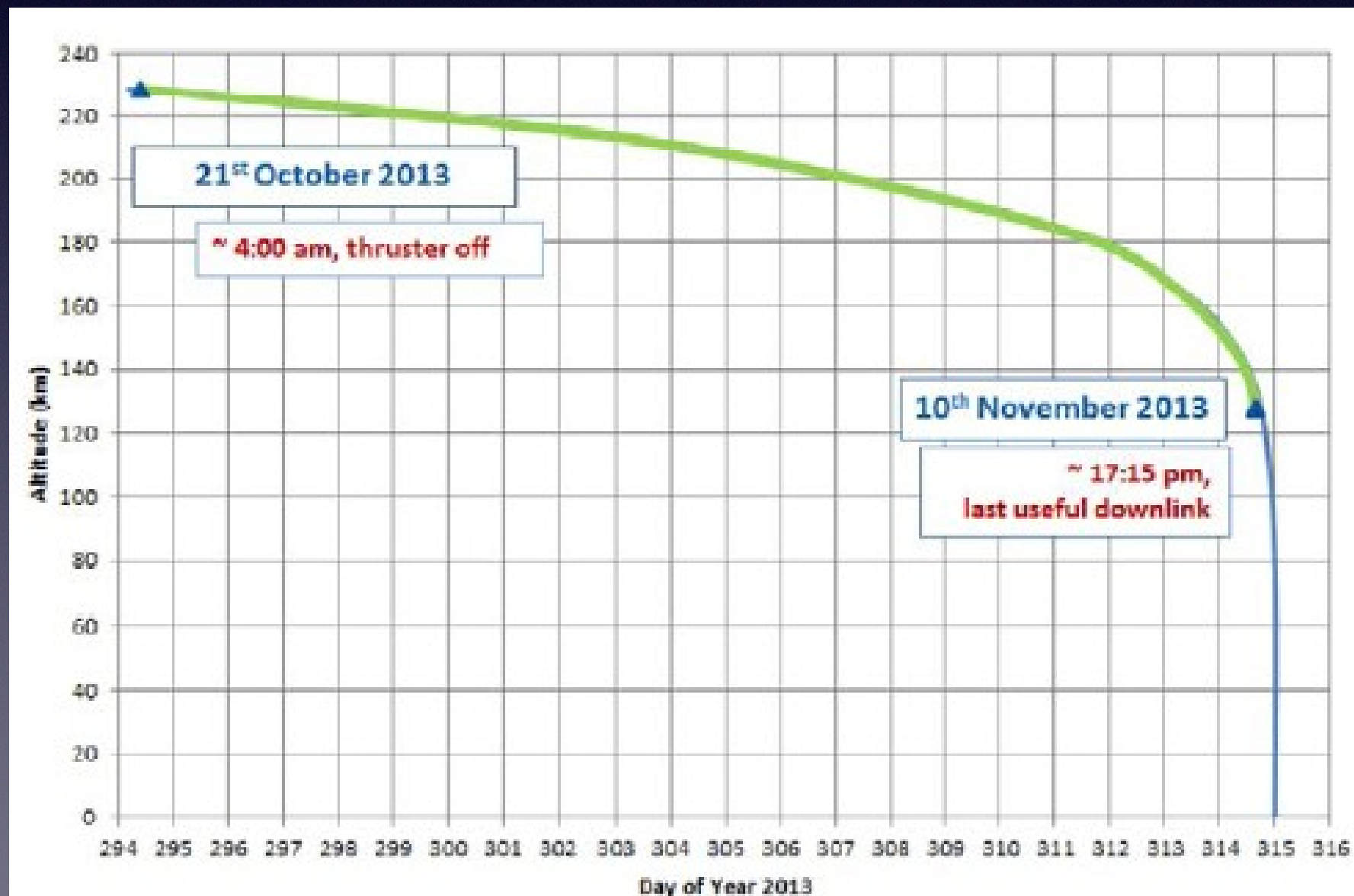
NASA LWS Institute: Nowcast of Atmospheric Drag for LEO Spacecraft

Task 1.1 Variations of solar spectra (X-ray, EUV, FUV) under different time scales and conditions: long term (multi decades), solar cycle, solar rotation, flares, etc. from observations and modeling (A. Vourlidas, L.J. Paxton).

Task 1.2 Thermospheric response to solar radiation changes during geomagnetic quiet times (E. Sutton and A. Stephan, S. Bruinsma)

Task 1.3 Storm-time thermospheric variations through data analysis (Y. Zhang, L.J. Paxton, M. Mlynczak, D. Knipp, H. Liu, S. Bruinsma)

Task 1.4 Modeling Storm-time thermosphere and ionosphere variations (A. Ridley, E. Sutton, G. Bust, and Y. Zheng)

Task 1.5 Thermospheric response to lower atmospheric forcing (H. Liu, Y. Zhang)

Task 1.6 Nitric Oxide feedback effect on storm-time thermosphere (D. Knipp, M. Mlynczak, and Y. Zhang)

Task 1.7 Using observations of NO IR emissions as a possible real-time forecast tool (M. Mlynczak).

Task 1.8 Thermospheric neutral wind during geomagnetic quiet and storm times (E. Sutton, H. Liu, and A. Ridley, J. Thayer)

Task 1.9 Thermospheric and ionospheric assimilation (G. Bust, A. Stephan, Y. Zhang)

Task 1.10 Issues in LEO satellite operations, lessons from collision events (J.C. Jones, N. Ericson, M.D. Hejduk, W. Lee)

Task 1.11 Comparing electromagnetic force and atmospheric drag force (M.D. Hejduk, W. Lee)

Task 1.12 Effect of composition (e.g. helium) on thermospheric density response to storms (J. Thayer, S. Bruinsma)

And also:

- CNES: website with F3.5....F30 (also forecast)

- AFRL/NOAA/CIRES: TIEGCM with He

- ASTRA/AF: New thermosphere data assimilation model (Dragster)