

Space weather induced thermosphere disturbances

Chantal Lathuillère

Laboratoire de Planétologie de Grenoble
Bâtiment D de Physique
BP 53
F-38041 Grenoble Cedex 9, France

Michel Menvielle

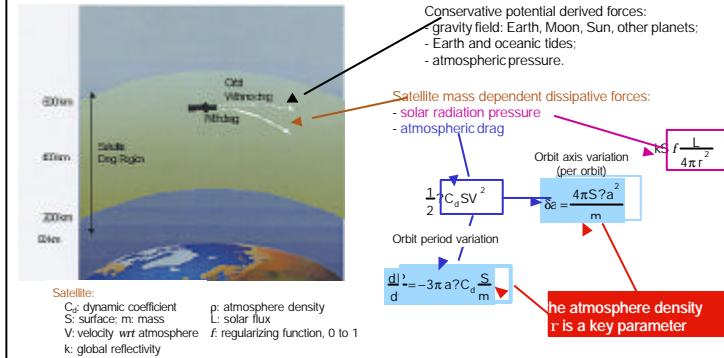
Centre d'études des Environnements Terrestre et Planétaires
4, Avenue de Neptune
F-94100 Saint Maur, France

- > Thermosphere perturbations and orbitography
- > WINDII data
- > Impact of magnetic activity on thermosphere temperature

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Thermosphere perturbations and orbitography (1)

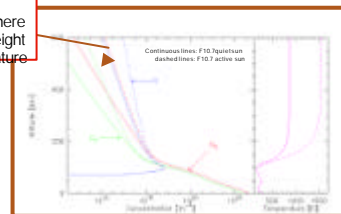
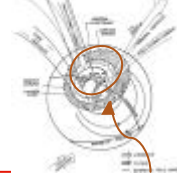


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Thermosphere perturbations and orbitography (2)

The vertical concentration profiles of atmosphere components is governed by their scale height that depends on the exosphere temperature



(Courtesy of J. Liliensten)

Joule deposit in the auroral zone related to the field aligned currents/auroral electrojets system result in a significant thermosphere heating

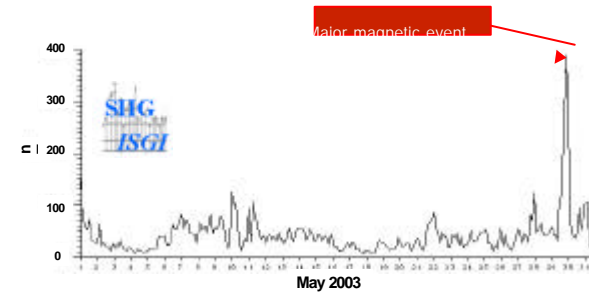
The magnetic activity impacts on the vertical thermosphere density profile

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Thermosphere perturbations: a case history (1)

Geomagnetic activity (3-hour am indices)

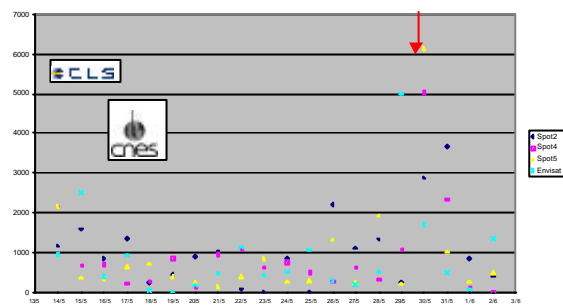


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Thermosphere perturbations: a case history (2)

Along-track component - comparison predicted 1 day / adjusted DORIS orbits



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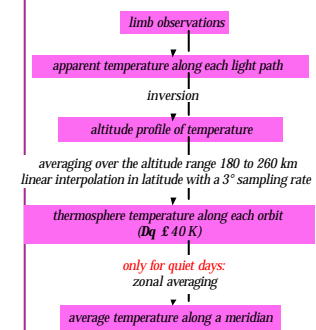
WINDII data



- Michelson interferometer developed by a French Canadian team;
- observes the natural airglow at 5 different wavelengths, at the Earth limb;
- among them the red line (at 630 nm) and the green line (at 557,7 nm) of atomic oxygen
- thermosphere temperature profiles have been retrieved from the red line data (the red line emission maximizes around 220 km altitude);
- data are available between 1992 and 1996 (declining phase of Solar Cycle 22).

9 disturbed days ($A_p > 13$; $\max(A_p) = 65$);
33 quiet days ($A_p < 12$).

Data processing

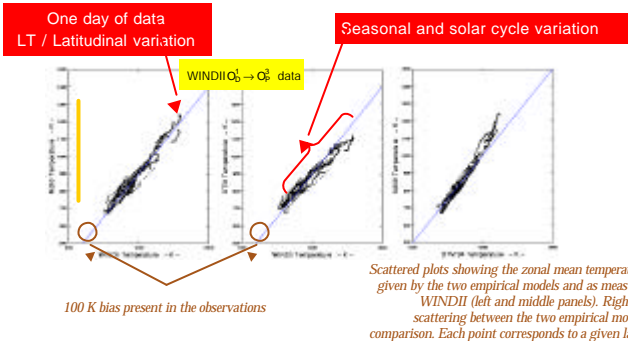


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Quiet magnetic situations

MSIS and DTM-94 account well for WINDII temperatures

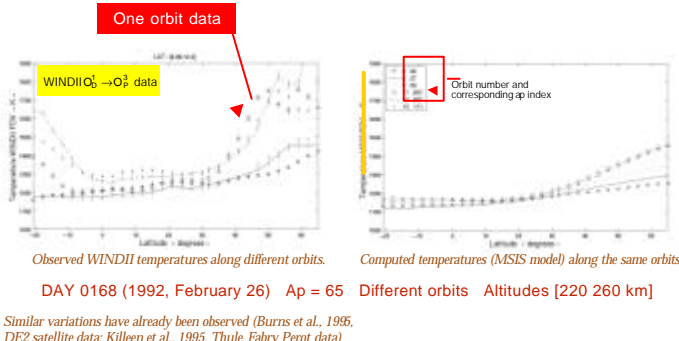


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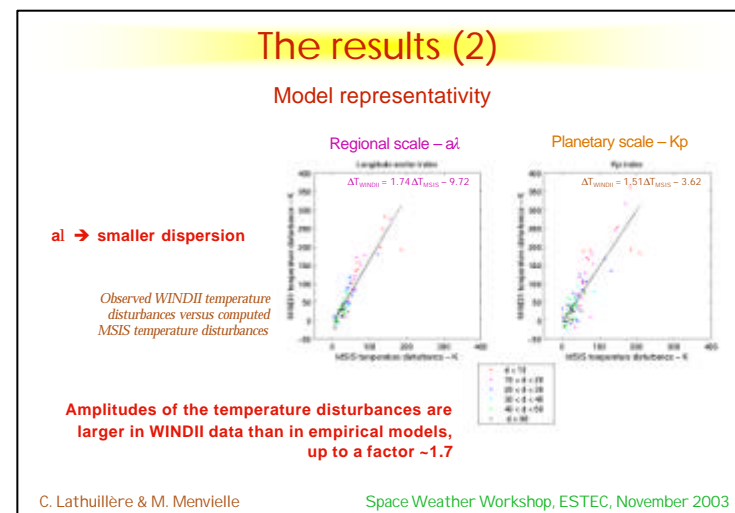
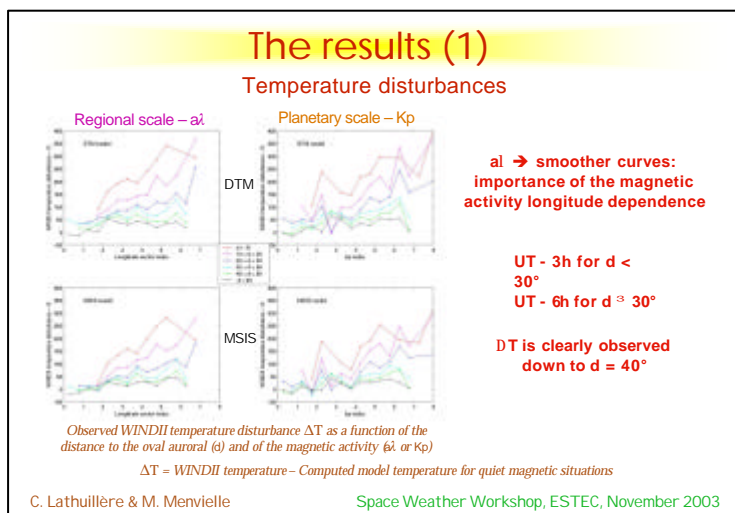
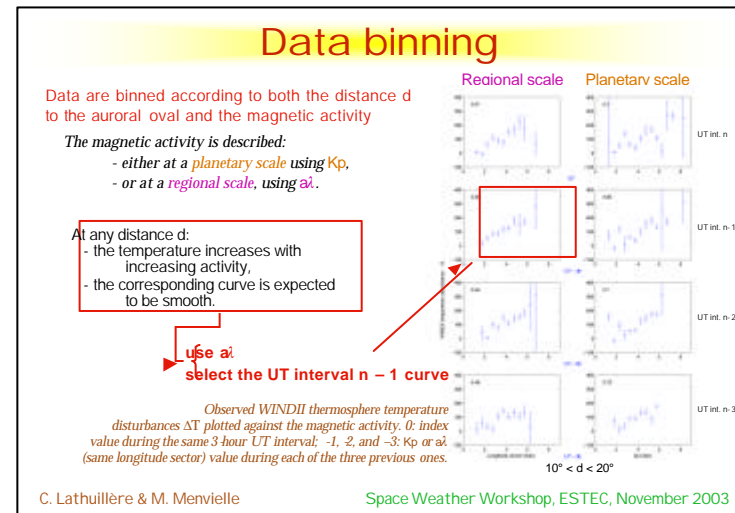
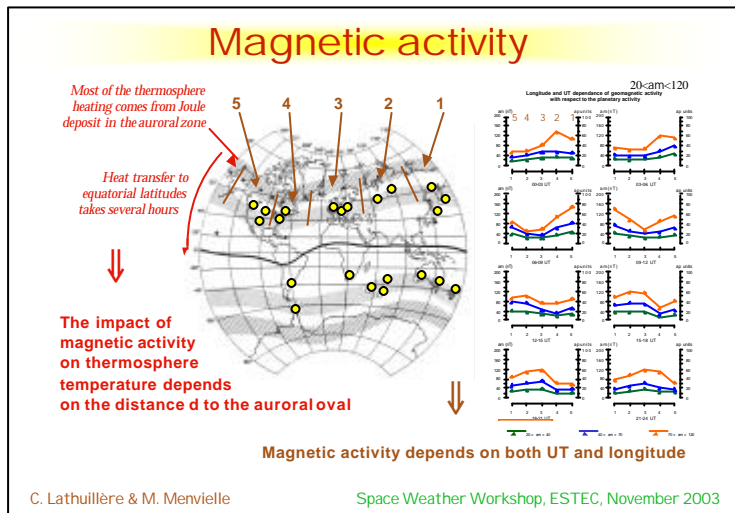
Disturbed magnetic situations

MSIS and DTM-94 do not account for WINDII temperatures



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Perspectives

Study of new proxies for semi-empirical thermosphere models.

e.g.: magnetic activity longitude sector indices;
magnetic indices over shorter time intervals
Mg II instead of F_{10.7}

Improvement of existing semi-empirical thermosphere models, and
development of new ones.

New set of data on thermosphere total density (CHAMP, GRACE) and
temperature (???)