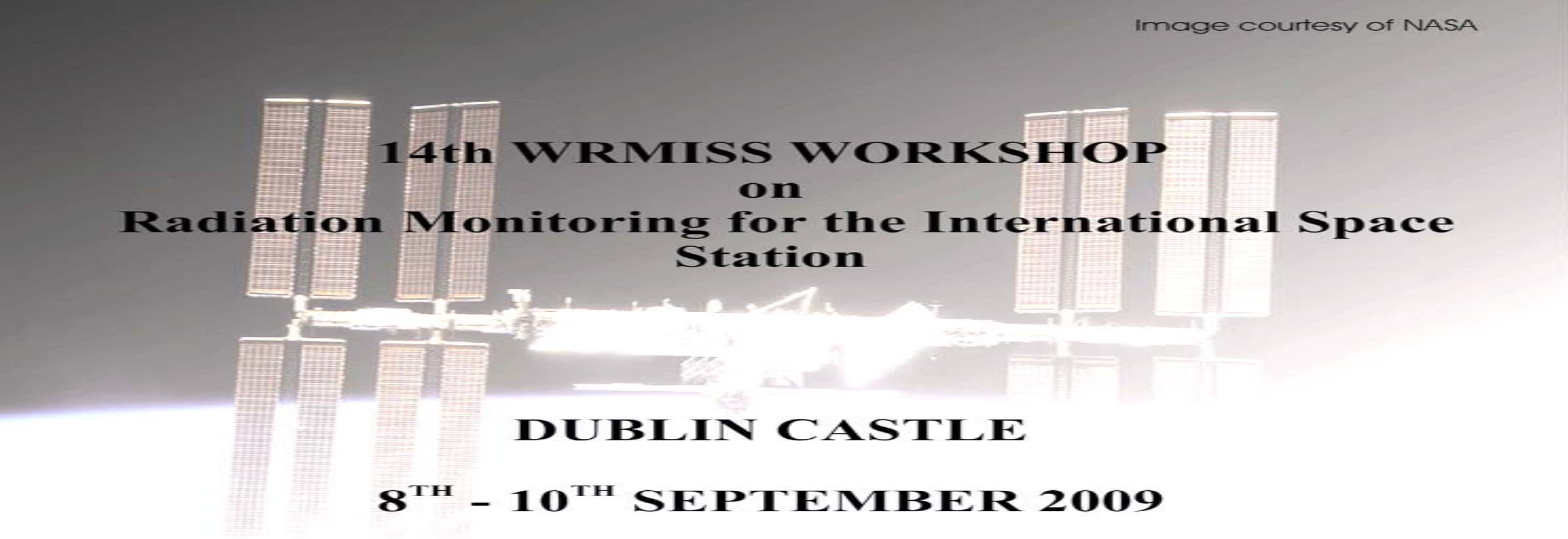
Image courtesy of NASA



14th WRMISS WORKSHOP on Radiation Monitoring for the International Space Station

DUBLIN CASTLE

8TH - 10TH SEPTEMBER 2009

HOSTED AND ORGANISED BY THE

DUBLIN INSTITUTE FOR ADVANCED STUDIES

CHAIRMAN: Guenther Reitz, DLR
LOC: Denis O'Sullivan, DIAS
Eileen Flood, DIAS
Anne Grace, DIAS

Skobeltsyn Institute of Nuclear Physics
Lomonosov Moscow State University

Long-term variation of the trapped proton flux

Kuznetsov N.V., ***Nikolaeva N.I.***, *Panasyuk M.I.*
Skobeltsyn Institute of Nuclear Physics

WRMISS 14
Dublin Castle
8-10th September 2009

Satellite data

NPOES-15 07.1998
NPOES-17 07.2002

Orbit 820 km, 98 deg

Proton energy channels

‘0deg detector’

30-80 keV
80-240 keV
240-800 keV
0.8-2.5 MeV
2.5-6.9 MeV
>6.9 MeV

‘90deg detector’

30-80 keV
80-240 keV
240-800 keV
0.8-2.5 MeV
2.5-6.9 MeV
>6.9 MeV

16-35 MeV
35-70 MeV
70-140 MeV
>140 MeV

Solar cycle dependence

NPOES-17 (> 70 MeV)

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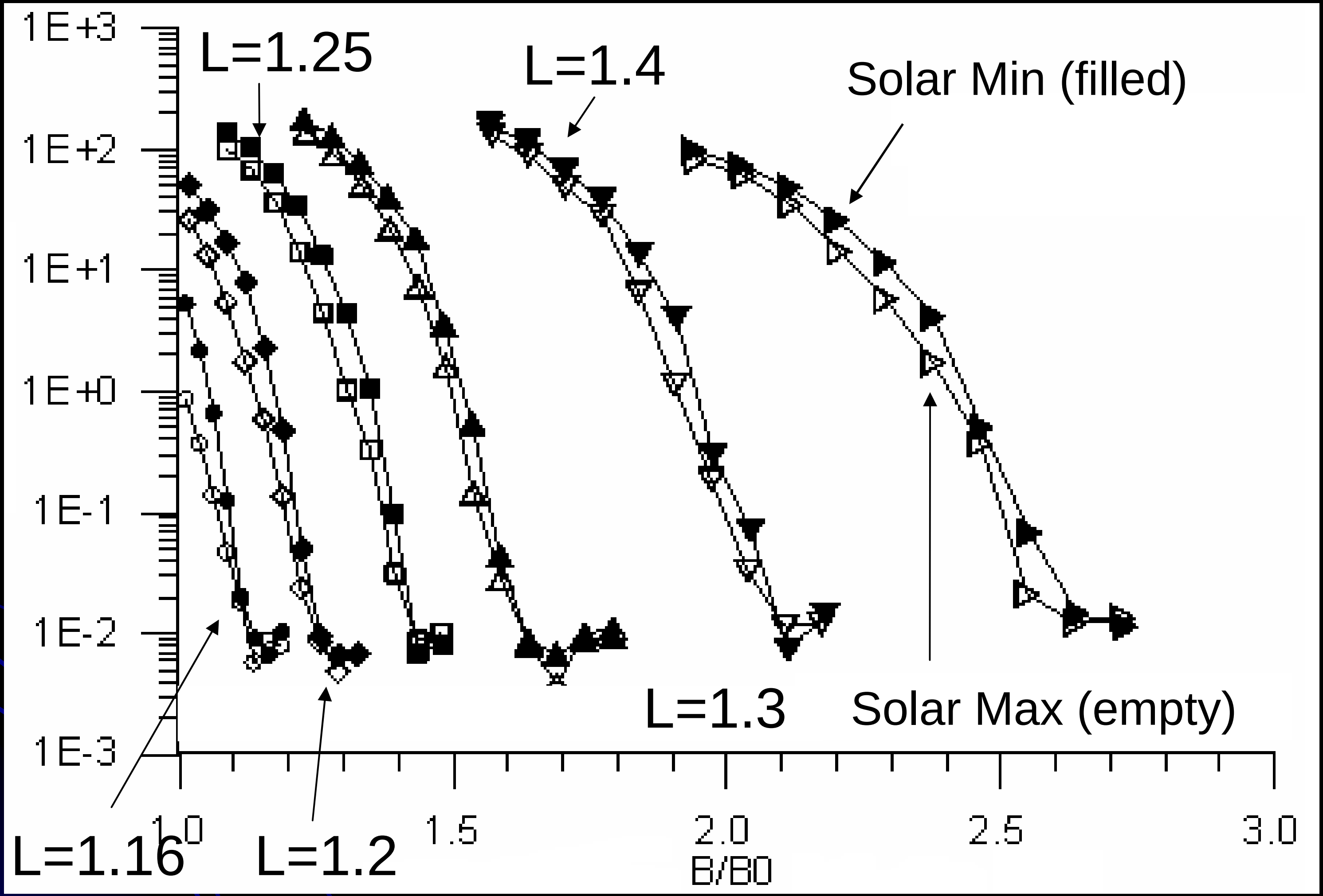
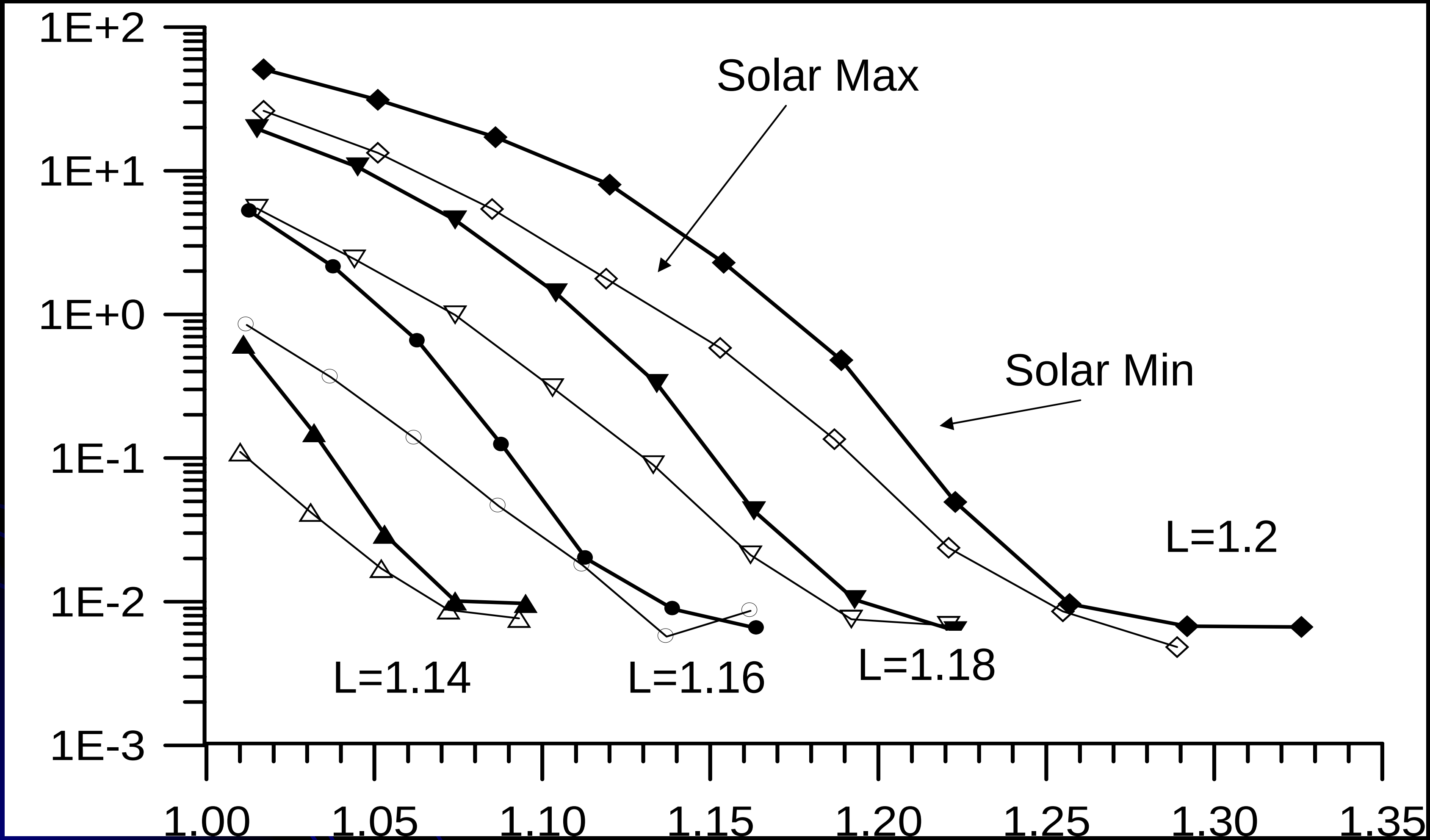


Trapped proton fluxes measured by NPOES-17 satellite in solar maximum and solar minimum for several L-shells

Solar cycle dependence

NPOES-17 (> 70 MeV)



Trapped proton fluxes measured by NPOES-17 satellite in solar maximum and solar minimum for several L-shells

Solar cycle variation

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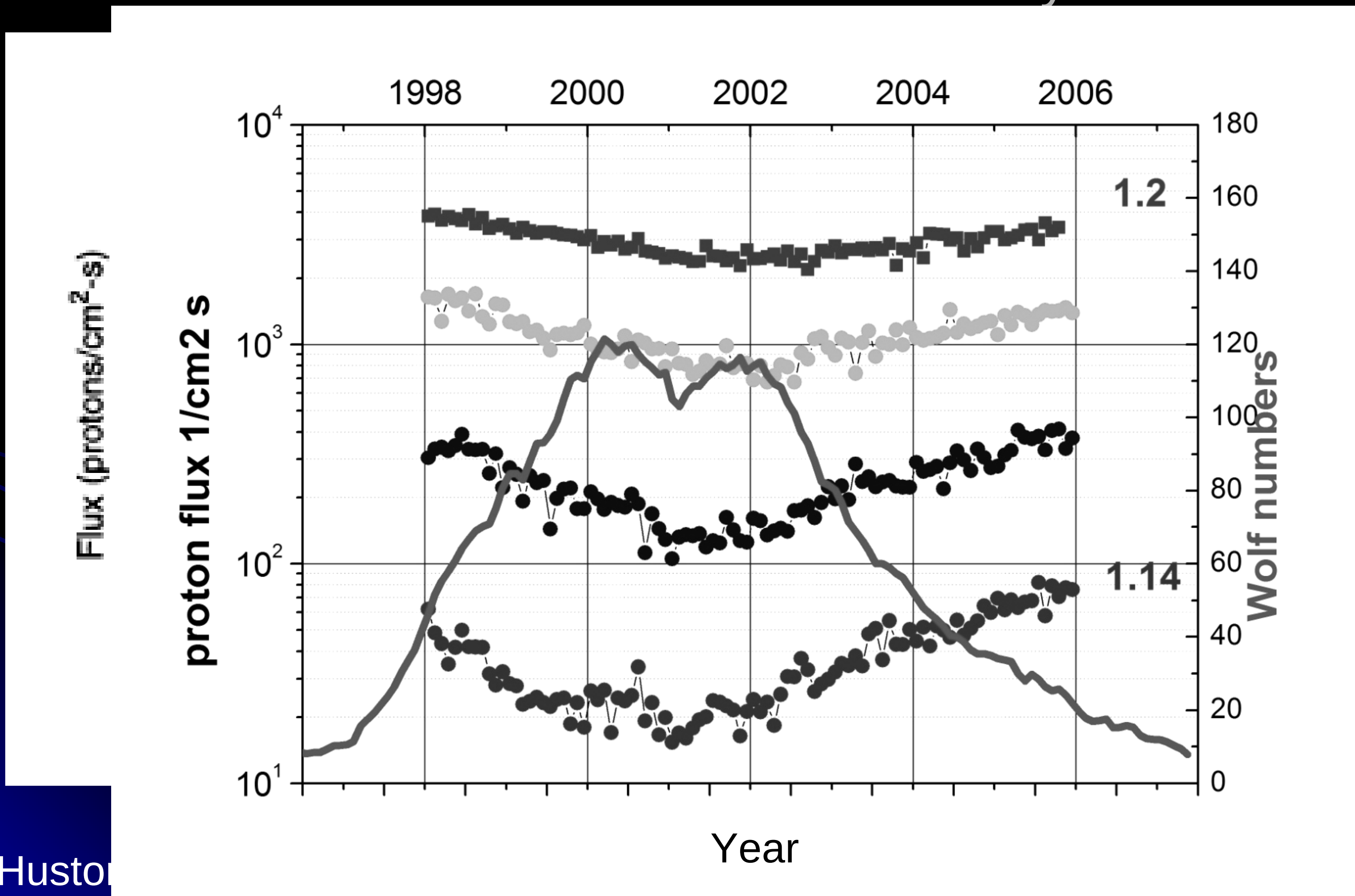
Trapped proton flux at the geomagnetic equator for several L-shells observed in 21-23 solar cycles

996



Huston ... itude
trapped proton flux // Adv. Space Res., 1998, V. 21(12), P.1625-1634

Solar cycle dependence
21-23 solar cycles

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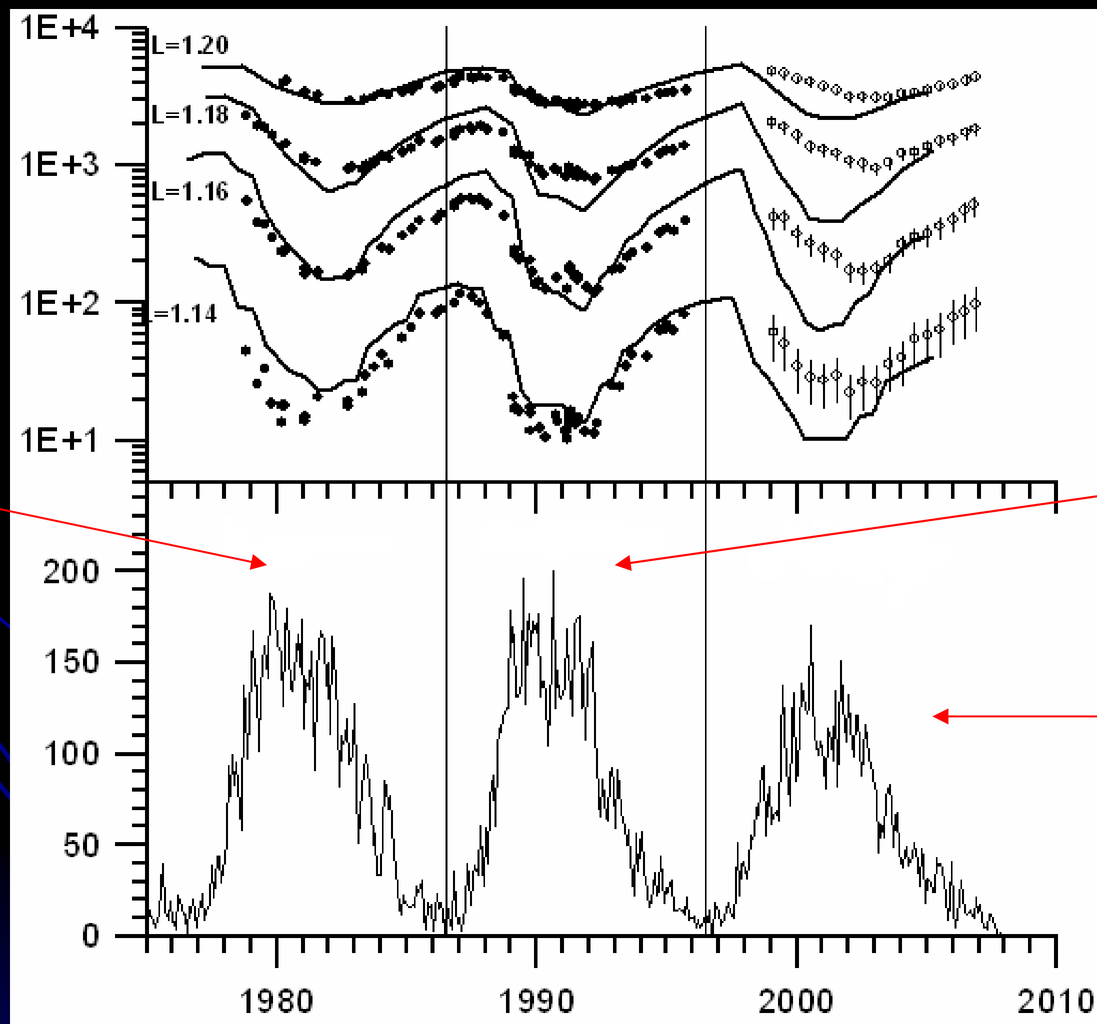
Daniel Boscher, Sebastien Bourdarie, Reiner Friedel, Reiner Friedel. Long Term Dynamic Radiation Belt Model for Low Energy Protons *Geophys. Res. Lett.*, 25(22), 4129–4132, 1998

Proton flux

Wolf numbers



21st

22nd

23rd

Year

Solar cycle dependence

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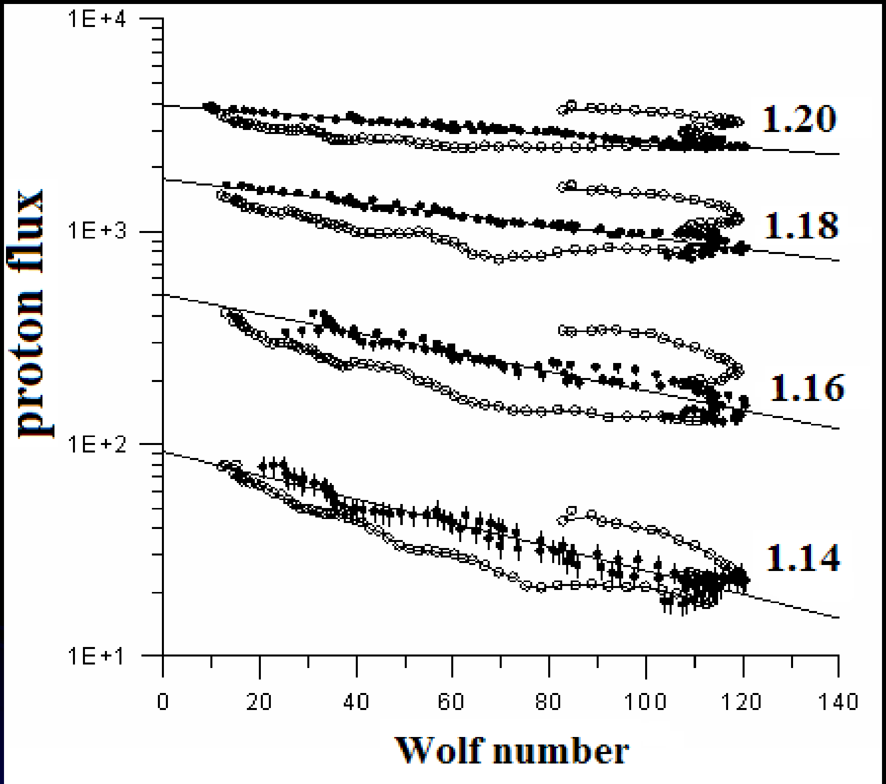
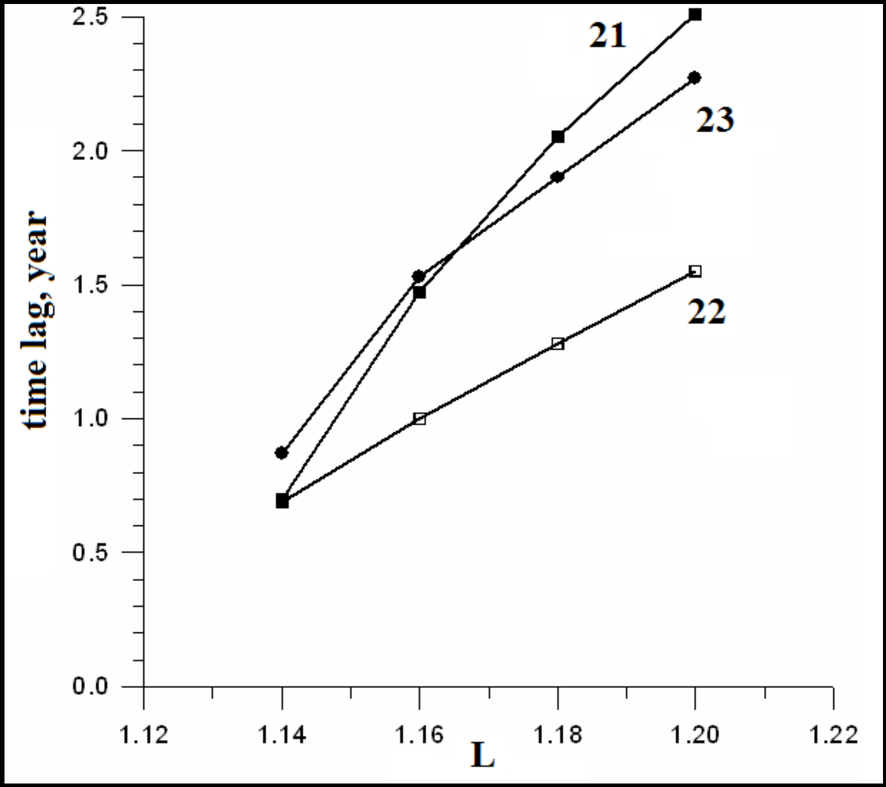


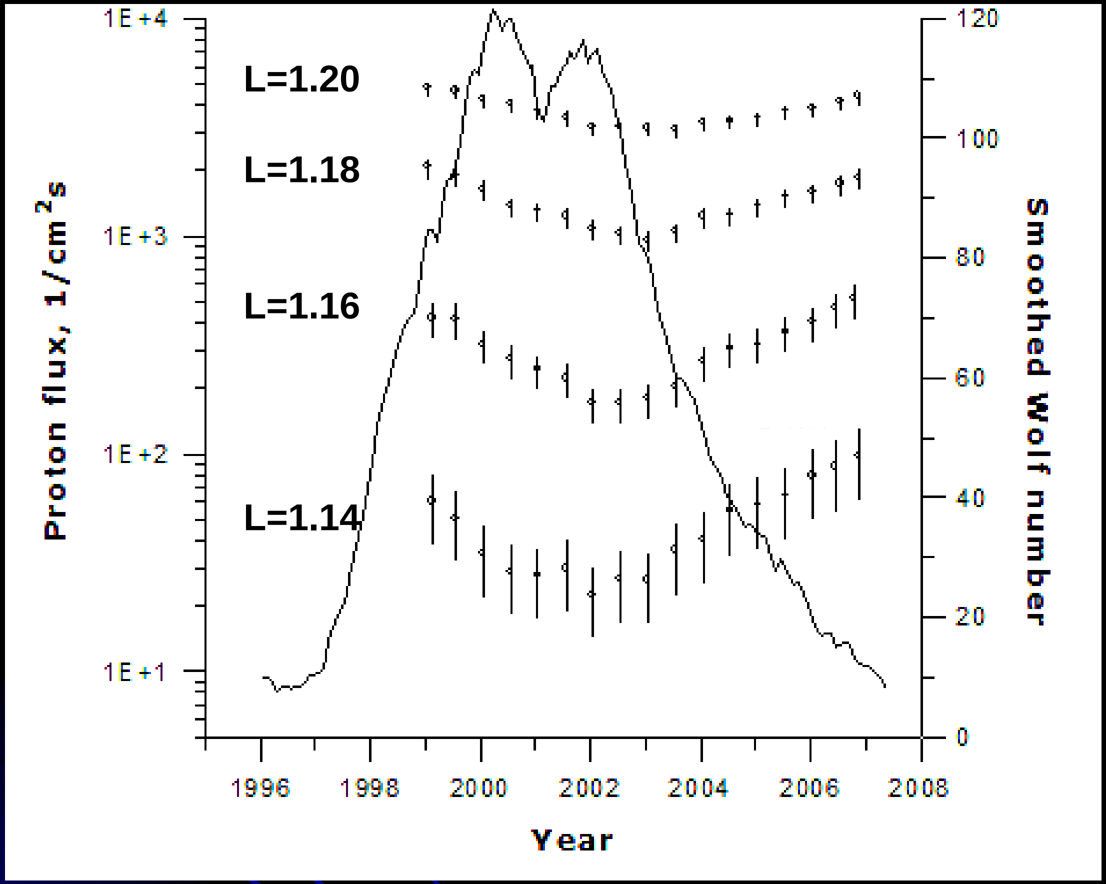


$$\ln F_{0L}(t) = a_0 + a_1 W(t - \Delta t)$$

Huston S.L., Kuck G.A. and Pfitzer K.A. Solar cycle variation of the low-altitude trapped proton flux, Adv. Space Res.,21(12),1625-1634,1998

Nymmik R.A., Time lag of galactic cosmic ray modulation: conformity to general regularities and influence on particle energy spectra, Advances in Space Research, Volume 26, Number 11, 2000 , pp. 1875-1878(4)

Solar cycle dependence



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>70 MeV

$$\frac{dN_{0L}(t)}{dt} = G(t) - \frac{f_{0L}(t)}{\tau_{eff}(t)}$$

$$G(t) = k_g g(t).$$

$$\frac{1}{\tau_{eff}(t)} = k < \rho_{atm} > (t)$$

$$N_{0L}(t) = e^{-\int_{t_1}^{t} \frac{dt}{\tau_{eff}(t)}} \left(N_1 + \int_{t_1}^{t} G(t) e^{\int_{t_1}^{t} \frac{dt}{\tau_{eff}(t)}} dt \right)$$

Solar cycle dependence.

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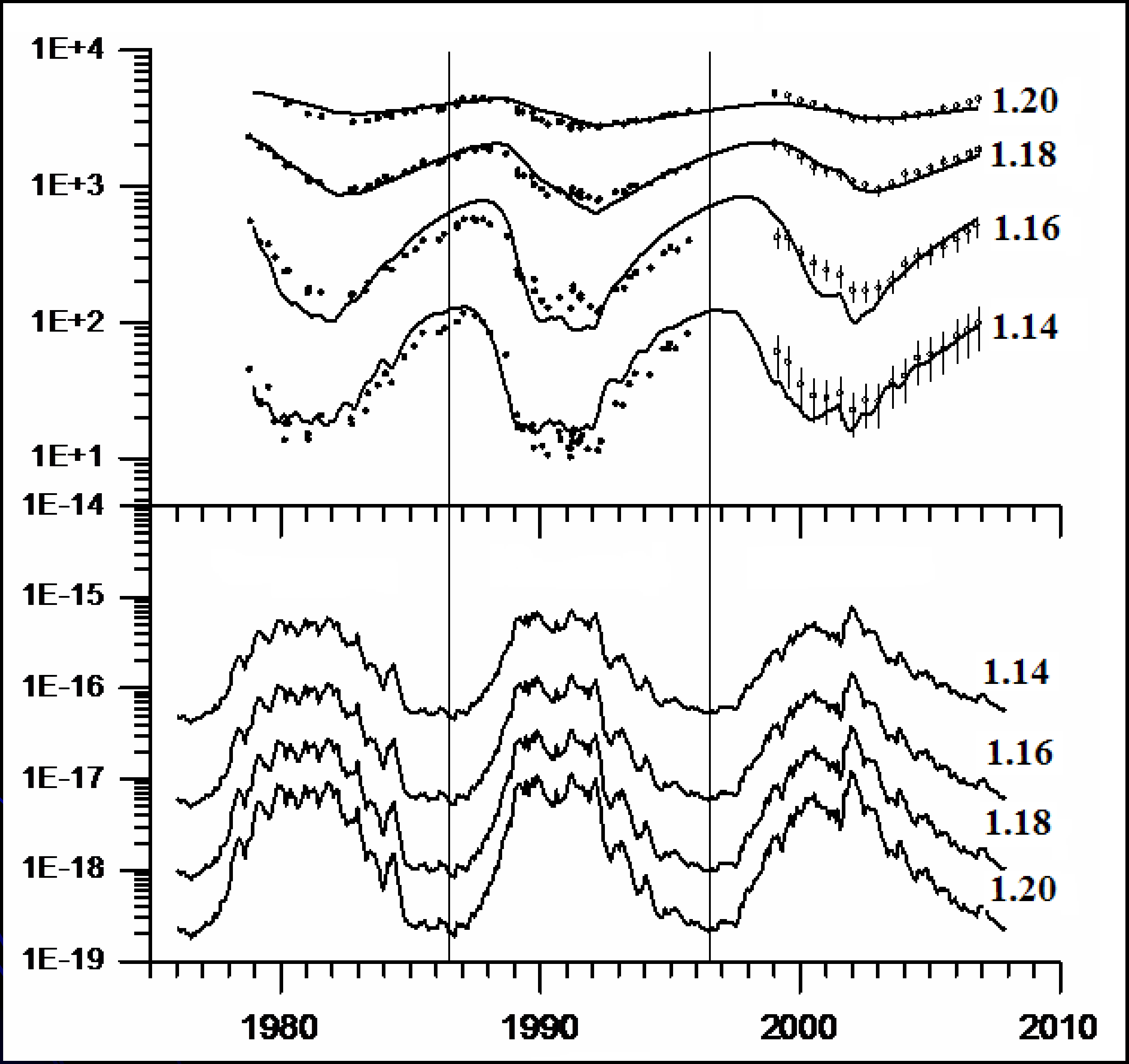
Proton flux

Atmospheric density



year

Conclusions

Trapped proton fluxes obtained during the 23d solar cycle were analyzed and were compared with the previous solar cycles. It was shown that for high energy proton flux dependence on the solar cycle is the similar for 21-23 solar cycles.

It was confirmed that variation of trapped proton fluxes correlate with the variation of solar activity taking into consideration the time lag

It was found that the time lag varies with L-shell and for L>1.14 it is dependant on the parity of solar cycle. Time lad is higher for the odd cycles

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Thank ou for your attention

Image courtesy of NASA

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