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Lomonosov Moscow State University

Solar Extreme Events in December 2006 and their influence on near-Earth environment: "Universitetskiy-Tatiana" satellite observations.

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Solar Extreme Events 2007: Fundamental Science and Applied Aspects

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Athens, Greece
Monday 24 September– Thursday 27 September 2007

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Four solar flares of X-class in SXR-emission in agreement with GOES classification were observed during the first half of December 2006 (X9.0 - 05.12.06, X6.5 – 06.12.06, X3.4 - 13.12.06 and X1.5 – 14.12.06). Solar energetic particle (SEP) produced in these flares after the propagation or/and acceleration in the interplanetary medium were observed in near-Earth space by different space missions. In particular, at the altitudes near 950 km SEP were detected by instruments on board Russian polar low-altitude “Universitetskiy-Tatiana”.

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«Universitetskiy-Tatiana» supersmall satellite - Space Scientific and Education project of the Lomonosov Moscow State University was launched on

circular orbit with altitude ~ 1000 km

inclination ~ 83°

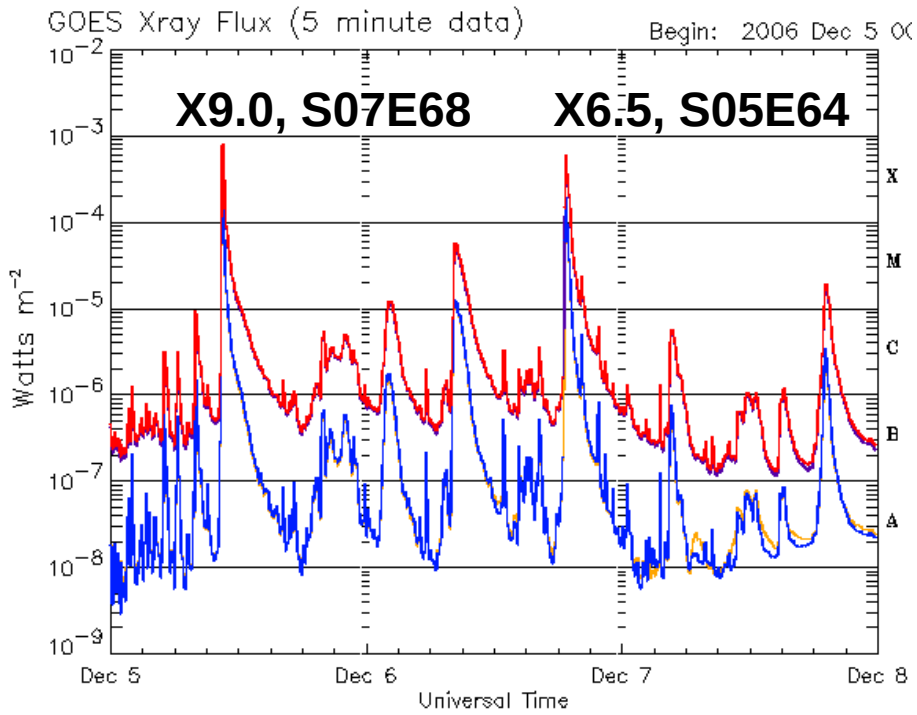
It operated from **January 20th, 2005** till **March 8th, 2007**

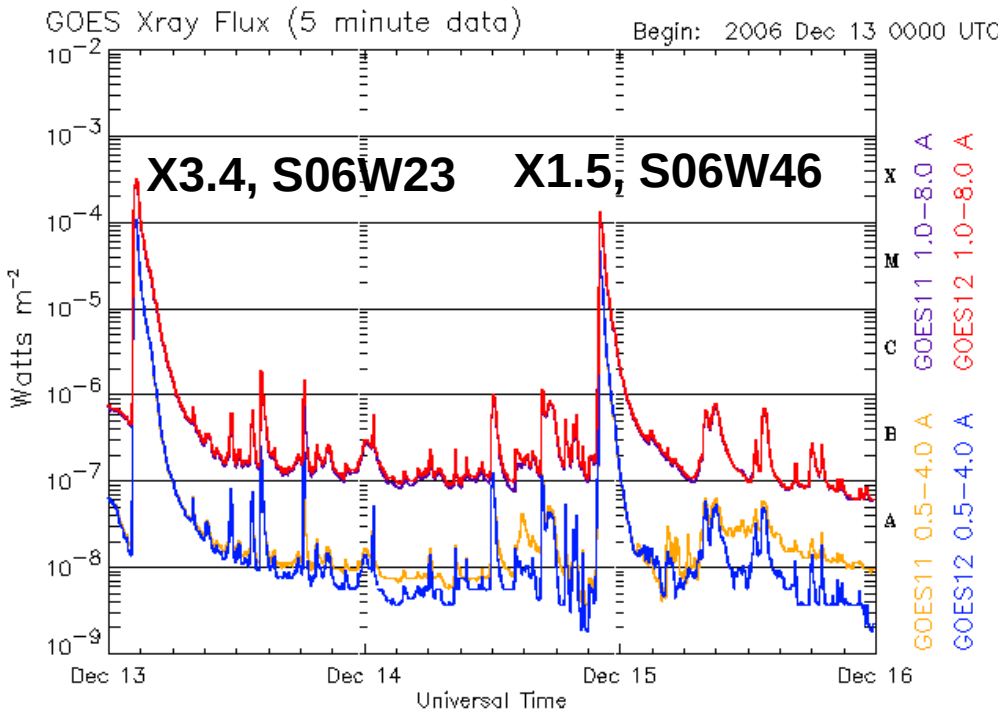
This satellite was intended for monitoring of radiation conditions near the Earth. We used data obtained with the help of BD instruments, which consist of semiconductor detector (1000 mkm Si) and scintillation detector (CsJ(Tl) 15×20 mm).

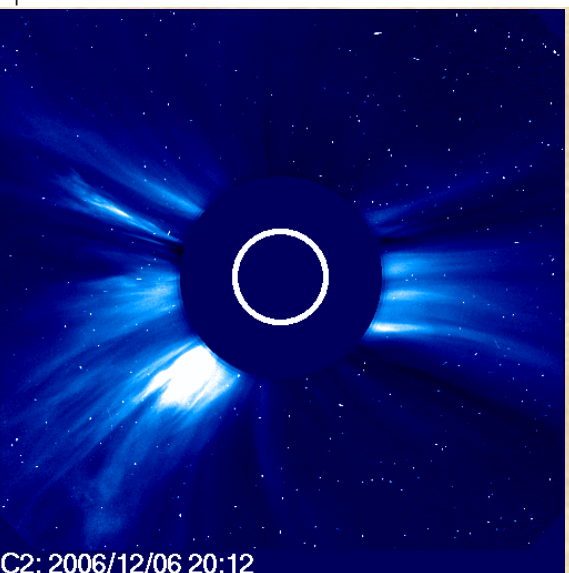
Scientific goals of MSU-250 project

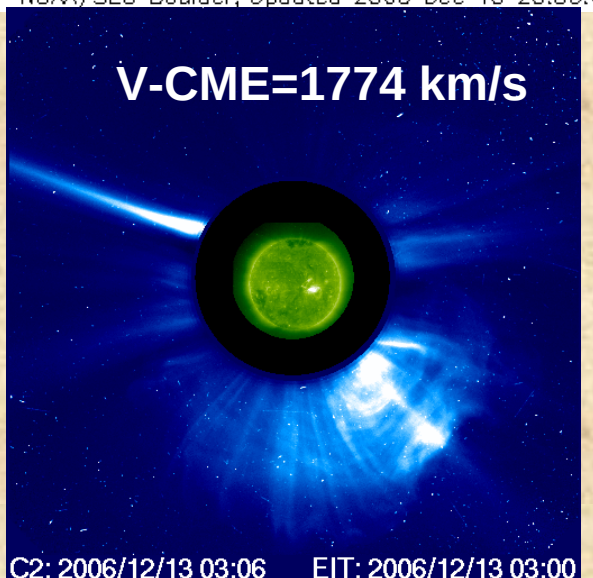
1. SEP fluxes (electrons with energies of 0.07 – 3.5 MeV and protons with energies of 2 - 100 MeV) dyinamics.
2. SEP cut-off rigidity variations during magnetic storms
3. Radiation belt dynamics during magnetic storms.

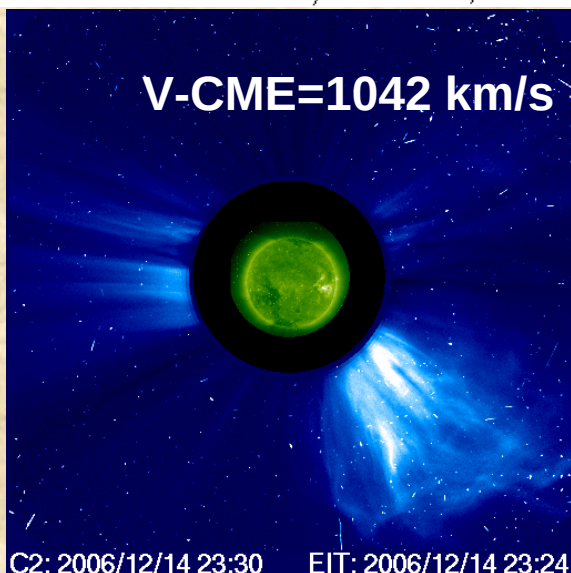
2006, December solar flares



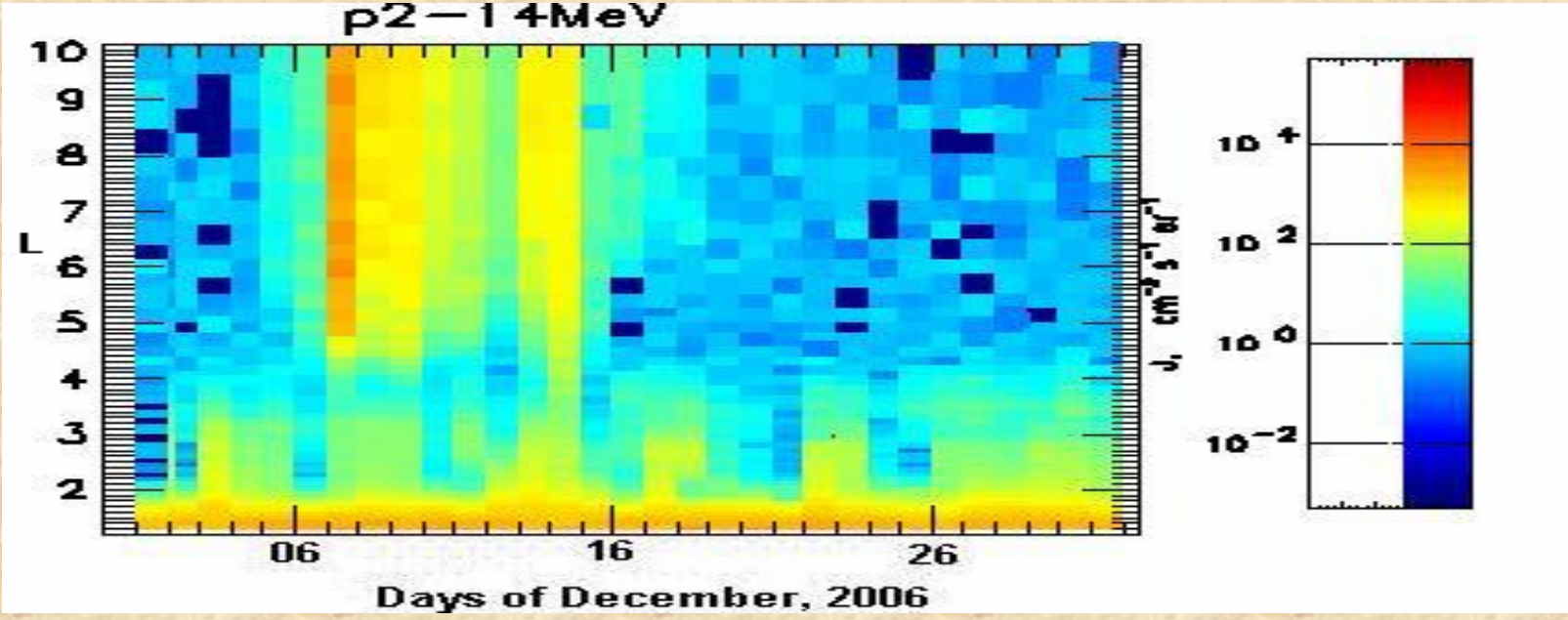


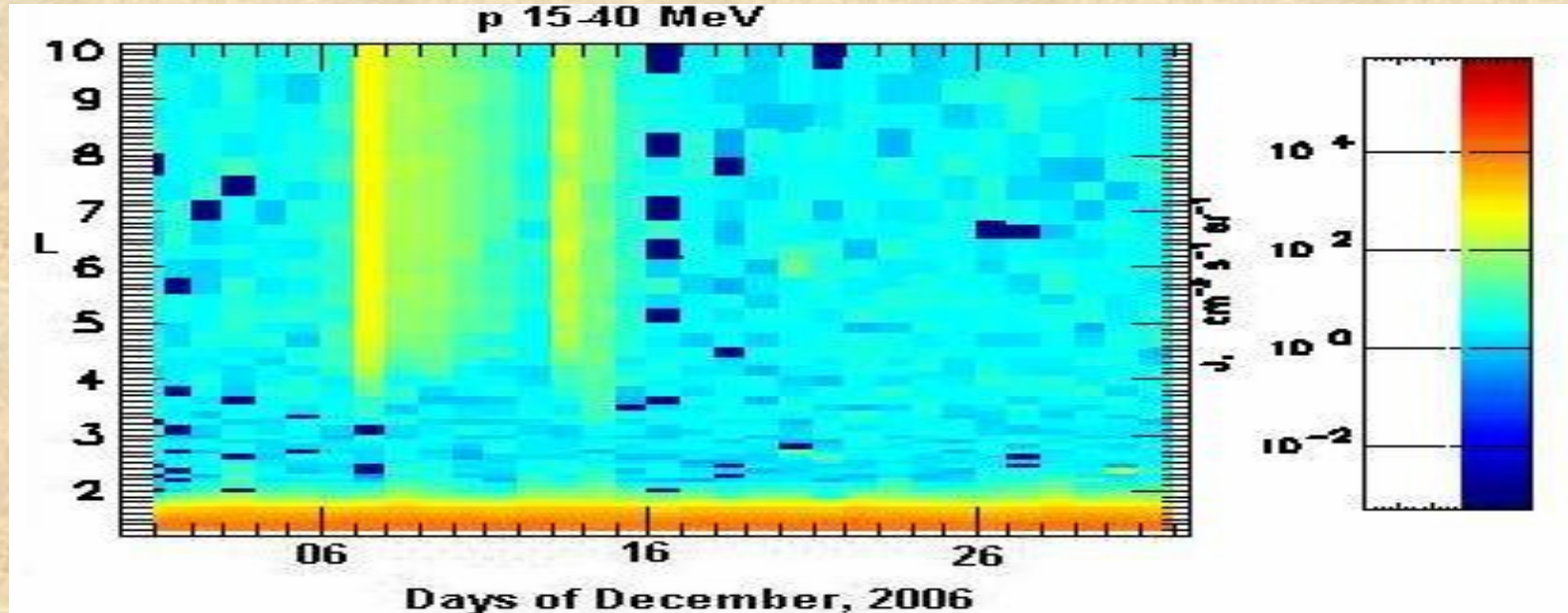




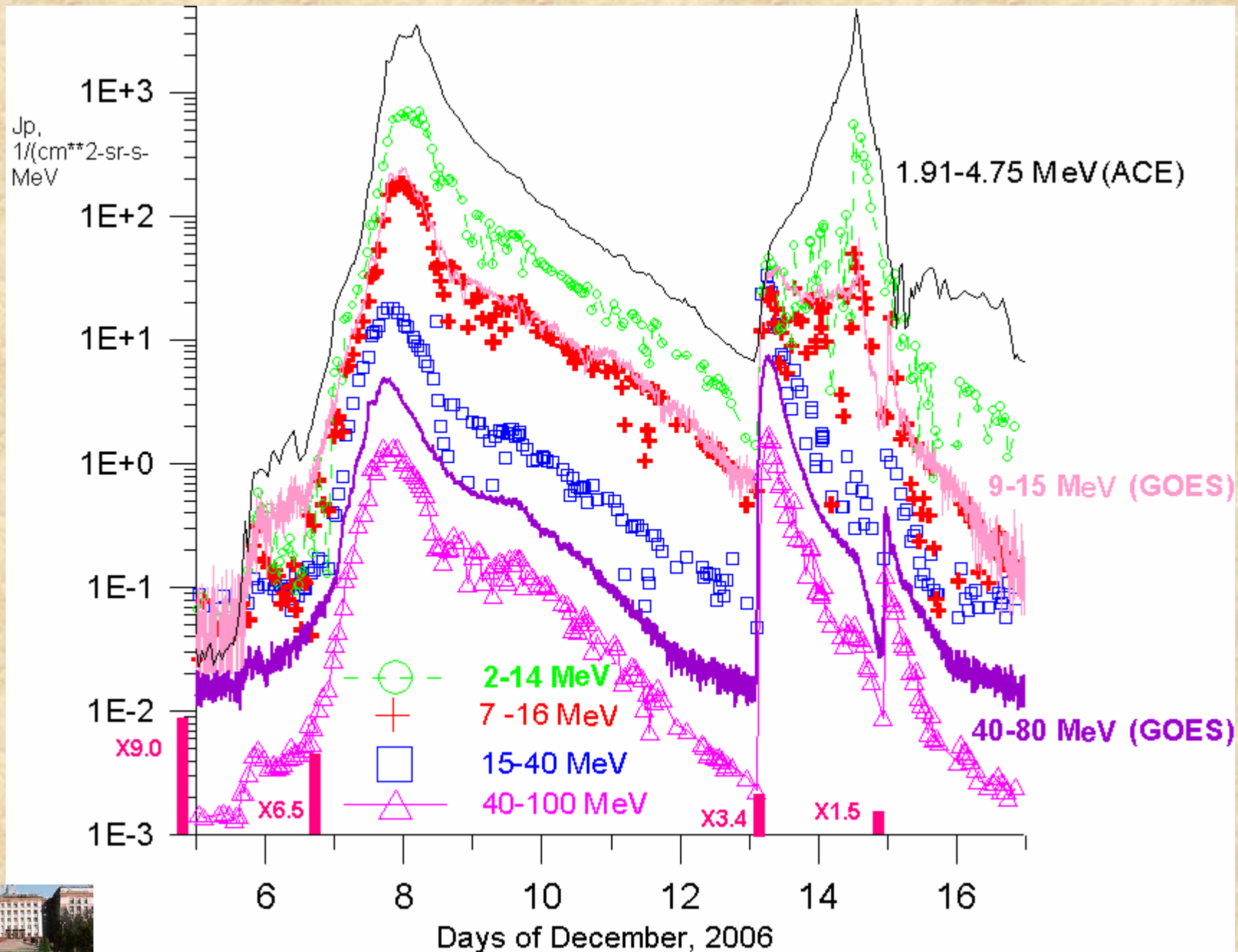


2006, December, Solar Protons

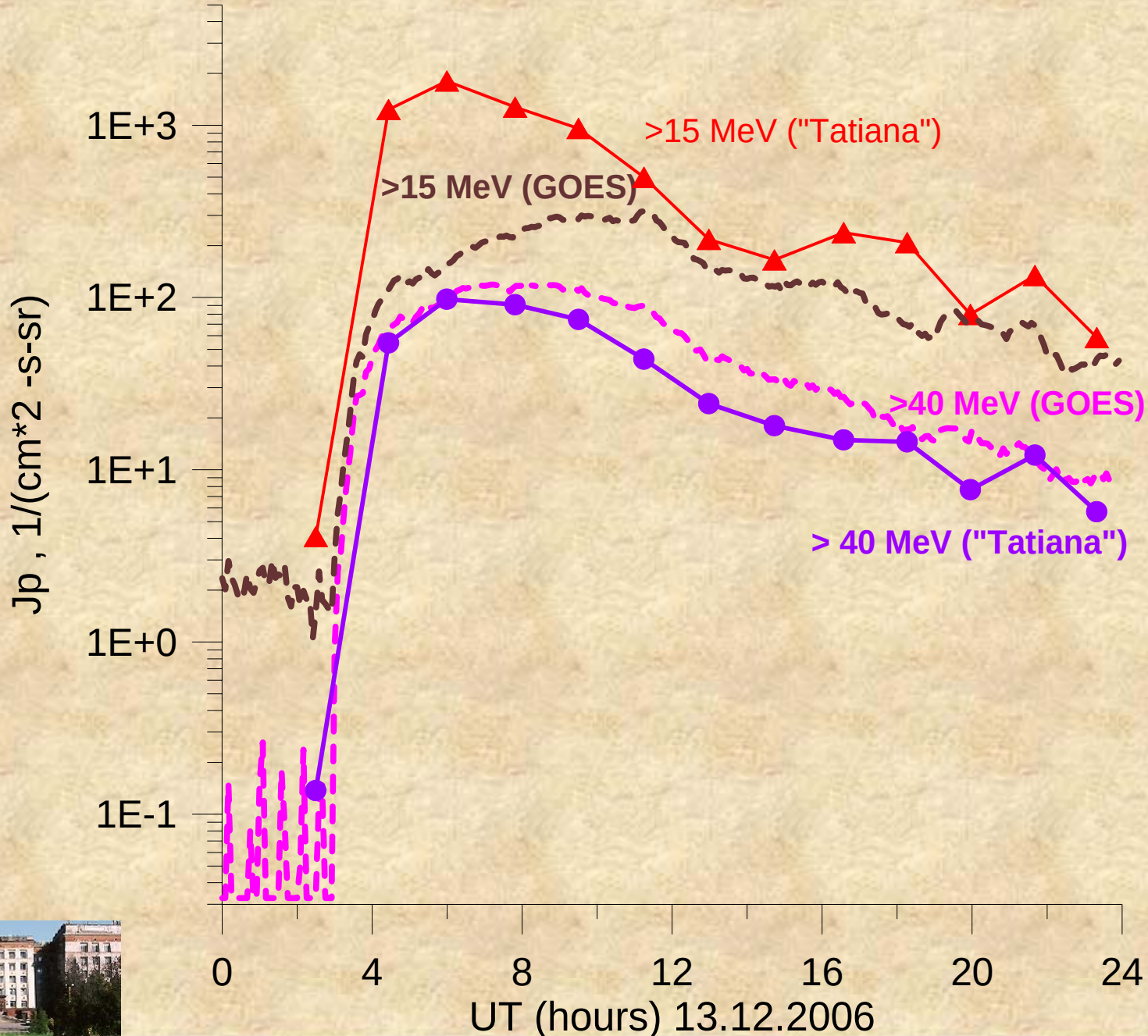




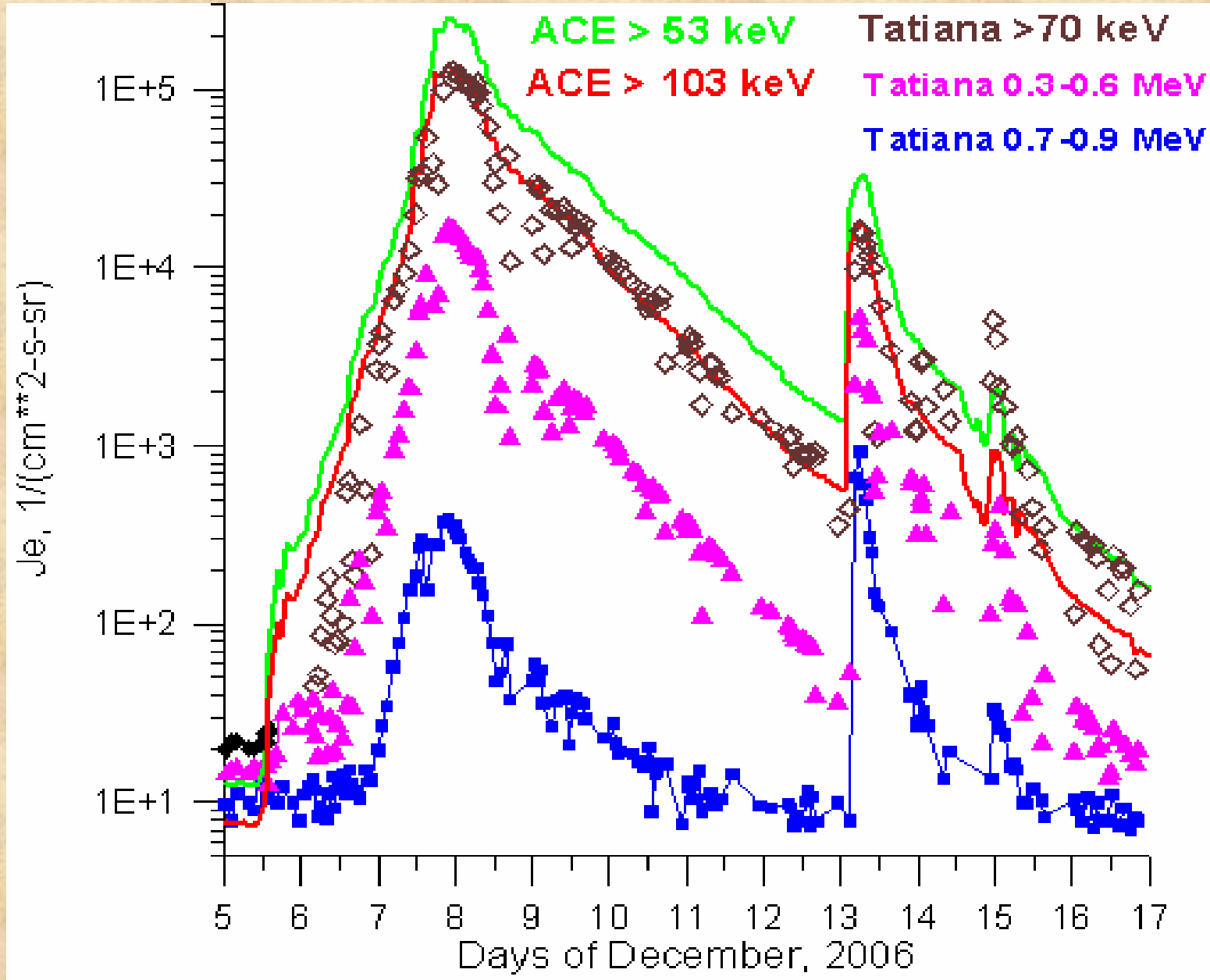
2006, December, Solar Protons (polar caps)



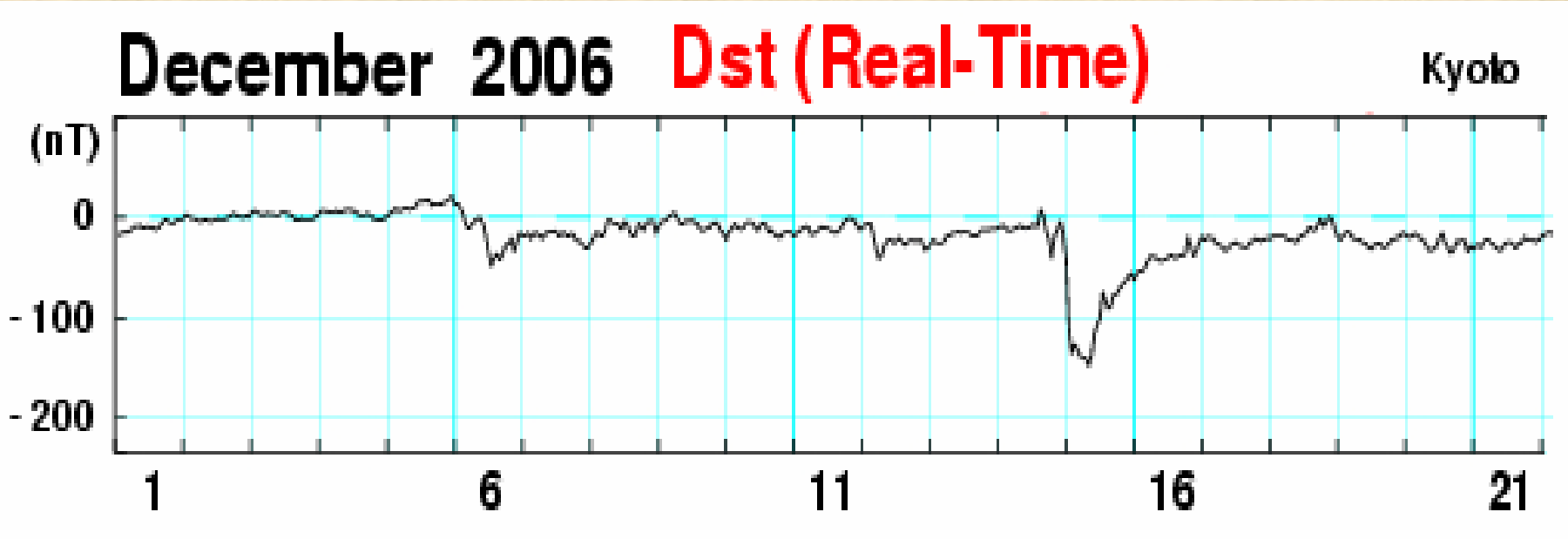
2006, December, 13 - Solar Protons (polar caps)

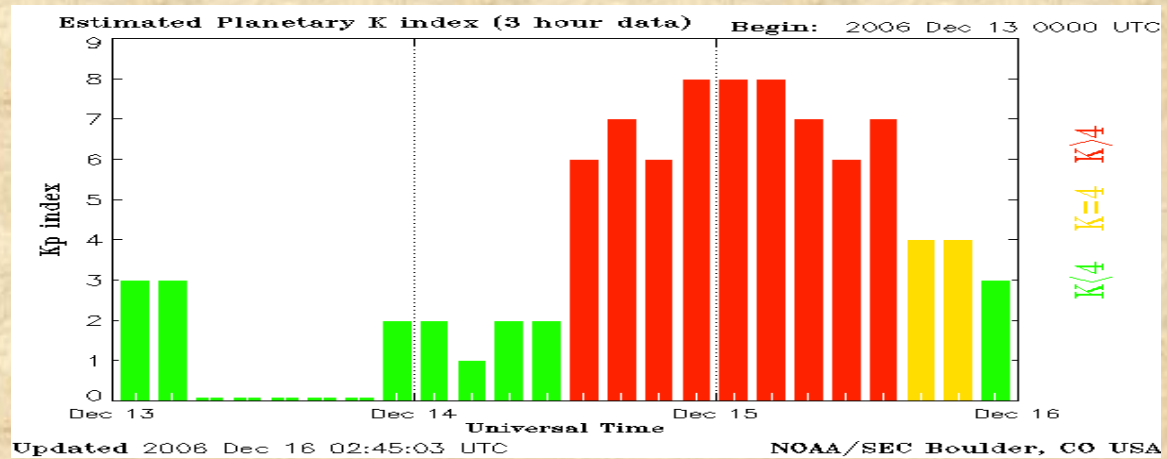


2006, December, Solar Electrons (polar caps)

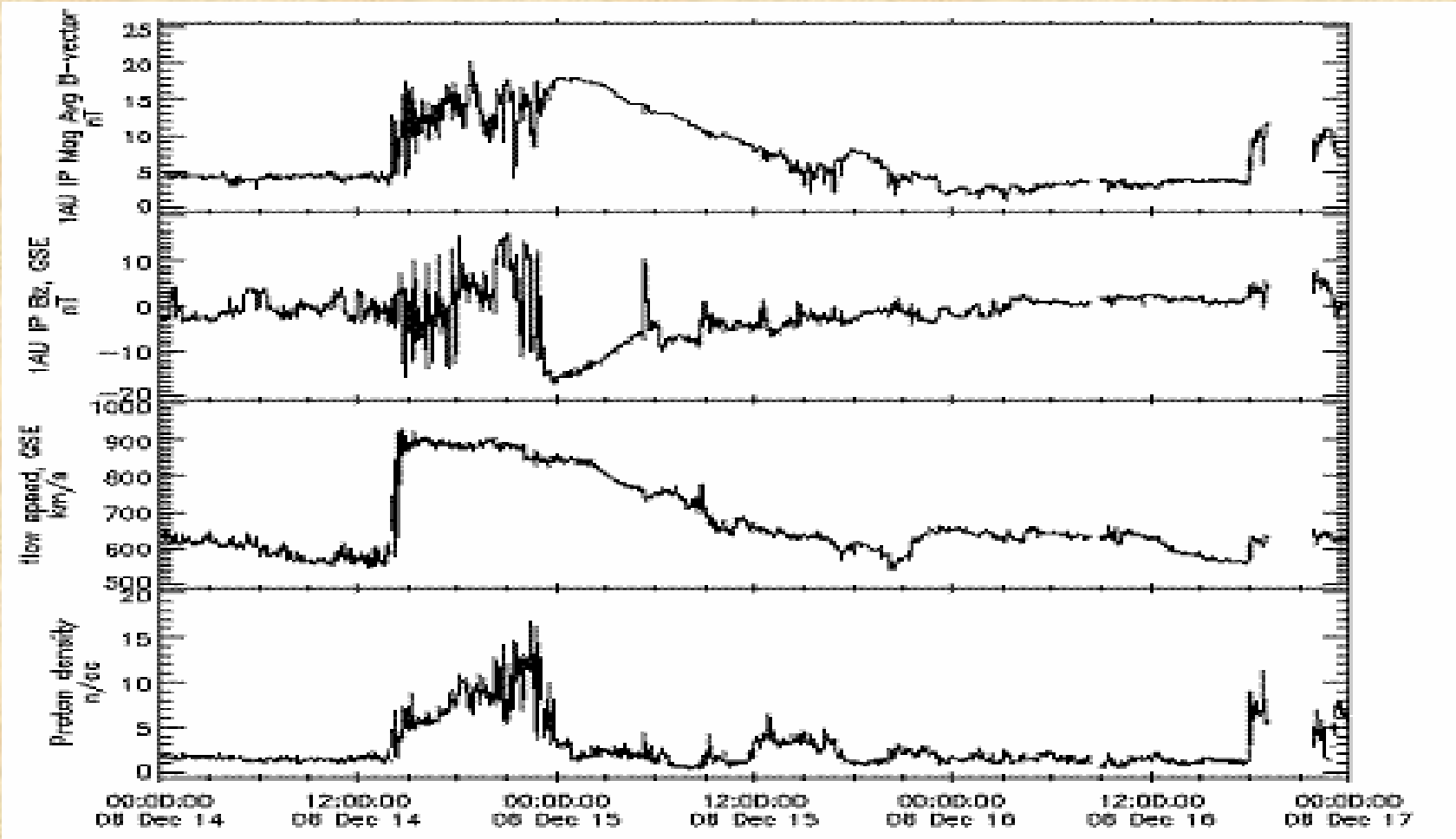


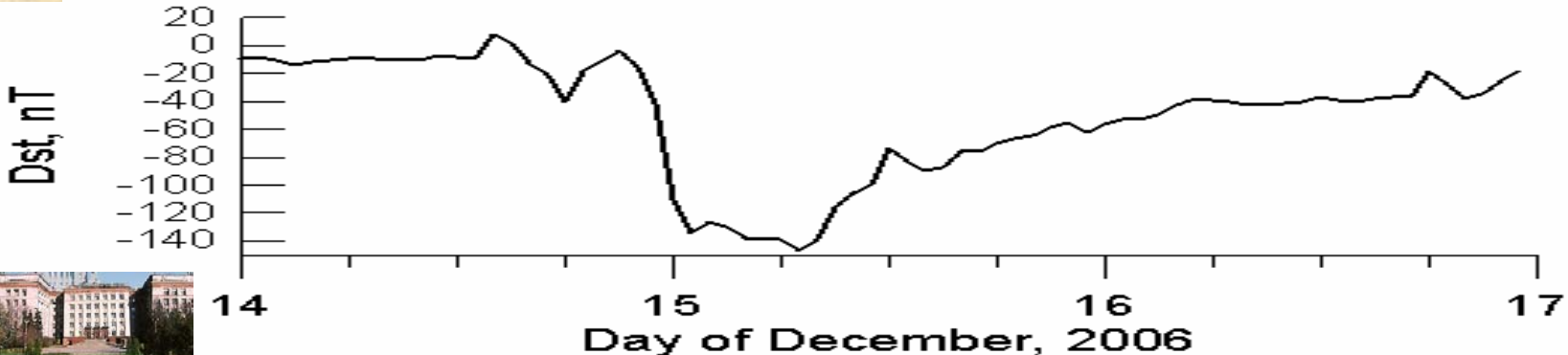
2006, December - magnetic storms



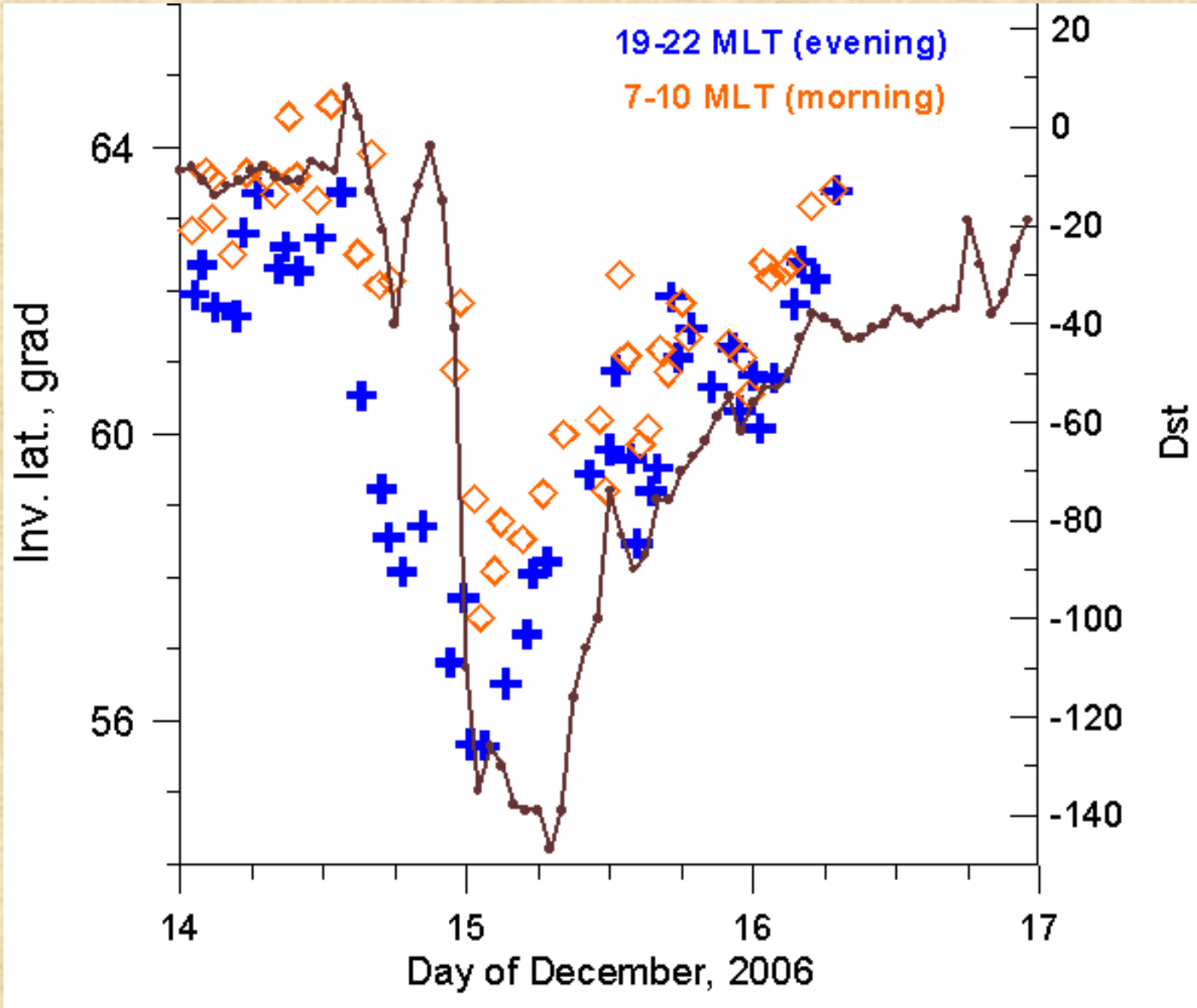


2006, December - solar wind





Solar protons 40-100 MeV penetration boundaries



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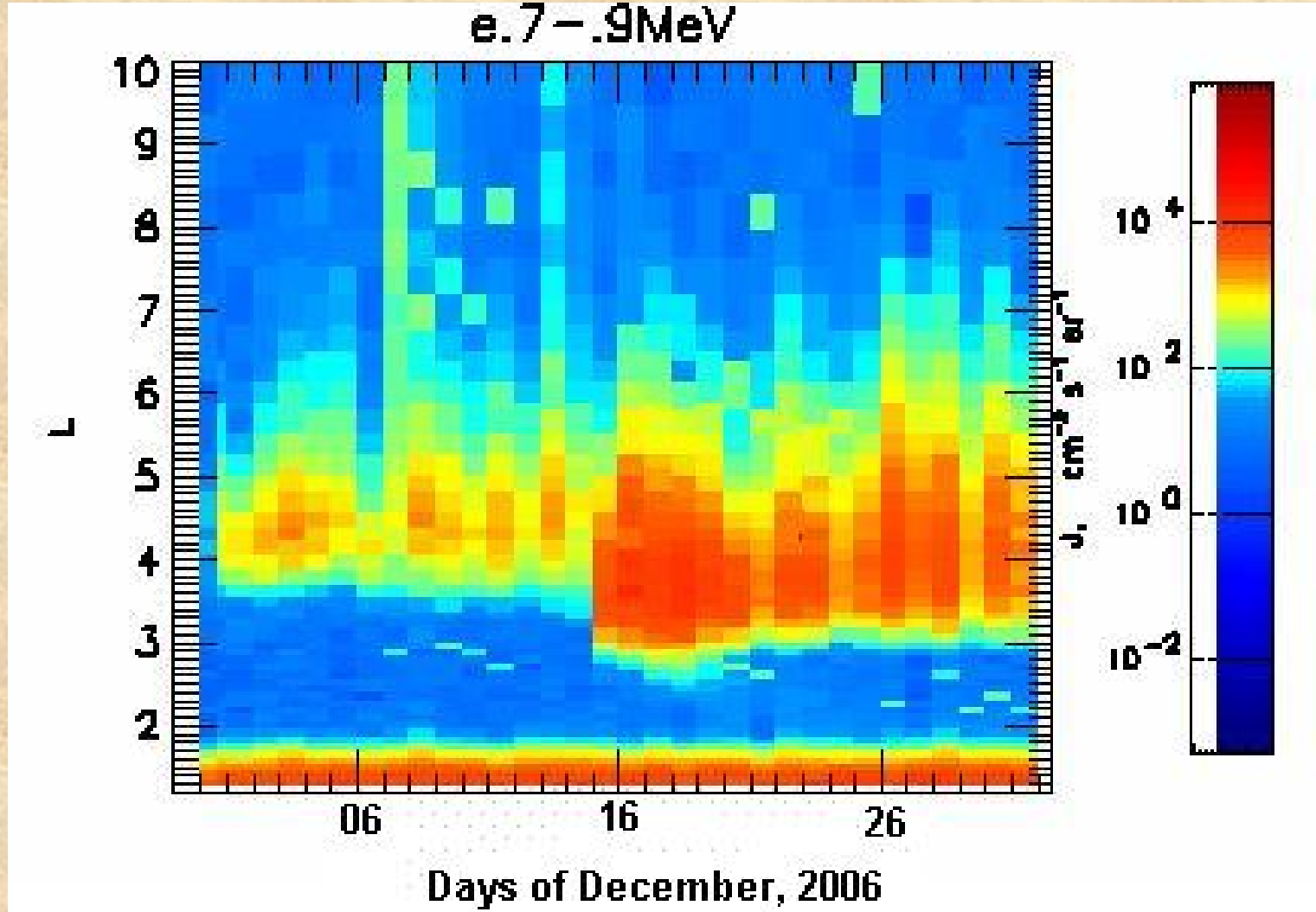
2006, December – sub-relativistic electrons variations



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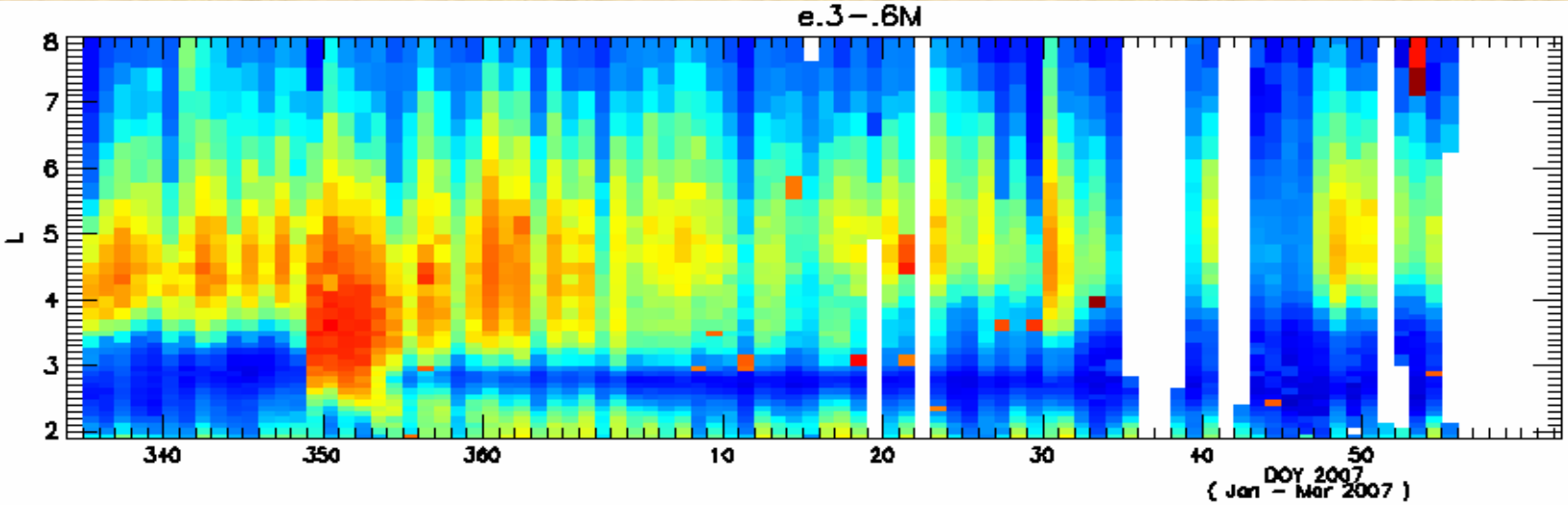
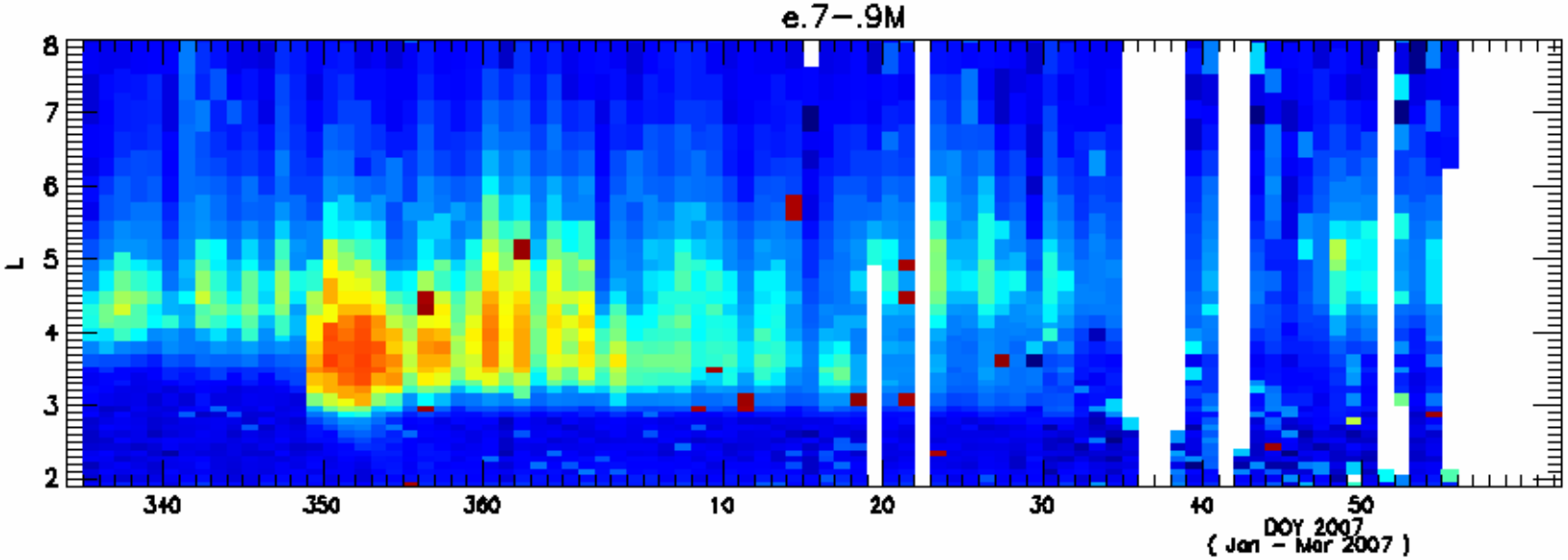
2006, December - 2007, Febriary: sub-relativistic electrons variations





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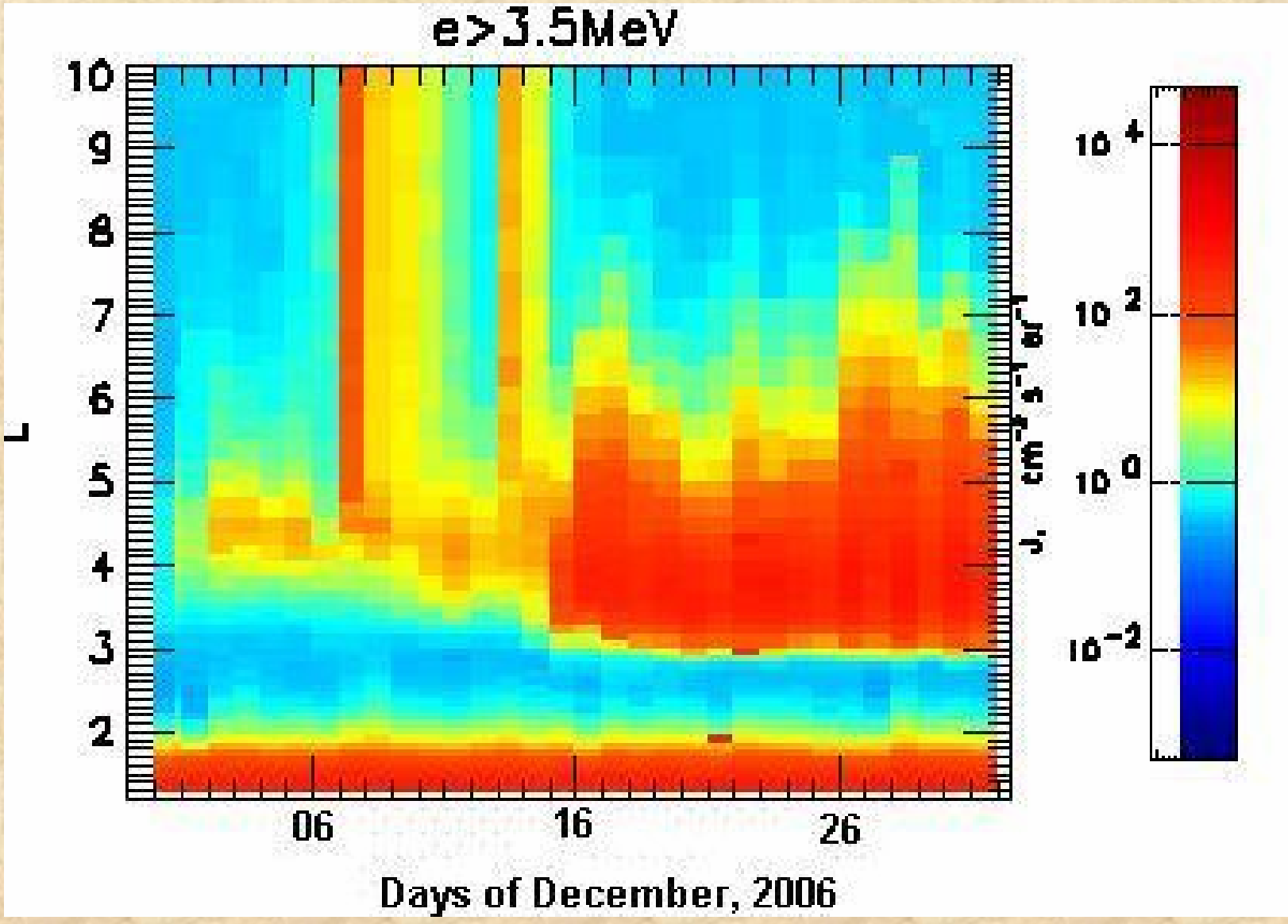
2006, December – relativistic electrons variations



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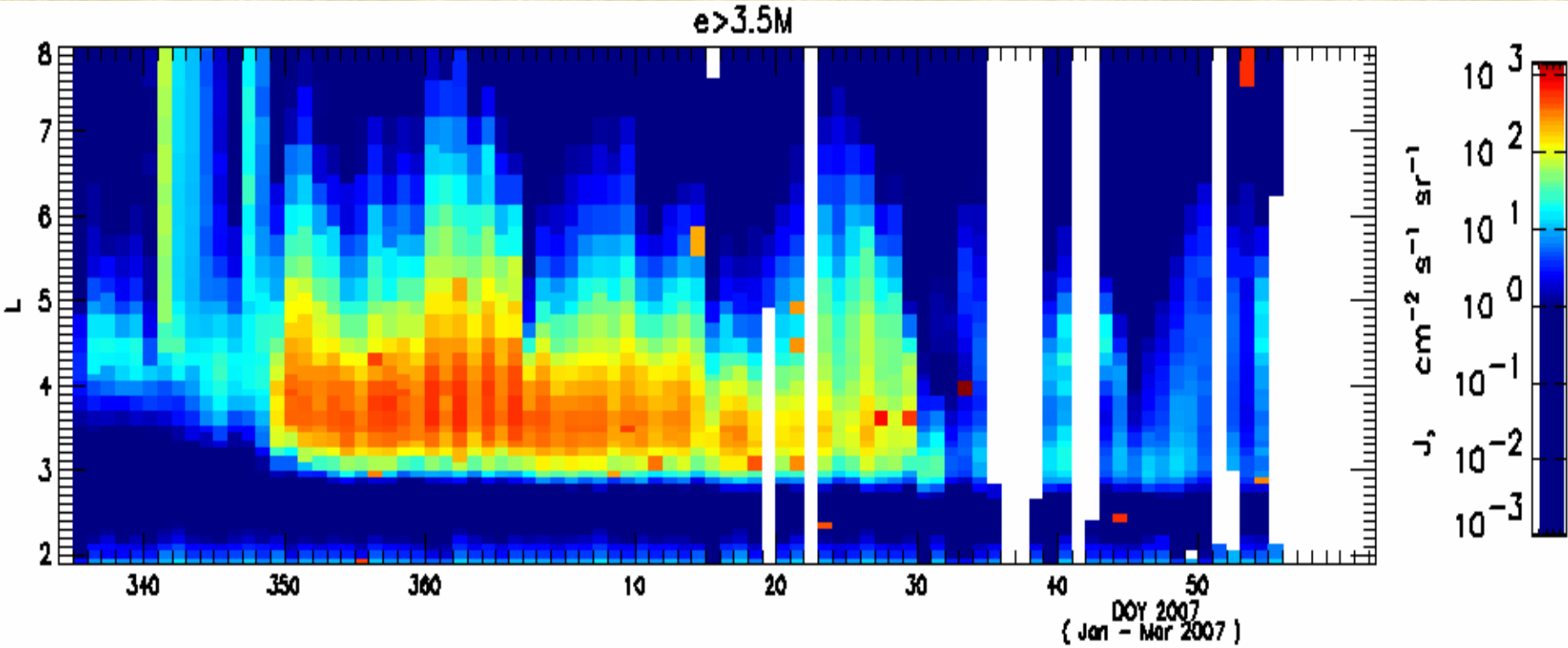
2006, December - 2007, Febriary: relativistic electrons variations



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SUMMARY

1. “**Universitetskiy-Tatiana”** microsatellite observations demonstrates that near-Earth space environment monitoring at low-altitude orbits is important during all SA cycle.
2. We can see that the joint influence of the magnetic storm+SCR on near-Earth’s environment is more significant due to SCR penetration in the Earth’s magnetosphere.
3. The presented experimental results demonstrate the real opportunity of small educational spacecrafts successful application in the important scientific programs (e.g. Space Weather).

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THANK YOU FOR YOUR ATTENTION!

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