



High energy particles and waves near equator
according different satellite experiments data.

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ABSTRACT

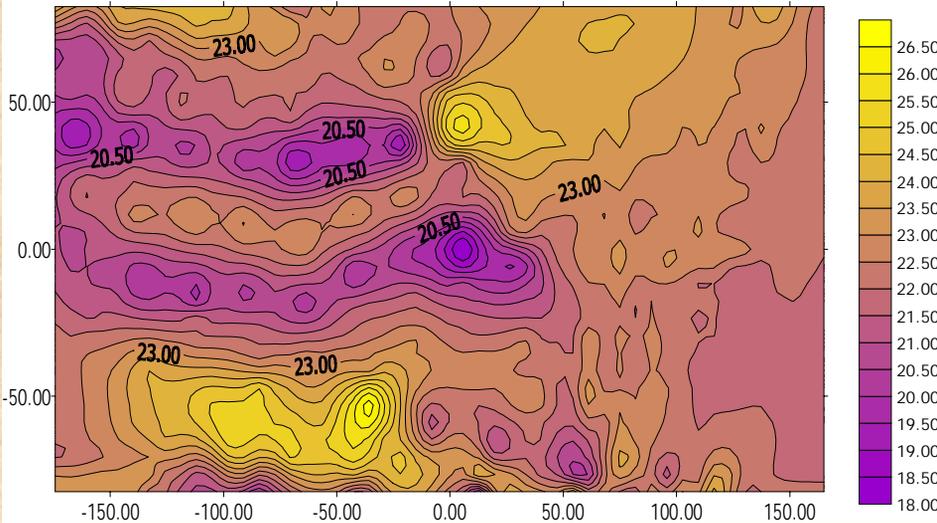
■ This work systematizes the experimental data of proton ($E_p=55$ keV - 30 MeV) and electron ($E_e=20$ keV - 1.2 MeV) fluxes, the data of VLF and RF radio noises in frequency range 0.1 - 15 MHz near geomagnetic equator. These data obtained in different satellite experiments in last ten years. The results of experiment with SORS instruments that measured the radioemissions onboard the CORONAS-I satellite are analyzed in details. This work also presents the results of simultaneous registration of radioemissions and proton and electron fluxes with energy up to 500 keV onboard ACTIVE satellite. It was marked that there is longitudinal dependence of particle fluxes and wave intensities in different frequency ranges near equator. The waves registered in east hemisphere in wide frequency range, but in the west hemisphere only waves with energy up to 2 MHz registered.

CORONAS I

HF diagnostic

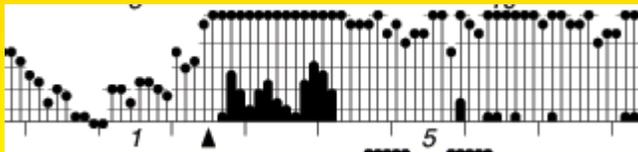
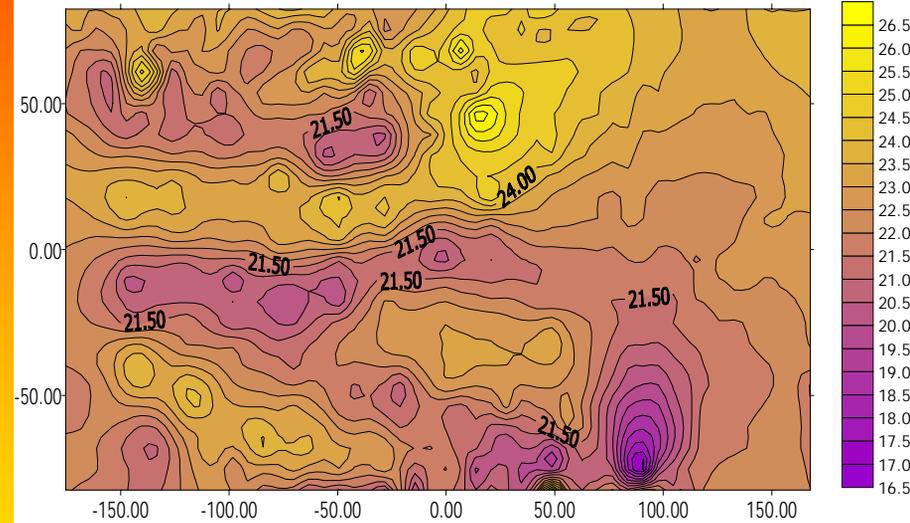
31.03.1994

DB



06.04.1994

DB



Global distribution of HF emission in the ionosphere in the frequency range 0.1-2 MHz during day time sector. The spectral intensity was integrated at around 500 km altitude 31.03.1994 during quiet condition and on 6.04.1994 during strong geomagnetic disturbances, recorded by SORS-1 instrument on board the Coronas_I satellite. The well manifested enhancements of HF frequency (whistler frequency range) follow the geomagnetic equator and some enhancements is also remarkable in the region where energetic proton fluxes are detected

Map of near-equatorial protons obtained by CORONAS-I satellite (1994 year)

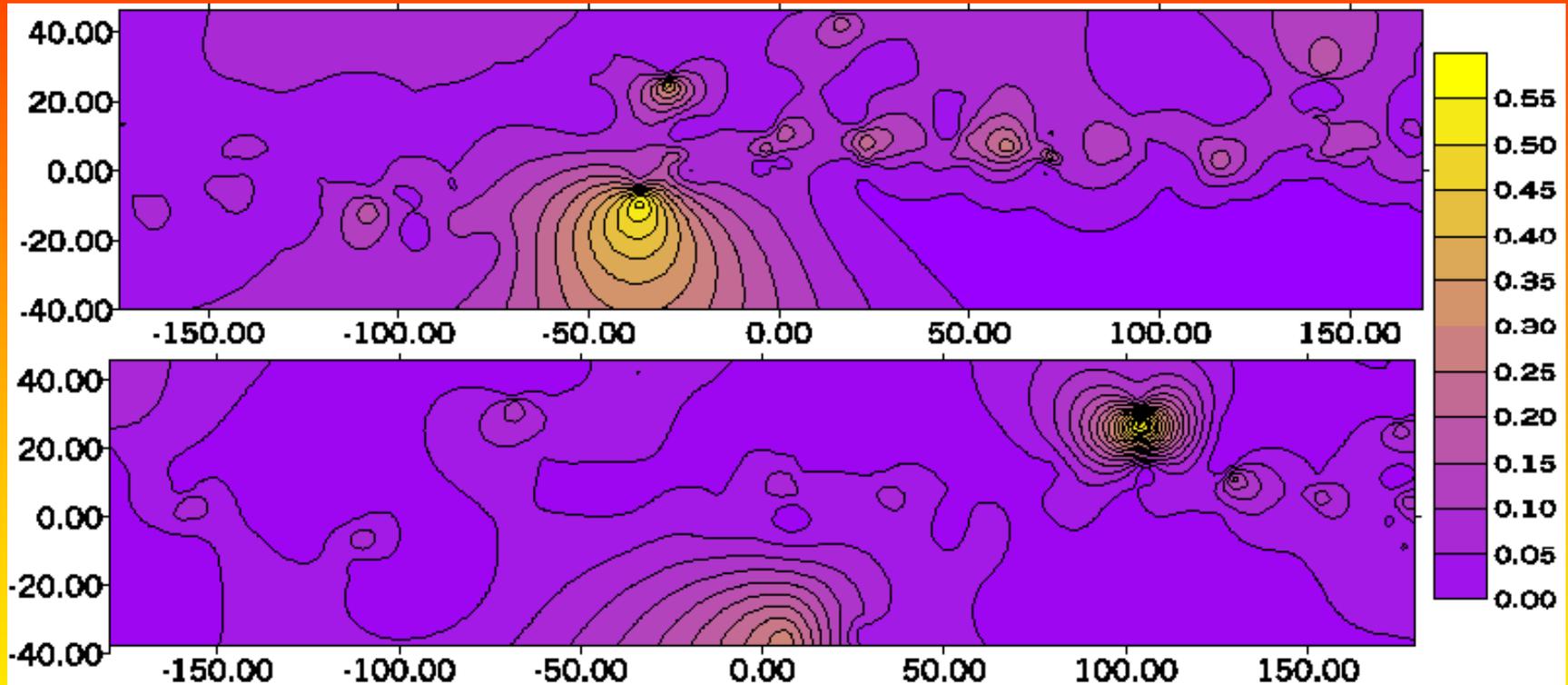
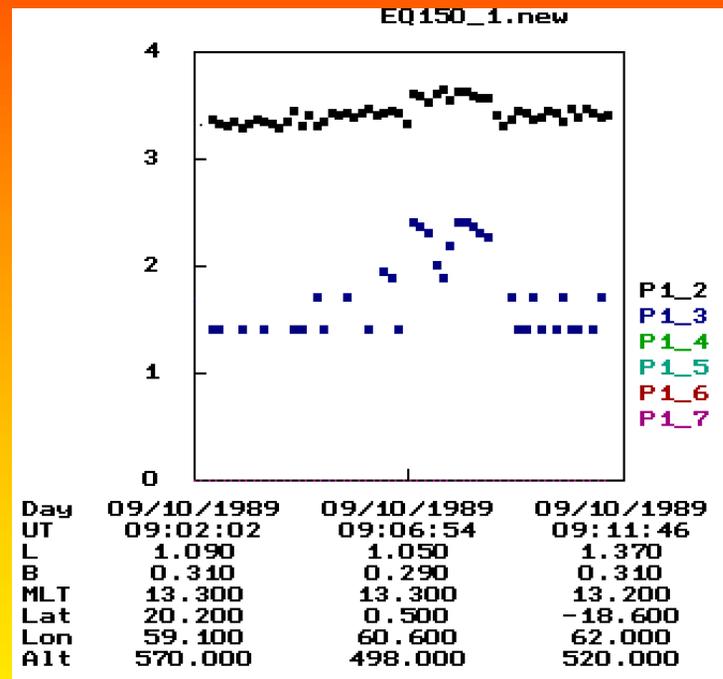
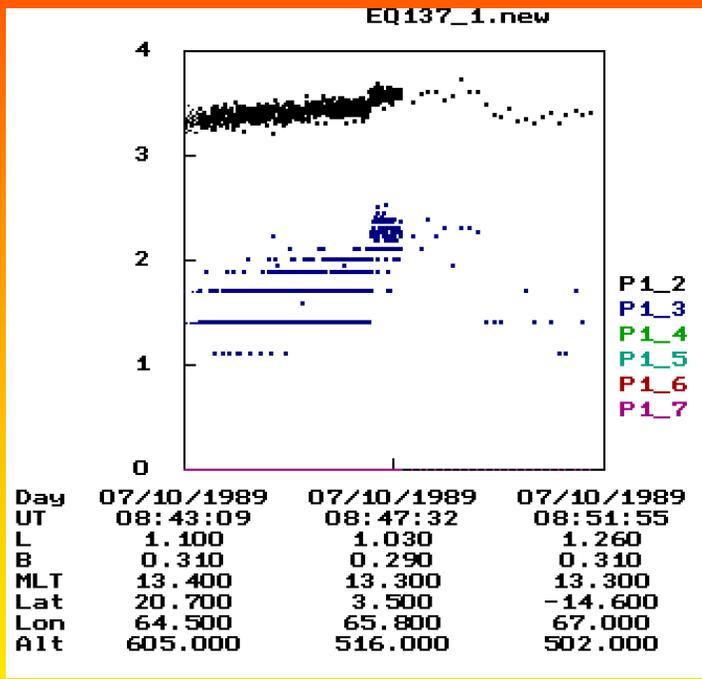


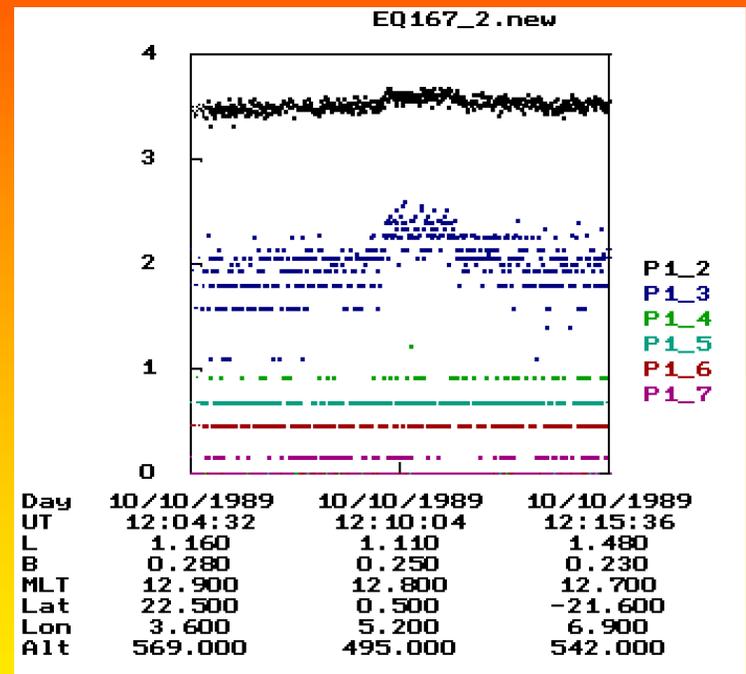
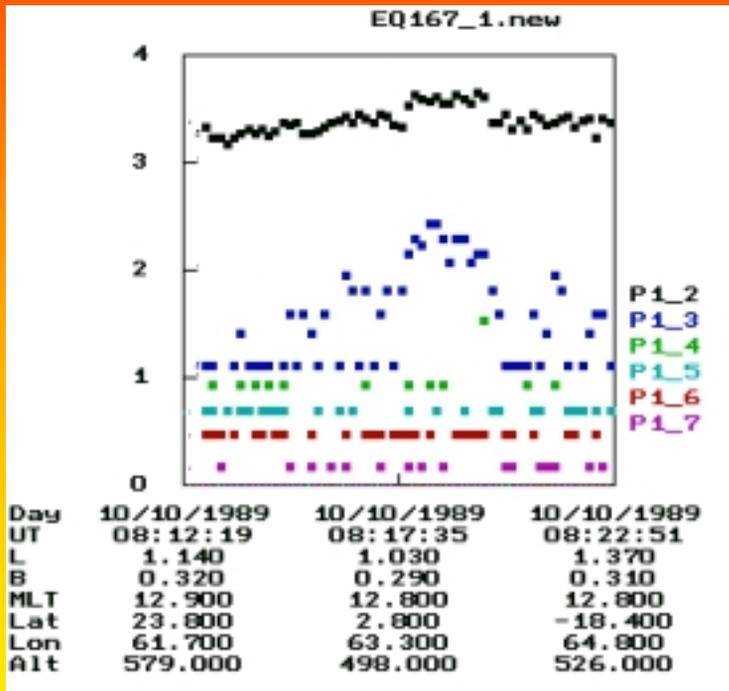
Figure presents the CORONAS-I satellite data about the near-equatorial proton flux registration. The altitude is $H=500$ km The energy of protons is $E=1.2$ MeV. The upper figure corresponds to the disturbed period of geomagnetic activity. The lower figure – to quiet period of geomagnetic activity. It is visible that flux increased in the geomagnetic disturbances time. This is additional argue that one source of equatorial protons is radiation belt (current ring).

Example of near-equatorial protons registration by ACTIVE satellite (1989 year)



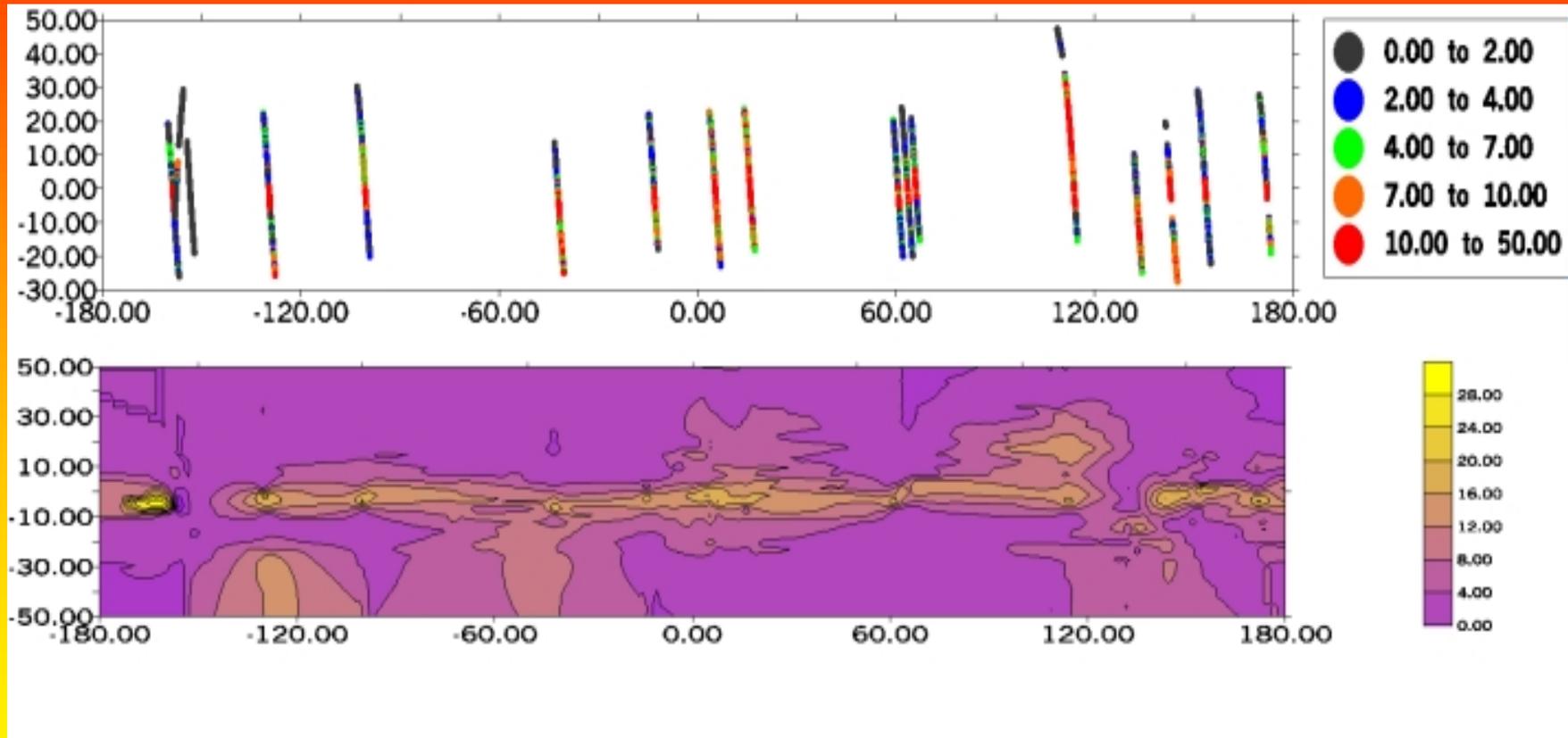
These figures show that in the near-equatorial region ($L < 1.15$) at the 500-600 km altitudes there is zone of essential increasing of proton flux. The maximums of proton flux corresponds to geomagnetic equator region. The energy of registered protons is $E = 55-550$ keV (P1_2 - P1_7).

Example of near-equatorial protons registration by ACTIVE satellite (1989 year)



These figures show that in the near-equatorial region ($L < 1.15$) at the 500-600 km altitudes there is a zone of essential increasing of proton flux. The maximum of proton flux corresponds to the geomagnetic equator region. The energy of registered protons is $E = 55-550$ keV (P1_2 - P1_7).

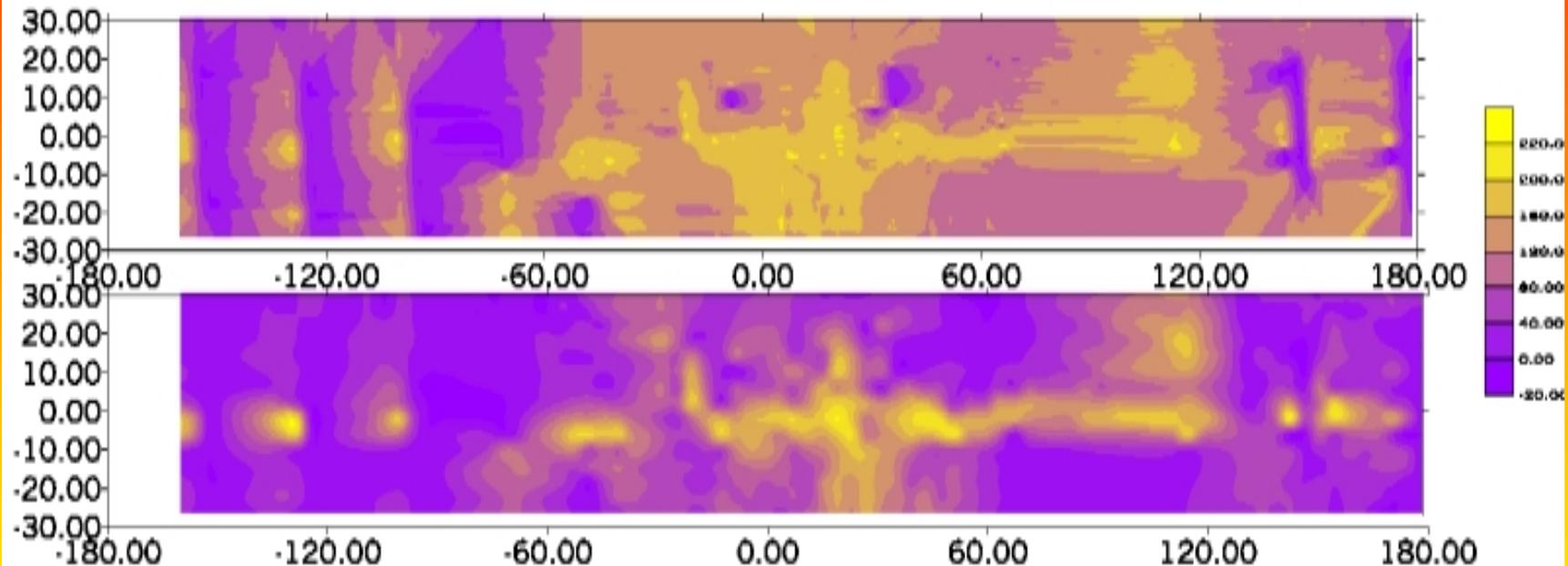
Map of near-equatorial protons obtained by ACTIVE satellite (1989 year)



Example of several passes of ACTIVE satellite through equatorial region ($L < 1.15$) at the altitude $H = 500-600$ km. The upper figure shows the proton ($E = 5$ keV) flux. The lower figure is the average flux map using the Kriging method. There is evident band of enhanced proton flux near geomagnetic equator.

Comparison of near-equatorial proton flux

for two different energies by ACTIVE (1989 year)



Map of proton ($E=50$ keV – upper figure, and $E=70$ keV – lower figure) flux in equatorial region ($L < 1.15$) at the altitude $H=500-600$ km after the kriging. It is evident that the position and shape of equatorial formation does not depend on energy (in the range $E=50-70$ keV).