Monitoring the Chandra X-ray Observatory Radiation Environment: Correlations between GOES-8 and Chandra/EPHIN during DOY 89 - 106, 2001.

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SUMMARY

The time period between DOY 89 (March 30) and DOY 106 (April 16), 2001 will likely be remembered as one of the most active time spans in this solar cycle. During this period of activity, the Sun unleashed many M and X-class solar flares. Two of which, an X20 and an X17, were amongst the largest solar flares recorded in the last 10 years. Indeed the sunspot group responsible for this activity, AR 9393, will also likely be recorded as one of the most active sunspot groups of this solar cycle.

The *Chandra X-ray Observatory* (CXO), NASA's latest "Great Observatory", was launched on July 23, 1999. The highly elliptical orbit of the CXO (perigee $\approx$ 10,000 km, apogee $\approx$ 140,000 km, 28.5 degree initial inclination) takes the satellite outside of the Earth's magnetosphere during a large fraction of the year. In this location, the CXO is directly exposed to the particles released during solar flares/CMEs, resulting in high background and possible damage to the science instruments.

In this paper, we present data from the EPHIN radiation monitor on-board the CXO and the SEM instrument on-board the GOES-8 satellite (in a geostationary orbit). Not unexpectedly, considering their magnetic rigidities, we find strong correlations between the EPHIN P4 (5–8.3 MeV) and the GOES-8 P2 (4–9 MeV) proton channels, and also between the EPHIN P41 (41–53 MeV) and the GOES-8 P5 (40–80 MeV) proton channels. Since data from EPHIN are only available once a communication link has been establised (nominally once every 8 hours), these correlations allow the Science Operations Team of the CXO to better gauge the radiation environment of the CXO and to take preventive measures, such as suspending observations and protecting the science instruments, when necessary.

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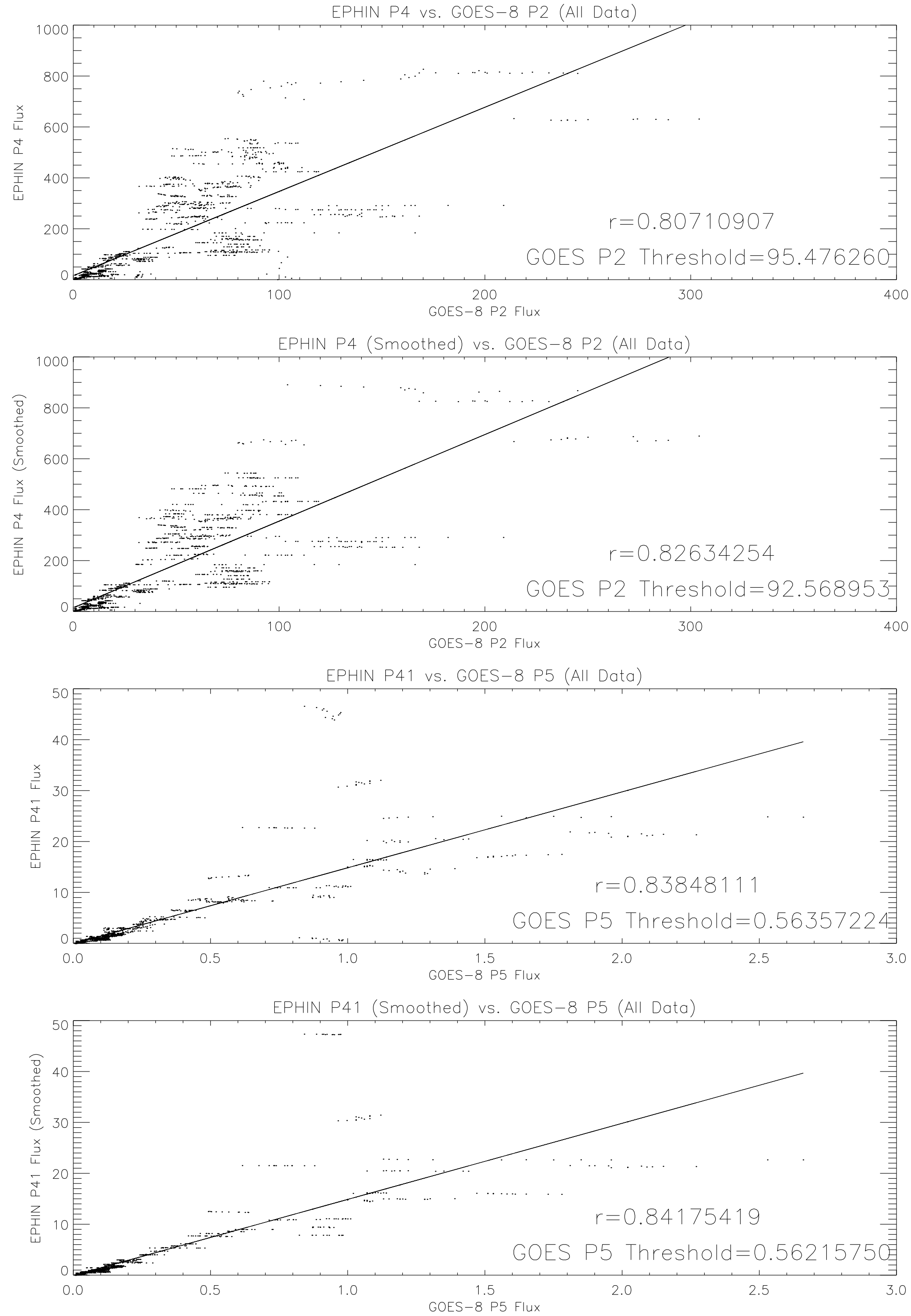

Fig. 1. *TOP 2 PLOTS*: EPHIN P4 proton (5-8.3 MeV) data versus the GOES-8 P2 proton (4-9 MeV) data. *BOTTOM 2 PLOTS*: EPHIN P41 proton (41-53 MeV) data versus the GOES-8 P5 proton (40-80 MeV) data. The second plot in each grouping presents the correlation once the EPHIN proton data set has been smoothed (width = 5 EPHIN samples). Also included is the linear Pearson correlation coefficient, r. Flux are in units of $protons/(cm^2 - s - sr - MeV)$.