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New homogeneous composite of energetic electron fluxes from NOAA/POES satellites

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One of the most popular datasets of energetic particles used in, e.g., long-term radiation belt studies and in atmospheric/climate studies is perhaps the NOAA/POES (Polar Orbiting Environmental Satellites) dataset, which is unique in its length extending nearly continuously from 1979 to present. However, it has been long recognized that the energetic particle measurements by the MEPED instrument (Medium Energy Proton and Electron Detector) onboard the POES satellites has numerous instrumental problems, which have made quantitative estimates of energetic particle fluxes somewhat difficult. In the recent years a lot of effort has been put in understanding and correcting these instrumental deficiencies, and as a result we have produced a dataset, which corrects instrumental degradation, electronic noise and various sensitivity and contamination issues.

However, there are also other remaining factors, not related to instrument construction, which still severely impact the homogeneity of the 39-year POES dataset when considered for long-term studies. One inhomogeneity is caused by the drift in the orientation of the satellite orbital planes over long periods of time, which leads to spatial changes being misinterpreted as temporal changes. Another, even more serious issue, is the difference in the orientation of the particle telescopes between the satellites flown before mid-1998 (SEM-1 era) and after that (SEM-2 era). Here I discuss these problems and how the data can be corrected for them, and present a new homogenized composite POES data series, which yields the latitudinal distribution of energetic electrons from 1979 to present with daily time resolution.