

# New medium-energy electron precipitation solar forcing dataset for CMIP7

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A new dataset has been provided for CMIP7, to model the ion pair production due to mid-energy electron precipitation.

The data set has been calculated using an updated version of the CMIP6 electron flux model and an atmospheric ionization parameterization (Fang et al., Geophys. Res. Lett., 37, L22106, doi:10.1029/2010GL045406, 2010). The electron flux model is fit to equivalent isotropic precipitating electron fluxes estimated from observations of the MEPED detectors onboard POES NOAA-6, 8, 10, 12 and 15 satellites during 1979 to 2023. The isotropic fluxes were estimated by fitting the measurements of the two MEPED telescopes to a theoretical form of pitch angle distribution describing pitch angle diffusion under wave-particle-interactions (Nesse-Tyssoy, J. Geophys. Res. Space Physics, 121, <https://doi.org/10.1002/2016JA022752>; Asikainen, 2024 pers. comm.). These data have been instrumentally calibrated and corrected for proton contamination (Asikainen and Mursula, (2013), J. Geophys. Res., 118, <https://doi.org/10.1002/jgra.50584>) as well as temporally and spatially corrected for background noise, changing satellite orbits and differences in satellite instrumentation (Asikainen and Ruopasa (2019), J. Geophys. Res. Space Phys., 124, <https://doi.org/10.1029/2018JA026214> and Asikainen (2019), J. Geophys. Res. Space Phys., 124, <https://doi.org/10.1029/2019JA026699>).

The flux model depends on the geomagnetic Ap index. The CMIP7 reconstruction of Ap has been used to cover the whole period between 1850 and 2023. The valid range of MEE IPR data is 44.5-71.5 deg geomagnetic latitude (both hemispheres) and 7.26e-5 –10 hPa. Outside this range MEE IPR data are set to zero. Standard data represent the median values of the 1850-1873 period.

## Solicited or Contributed

Contributed

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