



HAL
open science

Introducing a new ground-based Radiation belt electron enhancement events catalog

Gautier Nguyen, Guillaume Bernoux, Vincent Maget

► To cite this version:

Gautier Nguyen, Guillaume Bernoux, Vincent Maget. Introducing a new ground-based Radiation belt electron enhancement events catalog. EGU 2024, Apr 2024, Vienne, Austria. pp. EGU24-7584, 10.5194/egusphere-egu24-7584 . hal-04891959

HAL Id: hal-04891959

<https://hal.science/hal-04891959v1>

Submitted on 16 Jan 2025

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



Distributed under a Creative Commons Attribution 4.0 International License

EGU24-7584, updated on 16 Jan 2025

<https://doi.org/10.5194/egusphere-egu24-7584>

EGU General Assembly 2024

© Author(s) 2025. This work is distributed under the Creative Commons Attribution 4.0 License.



Introducing a new ground-based Radiation belt electron enhancement events catalog

Gautier Nguyen, Guillaume Bernoux, and Vincent Maget

ONERA, DPHY, France (gautier.nguyen@onera.fr)

Electron radiation belt enhancement events are a key phenomena of the Earth geomagnetic activity and have been thoroughly studied in the literature.

Establishing extensive catalogs of these events automatically is a key asset to both the global statistical study of the electron radiation belt enhancement and, from an operational perspective, to provide actionable scenario-based forecasts. The latter being the objective of the EU Horizon Europe FARBES (Forecast of Actionable Radiation Belts Scenarios) under which this work is funded.

Nowadays, the existing attempts of establishments of such catalogs are scarce and often based on the exceedance of certain thresholds of ground-based measurements (Bernoux and Maget, 2020) or onboard electron fluxes (Reeves et al. 2020). Which often leads to missed events, non-events or events with unrealistic boundaries.

In this work, we introduce a novel automatic detection method of radiation belt enhancement events based on the C_a index (Rochel et al. 2016), a simple 1D-proxy representative of the state of the electron radiation belts for average energies (up to MeV). This method is then used to produce an extensive catalog of events between 1870 and 2023 with more realistic boundaries. The most recent events of this catalog (detected after 1995) are then associated with their possible physical cause, whether it be Interplanetary Coronal Mass Ejections (ICMEs) or Streaming-Interaction regions (SIRs).