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On usage of electron observations from Cluster/RAPID/IES instrument in Earth's radiation belts and ring current

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For over 15 years, the Cluster mission passes through Earth's radiation belts at least once every two days for several hours, measuring the energetic electron intensity at energies from 30 to 400 keV. This vast amount of data has previously been considered as rather useless due to contamination by penetrating energetic particles (protons at >100 keV and electrons at >400 keV). In this study, we assess the efficiency with which aluminium shielding of RAPID/IES detector filters out contaminating high-energy electrons and protons. We base our estimation on the analysis of experimental data and a radiation transport code (Geant4). In our simulations, we use the incident particle energy distribution of the AE9/AP9 radiation belt models. We identify the Roederer L-values and energy channels that should be used with caution and show examples of misinterpreting the data, particularly in the slot region. Comparison of the data with electron and proton observations from RBSP/MagEis indicates that the subtraction from the IES electron data of proton intensities at energies ∼230–630 keV cleans well the data from the proton contamination. We show that the data from this detector measured in the radiation belts is still useful for many scientific applications. This is very valuable as it provides one of the longest available radiation belt data sets.