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PHENOMENOLOGICAL EARTH RADIATION BELTS MODELING: THE 5DRBM-E AND 5DRBM-P
MODELS FOR TRAPPED ELECTRONS AND PROTONS**Abstract**

This paper shows the development and presents an updated version of a new phenomenological 3D dynamic volume model of the Earth Van Allen Belts called 5DRBM-E, 5 Dimensions (x, y, z, time, radiation) Radiation Belt Model for Electrons. Only based on measurements coming from ESA's INTEGRAL and XMM-Newton missions, this model is robust and has already shown very good results with respect to the AE8min/max models that are currently widely used. The static version for the radiation model has been validated using Global Navigation Satellite System (GNSS) satellite measurements and compared to AE8min/max models. The new model version features the sun's influence on the Van Allen Belts through the 11 years solar cycle and the Radiation Belts yearly/seasonal variations. The 5DRBM-E is one of the first global dynamic models of the Earth Electron Radiation Belt. It is dedicated to long-term

mission planning as it ignores short-term dynamics induced by the sun such as coronal mass ejections or solar flares which are not predictable on a long timescale. The development and testing of the 5DRBM-P model for trapped protons are also presented in this paper. The final goal is to have full electron and proton dynamic Radiation Belts models which could be simply and widely used within the space science and space engineering community to design, prepare and plan space missions.