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Space Earthquake Perturbation Simulation (SEPS) an application based on Geant4 tools to model and simulate the interaction between the Earthquake and the particle trapped on the Van Allen belt

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During last decades, few space experiments revealed anomalous bursts of charged particles, mainly electrons with energy larger than few MeV. A possible source of these bursts are the low-frequency seismo-electromagnetic emissions, which can cause the precipitation of the electrons from the lower boundary of their inner belt. Studies of these bursts reported also a short-term pre-seismic excess.
Starting from simulation tools traditionally used on high energy physics we developed a dedicated application SEPS (Space Perturbation Earthquake Simulation), based on the Geant4 tool and PLANETOCOSMICS program, able to model and simulate the electromagnetic interaction between the earthquake and the particles trapped in the inner Van Allen belt. With SEPS one can study the transport of particles trapped in the Van Allen belts through the Earth's magnetic field also taking into account possible interactions with the Earth's atmosphere. SEPS provides the possibility of: testing different models of interaction between electromagnetic waves and trapped particles, defining the mechanism of interaction as also shaping the area in which this takes place,assessing the effects of perturbations in the magnetic field on the particles path, performing back-tracking analysis and also modelling the interaction with electric fields.
SEPS is in advanced development stage, so that it could be already exploited to test in details the results of correlation analysis between particle bursts and earthquakes based on NOAA and SAMPEX data. The test was performed both with a full simulation analysis, (tracing from the position of the earthquake and going to see if there were paths compatible with the burst revealed) and with a back-tracking analysis (tracing from the burst detection point and checking the compatibility with the position of associated earthquake).