Geosynchronous environment for Identification of satellite hit anomalies (GEISHA)

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We focus on prototyping a space weather service able to help in the analysis of anomalies that may appear on spacecraft after major events, the focus being geosynchronous orbit. This first step consists in the identification of the user needs concerning the determination of high and medium energy particles at geosynchronous orbits. The objective is for this Space Weather prototype service to provide products and parameters outputs matching the users requirements in terms of: exploitability of the data; correlation of the phenomenon with satellite distortion; quantification of the environment; time lining of the events . The proposed service shall address the following aspects :

- nowcasting, meaning the delivery of data enabling a straightforward use in the operation of the satellite
- post-event analysis, meaning an appropriate quantification of the phenomenons and associated parameters accuracy, for the engineers to derive clear conclusions on the satellite design sensitivity .

To reach user needs we perform an interpolation between all LANL geosynchronous electron measurements available at any given time taking into account single electron properties trapped in the Earth magnetic field. We will also consider solar proton and extend one single point measurement at GEO to all longitudes considering the motion of un-trapped particles. We should then be able to restore the entire environment at GEO of interest to make any post anomaly analysis. Next the accuracy of the predictions have to be investigated for any magnetic conditions to make this product useful to users otherwise they will never know how far they can believe in the results and would not consider the product anymore. To evaluate this space weather product we will then compare our predictions with the other LANL-GEO or NOAA-GOES measurements, respectively for electron and proton, available at other longitudes than the input. This can be done running the code throughout the entire database available at ONERA (Figure 2), i.e. from February 8, 1977 to present for LANL-GEO and from March 01, 1987 to present for NOAA-GOES (when at least two spacecraft are operational at the same time). Then errors bars will be defined for different space weather conditions, quiet, moderate, active and very active.