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DETECTING AND INVESTIGATING SPACE WEATHER EVENTS AROUND MARS WITH EDAC
COUNTERS**Abstract**

The aim of this study is to develop an algorithm for the detection and investigation of space weather events around Mars by using Error Detection and Correction (EDAC) counters on the Mars Express satellite. EDAC counters are engineering housekeeping parameters that monitor memory errors in onboard computers on all spacecrafts. The EDAC counters can be triggered by charged energetic particles, such as Galactic Cosmic Rays (GCR) and solar energetic particles, that penetrate the spacecraft and hit onboard computers causing bit-flips. The counters are cumulative and increase relatively steady due to the continuous presence of GCR.

A daily EDAC count rate is calculated by finding the difference in the counter readings from a set interval of days and dividing by the number of days. The rate is affected by the long-term variations of GCR background radiation caused by solar cycle modulation. When this variation is corrected for, transient solar space weather events can be discerned from the background, visible as EDAC count rate spikes. A large number of events was detected in Mars orbit, and selected events are compared with other dedicated radiation instruments.

The use of EDAC counters for scientific purposes is a fairly recent development. The benefit of utilizing these parameters are many; there are large amounts of EDAC data available as EDAC counters are present on all spacecraft, the data is collected continuously providing long uninterrupted timeseries, and the distribution of the entire fleet of spacecraft in the solar system allows for excellent spatial coverage. The use of EDAC data to investigate space weather events could yield valuable information on the radiation environment for current and future human and robotic exploration of space.