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Profiling the high energy particle flux in the Swarm orbit.

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The Swarm mission launched in 2013, uses a constellation of three spacecraft to obtain the hitherto most detailed magnetic mapping of the Earth. With the mission objective set on recovering the space-time ambiguity of the magnetic field, the spacecraft are configured as a loose configuration, with two spacecraft orbiting with a moderate lateral separation and the last in a somewhat higher orbit. Each spacecraft is equipped with an accurate star tracker for accurate attitude recovery, featuring three sensor heads oriented such as to eliminate the risk of simultaneous blinding, located close to and on the same optical bench as the spacecraft high accuracy vector magnetometer. Star tracker sensors are intrinsically sensitive to passing ionizing radiation, and must feature means to suppress this signal, if full operations are to be maintained during passages of the South Atlantic Anomaly (SAA) and e.g. passing Corona Mass Ejections (CMEs). In the case of Swarm, the proximity to the Vector Magnetometer precluded the traditional use of larger metallic radiation shields, why a SW based morphological filter was used instead. The SW filter output the number of particle traces removed, per update, effectively turning this output into a high energy particle detector. In November 2017, we started to send this information to the ground, one count per star tracker per update, to monitor the high energy fluxes in the orbits of the Swarm spacecraft. The low spatial separation of the spacecraft enables a precise mapping of the energetic particles encountered.
We present the first result of the measured high energy particle flux measured by the Swarm mission, and discuss its energy calibration, angular resolution and temporal resolution, and show examples of how freshly injected particle populations relax to the standard trapped flux observed by typical radiation monitors.