Van Allen Probes data dives deep into Near-Earth space, revealing safer areas with less radiation

Claudepierre, S. G., et al.(2017), The hidden dynamics of relativistic electrons (0.7-1.5 MeV) in the inner zone and slot region, J. Geophys. Res. Space Physics, 122, doi:10.1002/2016JA023719.

Artists rendering of one Van Allen Probes satellite. Credit: NASA

The NASA Heliophysics Van Allen Probes mission is allowing scientists to study parts of space we've never been able to see before, revealing dynamic changes in Earth's radiation belts. Earth's radiation belts envelope our home planet and are full of charged particles that change in energy, intensity, charge and location in response to geomagnetic storm activity. Space radiation can have detrimental effects on our spacecraft and instruments in orbit and because of this, it's useful to learn more about how our radiation belts operate and how they respond to space weather in the ways they do.

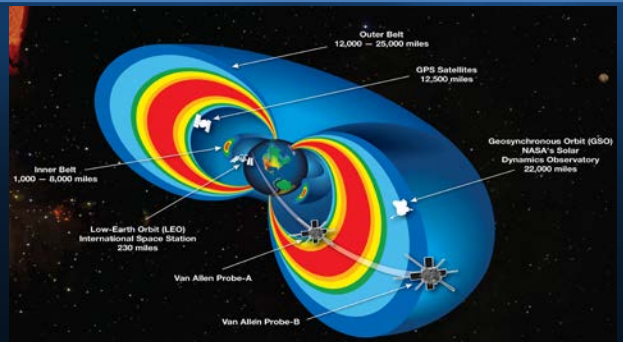
The outer belt, consisting of mostly electrons, has been studied extensively for years. It's been difficult to study inner belt electrons as we didn't have the technology in space to be able to decontaminate the data from large amounts of high-energy protons found in inner belt data until Van Allen launched in 2012. This meant that parts of the inner belt's electron energy spectrum were invisible to scientists.

Enter the MagEIS instrument aboard the Van Allen Probes spacecraft.

This instrument has the technology to sort particles based on their charge AND energy. The data MagEIS has obtained while flying through Earth's radiation belts over the past four years has allowed scientists to study the inner belt and its energies in brand-new ways.

Thanks to MagEIS data, a team of scientists led by Seth Claudepierre from the Aerospace Corporation has found that the inner belt doesn't house many relativistic electrons over time and so, **there is less radiation in this belt than the outer belt, on average**.

As we work on being able to better predict geomagnetic storm activity, information provided by Claudepierre et al. demonstrate that space is safer than previously believed, with less radiation impacts for our spacecraft in orbit. This research could also be applied to spacecraft design for satellites and instruments orbiting the inner belt as it may result in the production of lighter and cheaper components that don't need to be built to withstand large amounts of radiation.



Animation of Earth's radiation belts and where various spacecraft orbit. Credit: NASA