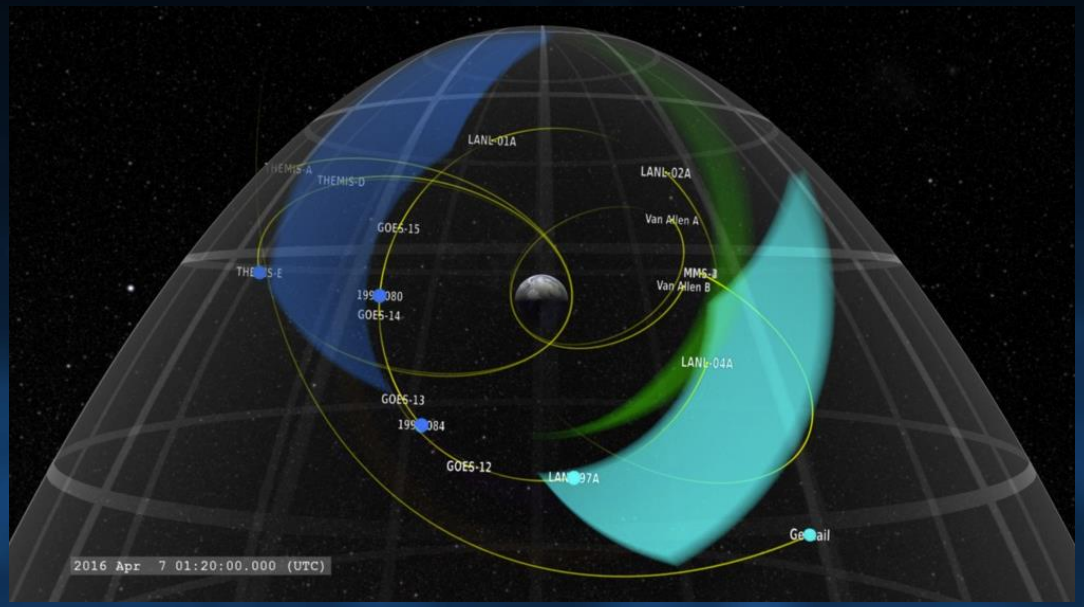
# 16 Spacecraft Collaborate on Substorm Onset

In a collaborative study, scientists combined data from 16 separate NASA and Los Alamos National Laboratory spacecraft to track the growth and movement of a particle phenomenon in the magnetic environment around Earth. These events, called substorms, can cause spectacular auroras and accelerate the high-energy charged particles trapped in Earth's radiation belts.

Data from individual missions provide a snapshot of what a space environment looks like at a specific place and time, but it is difficult to get a comprehensive picture of where the particles came from and where they're going. For this study, the scientists used data from four individual NASA missions — the Magnetospheric Multiscale mission, Van Allen Probes mission, Geotail (joint with JAXA), and the Time History of Events and Macroscale Interactions during Substorms mission — plus the Los Alamos geosynchronous satellites and ground-based magnetometers.




By combining observations from 16 spacecraft situated in locations spread around Earth, recent research gained big-picture insight into how particles move during magnetic disturbances called substorms. Such work provides insight into how the energetic particles that pervade substorms originate and become energized -- information that ultimately can help improve predictions of the onset of this type of space weather.

With the magnetometers, the researchers found a signature of a substorm current wedge — one of the major features of a classic substorm. Combining this information with the spacecraft data, showed there is activity around Earth for more than an hour leading up to wedge formation, a process that has been hotly debated in the past.

The next step is to determine if this long growth time is typical of other substorms. With the Magneotspheric Multiscale mission in a new orbit that takes it farther from Earth, the team expects to be able to see the point of origin of the events and hopefully capture a complete start-to-finish picture of a substorm event.