The Geostationary Synthetic Thinned Aperture Radiometer, GeoSTAR, is a new concept for a microwave atmospheric sounder intended for geostationary satellites such as the GOES weather satellites operated by NOAA. A small but fully functional prototype has recently been developed at the Jet Propulsion Laboratory to demonstrate the feasibility of using aperture synthesis in lieu of the large solid parabolic dish antenna that is required with the conventional approach. Spatial resolution requirements dictate such a large aperture in GEO that the conventional approach has not been feasible, and it is only now - with the GeoSTAR approach - that a GEO microwave sounder can be contemplated. Others have proposed GEO microwave radiometers that would operate at sub-millimeter wavelengths to circumvent the large-aperture problem, but GeoSTAR is the only viable approach that can provide full sounding capabilities equal to or exceeding those of the AMSU systems now operating on LEO weather satellites and which have had tremendous impact on numerical weather forecasting. GeoSTAR will satisfy a number of important measurement objectives, many of them identified by NOAA as unmet needs in their GOES-R pre-planned product improvements (P3I) lists and others by NASA in their research roadmaps and as discussed in a white paper submitted to the NRC Decadal Survey. The performance of the prototype has been outstanding, and this proof of concept represents a major breakthrough in remote sensing capabilities. The GeoSTAR concept is now at a stage of development where an infusion into space systems can be initiated - either on a NASA sponsored research mission or on a NOAA sponsored operational mission. GeoSTAR is an ideal candidate for a joint "research to operations" mission, and that may be the most likely scenario. Additional GeoSTAR related technology development and other risk reduction activities are under way, and a GeoSTAR mission is feasible in the GOES-R/S time frame, 2014-2016.