

# **Statistical study on plasma bubble with Equatorial Atmosphere Radar, GPS scintillation, and GAIA model**

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We have been studying the plasma bubble over a decade by using various techniques. Equatorial Atmosphere Radar (EAR) conducted multi-beam experiment of the plasma bubble, made it possible to distinguish spatial and time variations, and clarified its near sunset-terminator occurrence of the phenomenon. EAR also found that the plasma bubbles form several-hundred km scale zonal structures, which can be considered as earlier study of large-scale wave structures (LSWS). EAR continues every-night experiment of the plasma bubble since 2010.

We now conduct statistical study on the plasma-bubble condition based on observations of GPS scintillation and atmospheric condition from the GAIA model. We are finding evidences that the stratosphere around the equator show enhanced fluctuations on the day of intense plasma bubble measured by the GPS scintillations. We try to expand the comparison bases including long-term data from the EAR.