Hyosub Kil/Johns Hopkins University Applied Physics Laboratory
A tool forecasting equatorial plasma bubbles

The equatorial plasma bubbles (EPBs) cause the most severe radio scintillation in the equatorial region at night. Its forecast is urgently needed to the users of satellite communication and navigation systems. Despite the significant progress in modeling and observational techniques in the last 30 years, the variability of the EPB activity is not yet fully understood. Not knowing the precursor of the EPB, EPB forecasting is still a challenging goal to achieve in the near future. The purpose of the proposed study is to support the on-going EPB and scintillation forecasting efforts by providing the database for the EPB properties and developing a forecasting tool. The nighttime FUV observations of the F-region from the TIMED/GUVI provide the global EPB images that show large variability in their depletion depth, longitudinal width, north-south elongation, tilt, and occurrence pattern. Retrieval of the EPB images from the GUVI data will provide a unique data source for the EPB properties that can be used for the study of the EPB distribution, seed perturbation, growth condition, and its forecast. A few techniques have been developed to retrieve the EPB images from the GUVI data but the EPB database has not been created. We propose to apply an image processing technique to retrieve the EPB images and produce the EPB database by processing the GUVI data during 2002-2004. We will also process the ROCSAT-1 data during 1999-2004 to retrieve the EPB characteristics. An EPB forecasting tool will be developed using the EPB database from the GUVI and ROCSAT-1. The EPBs often occur superimposed on large-scale structure that ranges a few to several tens of degrees in longitudes. This phenomenon occurs repeatedly and in all longitude regions. There may be coherence in the occurrence of EPBs. Our forecasting tool will exploit the possible coherent occurrence of EPBs.