Thailand's statement
On Agenda Item 11: Space weather
by Mr. Sitthiporn Channumsin, Chief of Astrodynamics Research Laboratory, Geo-Informatics and Space Technology Development Agency
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Mr. Chair and Distinguished delegates,

Thailand would like to update on the developments and activities in the space weather. Thailand has performed research concerning space weather for 30 years. We have a long-standing program to model the transport of solar energetic particles from the Sun to the Earth. We have analyzed data from ground-based neutron monitors in Earth's polar regions to map out the directional distribution of relativistic solar particles in so-called Ground Level Enhancement (GLE) events, which have the most intense and severe radiation effects among space weather events and are the only events of concern for radiation dosage of airline crew and passengers. Taking account of the extreme anisotropy of solar radiation storms, our research has shown that even if a commercial flight was to pass through the zone of most intense radiation during the GLE of 2005 Jan 20, which was the strongest event of the past 65 years, the radiation dosage would be similar to that at ground level for a year, which is not life-threatening. We provided the first theoretical explanation of precursory anisotropy of Galactic cosmic rays and its distance/time scales, which could provide advance warning of the impact of an interplanetary shock at Earth. We also developed ground-based instrumentation to monitor the Galactic cosmic ray flux, spectrum, and anisotropy, establishing the Princess Sirindhorn Neutron Monitor as a cosmic ray detector at the summit of Doi Inthanon, Thailand's highest mountain. We have recently extended our innovative measurement techniques to upgrade a polar neutron monitor at Mawson Station, Antarctica, which can improve measurements of GLE particles.

One of the main objectives of the Space Weather research in Thailand involve the study of equatorial plasma bubbles (EPB), which originate at the Equatorial latitude, then spread to high latitudes. As understanding of the EPB origination as well as day-to-day variation is not well understood, Thai researchers have started the research program on monitoring of EPB and its effects on crucial technology in society.

The VHF radar station at Chumphon province, southern part of Thailand, has recently been installed and operated in collaboration with NICT, Japan, in order to study the EPB in depth. This radar station is an important station as it is situated close to the magnetic equator. It is a complement to existing stations including GNSS receivers, All-sky images, Satellite beacon receivers and ionosonde stations. We have constructed the Thai GNSS and Space Weather Information Center to provide observation data and derived data products. The observation data include ionograms, total electron content (TEC) data and scintillation information. Derived data products include Rate of TEC change (ROTI) maps, Maximum usable frequency (MUF) maps, Positioning error map over Thailand, for instance. The characteristics of EPB have been studied including, EPB speeds, widths and gradients. Mixed observational data such as VHF radar images, TEC analysis and satellite beacon receiver are utilized for the study.

In addition, we have embarked on the research and study on the effects of EPB on positioning technologies such as real-time kinematic (RTK) system, PPP-RTK system, and aeronautical navigation technologies such ground-based augmentation (GBAS) and satellite-based augmentation system (SBAS). For GBAS, the spatial delay gradient statistics have been studied during quiet and disturbed events. For quiet periods, the derived standard deviation of vertical ionospheric gradient is useful in the GBAS system performance during the nominal condition. However, the analysis during disturbed periods results in the threat model. For SBAS, we have developed improved positioning accuracy by incorporating the locally-derived ionospheric delays in comparison with GAGAN and BDSBAS system.

Thailand continues to promote development of an improved understanding of space weather and look forward to work with the Space Weather Expert Group and with all member states.

Thank you, Mr. Chair.
