R010-02
A 会場 ：9/24　PM1 （13:45-15:30）
14:00〜14:15

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A Periodic Variation of Solar Wind Origins in Solar Cycles

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The solar wind is an important piece of information in space weather, space climate, and heliophysics, however, we have not yet fully understood its origin and acceleration mechanism and behavior in the heliosphere. Especially for the space climate, a variation of the global solar wind structure provides the key to understanding. Interplanetary scintillation (IPS) observation at the Institute for Space-Earth Environmental Research (ISEE) started routinely in 1985, and it allows us to reconstruct global solar wind velocity structure in each Carrington rotation (CR) without winter. Here, to derive long-term variations, the ISEE-IPS data are converted into latitudinal velocity structure data such as sunspot butterfly maps. It is clearly seen that the solar wind is composed of two types of solar wind with about 400 km/s (slow solar wind) and 800 km/s (fast solar wind), known as the bimodal solar wind, and their boundary latitudes depend highly on solar cycles. Subsequently, we employed the Potential Field Source Surface (PFSS) model to estimate the origins of the solar wind and investigate the characteristics of its long-term variation. Our findings reveal that the majority of the slow solar wind emanates from coronal holes situated at mid- and low-latitudes, whose spatial distribution aligns with the sunspot butterfly diagram. In this presentation, we concentrate on the variability of the solar wind origins and their statistical properties from 1985 to the present.