# Distribution maps of ROTI and losses of lock associated with equatorial plasma bubbles

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Equatorial plasma bubbles are local depletions of the electron density in the ionosphere. Due to various-scale irregularities, plasma bubbles affect wide-band radio waves and cause scintillations in the GPS navigation system in which L band is used. Strong scintillation leads to loss of lock on GPS signals because of rapid variations of signal amplitude and phase. Therefore, it is important to examine the effect of plasma bubbles on GPS systems. Detecting scintillations associated with plasma bubbles, we can observe the evolution of 100m-scale disturbances in the ionosphere. In addition, temporal variations of TEC, which is calculated from GPS data, are affected by kilometer-scale disturbances in considering the velocity of GPS satellites.

In this study, we analyzed rate of TEC change index (ROTI) and losses of lock to examine the scales of electron density disturbances in plasma bubbles. We selected plasma bubbles from 630-nm airglow data observed in 2001, and then compared the positions of the plasma bubbles with the distribution maps of ROTI and losses of lock at a height of 250 km.

As a result, it is shown that ROTI increased and losses of lock occurred in the vicinities of the plasma bubbles observed by 630-nm airglow camera. In the event of September 22, 2001, ROTI didn’t decrease even though occurrence of loss of lock decreased. It is conceivable that the disturbances in the plasma bubbles decay.