

Numerical simulation of equatorial plasma bubble

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Equatorial plasma bubble is a phenomenon that ionospheric plasma in the bottomside of F region moves to topside of F region. The generation process is considered as Rayleigh-Taylor instability under the gravity in the region of magnetic equator. The plasma bubble occurs after sunset, because the plasma density gradient in the bottomside of F region is large. We carried out 2 dimensional computer simulation of equatorial plasma bubble to understand the characteristics of plasma bubble. The model consists of momentum equation, continuity equation, and current conservation equation. Inertial term is not included in the model, because ion-neutral collision frequency is large in the bottomside of F region. Simulation results showed that the plasma bubble moved from bottom to topside of F region for about 1000 seconds. The growth time is comparable with that of the observation. Altitude of ionosphere and ionospheric plasma temperature affect strongly the generation of plasma bubble. At low altitudes, neutral wind is also key parameter for the growth of plasma bubble.