

A statistical investigation of plasmaspheric plasma by using global GPS TEC data

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A statistical analysis of the daily, monthly, yearly and solar cycle variations of plasmaspheric plasma from near earth to the dayside magnetopause is investigated by using the equatorial mapping data of the ground-based global position system (GPS) total electron content (TEC) from the noon meridian for the years of 2003-2015. During the geomagnetic storms, the mapped TEC data often showed clear plume structures in the afternoon sectors, which had been detached from plasmasphere towards sunward and reached the dayside magnetopause. However, the plasma in the plume was exhausted after the main phase of the storms and the plasmasphere needed one day or a few days to be refilled. This exhaustion may be because of the plasmaspheric plasma escaping through the dayside magnetopause where the magnetic reconnection or magnetopause shadowing occurred. The mapped TEC plumes and plasmasphere refillings preferred to appear around every afternoon and often reached the dayside magnetopause with different TEC value depending on the solar and geomagnetic conditions, which also preferred to appear in the months from March to May and from October to December and in the years during solar maximum. These results may suggest that the plasma in the plumes escaped away through the magnetopause due to the dayside magnetic reconnection or magnetopause shadowing during the recover phase of the geomagnetic storms, and the polar ionosphere continuously refills plasma into the plasmasphere during the quiet days, which can be stored and partially convected sunward to the dayside magnetopause for forming plumes.

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