Formation of the dense plasma sheet and its relationship with the development of geomagnetic storms

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The large southward interplanetary magnetic field, or the large duskward interplanetary electric field, is essential for the development of the severe ring current during geomagnetic storms. It is pointed out that the dense plasma sheet is also important for the development. It is not clear from observations, however, how dense plasmas are transported to form the dense plasma sheet, causing the development of the ring current. In the present paper, we statistically studied characteristics of plasmas and magnetic fields in the solar wind and the magnetotail when dense plasmas were observed at nightside geosynchronous orbit, addressing whether or not storms do develop during such periods. We found that a dense plasma region is observed between the high- and low-speed solar wind when the density is high at geosynchronous orbit. The density increases in the magnetotail, particularly in the postmidnight plasma sheet, from several hours before the appearance of geosynchronous dense plasmas. Furthermore, we will discuss entry and transport processes of dense plasmas from the viewpoint of the entropy, as well as the relationship with the development of storms.