

地球磁気圏シースの高温異常流中での磁気フラックスロープの形成

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Magnetic flux rope formation within a hot anomalous flow in Earth's magnetosheath

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We report observations on 1 March 2004 by the Cluster spacecraft of a hot flow anomaly (HFA) encountered in the dayside magnetosheath near Earth's bow shock. HFAs are an explosive phenomenon resulting from the interaction between a planetary bow shock and an interplanetary current sheet (more specifically, a tangential discontinuity). Embedded within the HFA was a magnetic flux rope with a diameter of a few thousand km, which was moving sunward and was presumably expanding. The pristine upstream solar wind seen by the ACE spacecraft contains an interplanetary current sheet favorable for the HFA formation, but shows no flux rope signatures. Moreover, some properties of the flux rope, such as its slow speed, magnetic field variations, and the absence of magnetospheric electrons, are not likely to be due to magnetopause flux transfer events. These observations suggest that the flux rope was created in the magnetosheath, rather than in the solar wind, in the foreshock, or on the magnetopause, through magnetic reconnection initiated in the course of the HFA development. Interestingly, energetic (~ 100 keV) electron fluxes were enhanced in and around this HFA-associated flux rope. The observations indicate that reconnection can occur within the magnetosheath part of HFAs and that such reconnection may play a role in the generation of energetic electrons, which is a common feature of HFAs.

