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Thin magnetosheath as observed by Themis probes

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We analyzed Themis observations of the subsolar bow shock and magnetopause in the 2007-2009 years and found more than 10 cases when the whole magnetosheath was swept along the probes in 2-5 minutes. Since typical values of speeds of the magnetopause and bow shock displacements are about 30-60 km/s, thus these observations suggest that the magnetosheath can be very thin (or the speeds of boundary displacements are very large) under some circumstances.

The paper presents a case study of simultaneous observation of the bow shock and magnetopause by the Themis and Geotail spacecraft. We have shown a significant deformation of the magnetopause surface that locally decreases its curvature radius. The highly curved magnetopause results in the decrease of the magnetosheath thickness to about a half of its standard value. The observed phenomenon is attributed to a change of the interplanetary magnetic field cone angle from nearly zero to 90 degrees.