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Spatial profiles of magnetosheath plasma and magnetic field parameters and their variations

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We present a new automatic method of determination of the bow shock and magnetopause locations based on continuous monitoring of plasma parameters and magnetic fields in regions scanned by the Themis spacecraft and their normalization to solar wind conditions. This method was successfully tested on the dayside magnetosphere using $\sim$6000 bow shock and $\sim$6000 magnetopause crossings. Applying the approach following from this method, we construct spatial profiles of the dayside plasma and magnetic field parameters in the magnetosheath in the range of 0.6 to 11 nPa of solar wind dynamic pressures.

We compare experimentally obtained spatial profiles of the magnetosheath parameters with the predictions of gasdynamic and global BATS-R-US MHD models. This comparison exhibits a good overall agreement of measured magnetosheath plasma parameters with both gasdynamic and MHD models even on small spatial scales. Finally, we follow the changes of plasma parameter profiles in accord with variations of different upstream conditions.