Polytropic index of the solar wind for radial IMF

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The preferential type of the thermodynamic process for long-duration radial interplanetary magnetic field (IMF) events is determined from the polytropic index (α). The value of α is derived from the polytropic relation between the number density and the temperature of the solar wind. In this study, we use the solar wind proton data observed from the Wind satellite to determine the value of α. The total energy conservation equation is used to select intervals for the stable α values obtained along the same streamline. We find that the occurrence distribution of α for radial IMF is similar to that for non-radial IMF. The bow shock and magnetopause usually have unusual displacements during the radial IMF condition. This result implies that the thermodynamic process in the solar wind cannot significantly contribute to the unusual displacements of the bow shock and magnetopause during the radial IMF condition.