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Hybrid simulations of the interaction of a current sheet with the termination shock

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We study the interaction of a current sheet with the solar-wind termination shock by using self-consistent hybrid simulations. The characteristics of the region near the intersection point of a shock with a current sheet depends largely on the orientation of the field. For instance, when the magnetic field changes sign across the current sheet in such a way that the drift of charged particles is directed away from the shock, a large region of hot, low density plasma, known as a hot flow anomaly (HFA) forms in the region near the shock. This is also the site of efficient particle acceleration. This may be relevant to our understanding of observations made by Voyager 1 near the termination shock. We perform new numerical simulations which address the formation of these regions and how they are influenced by the inclusion of imposed large-scale turbulence. We find from our simulations that the size of this region is a few million km; thus, it could take several hours for Voyager 1 to cross through this region and observe its characteristics. In addition, the interaction of current sheets with shocks leads to, among other things, efficient particle acceleration, and highly structured and turbulent dowstream plasmas which may be relevant to Voyager observations of the heliosheath. We also identify effects on the pickup population which indicate that it might be influenced by hot flow anomalies and which might have observable consequences.