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Formation of High Speed Jets in the Downstream Region of Quasi-Parallel Shock under different Solar Wind Mach Number conditions

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High speed jets (HSJ) have been clearly evidenced in the downstream region of the quasi-parallel terrestrial bow shock (Hietala et al., 2009; Plaschke et al. 2013), by experimental observations from space missions (including Cluster data more recently). 2D hybrid numerical simulations have evidenced quantitatively the key role of the shock front inhomogeneity and nonstationarity (front rippling) in the dynamics of quasi parallel shock and the formation of HSJs. A scenario has been proposed in which ion flows can be deflected (instead of being decelerated) at locations where ripples are large enough to play the role of local « secondary » shock. Therefore, the ion bulk velocity is different locally after ions are transmitted dowstream, and local high-speed jets patterns can be formed somewhere downstream. This scenario has been established for a reasonable Mach number regime (Ma=5-6). The present work is an extension of previous studies via a parametric analysis based on the variation of the solar wind regime. As will be shown, higher Ma leads to a higher level of turbulence (i) in the inhomogeneous upstream plasma flow carried by the solar wind and passing through the shock front, and (ii) in the shock front rippling itself which have a strong impact on in re-organisation of HSJs formation. Present results will analyze the possible relationship between the nonlinear structures forming upstream and the occurrence of HSJ in the downstream region. One key point is that HSJs are self-consistently « organized » i.e. do not require any upstream disturbance incident from the far solar wind to be convected and to interact with the shock front before penetrating downstream.