

Interactive comment on “Overshoot dependence on the cross-shock potential” by Michael Gedalin et al.

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We are grateful to the reviewer for useful comments. Revisions are made in accordance with the comments and ready for submission. All text corrections are implemented. All parameters, which were not properly defined in the previous version, are defined now. The following introductory paragraph is added:

"Collisionless shocks (CS) are one of the most efficient accelerators of charged particles in the Universe. They are present in 15 virtually all plasma environments at the scales from ~ 1 cm in the terrestrial labs to ~ 1 Mpc in galaxy clusters. CS is a multi-scale object, where highest energies are achieved at largest scales within the diffusive process due to scattering at fluctuations far upstream and far downstream

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and multiple crossings of the shock. The latter occur within the scatter-free region so that ion dynamics in the shock front is intimately related to the large scale acceleration: while the diffusive acceleration occurs at scales much larger than the shock width, the spectrum of the accelerated particles is essentially determined by conservation laws 20 at the scatter-free shock transition. The fields in the shock front are responsible for ion heating, generation of backstreaming ion beams (Burgess, 1987; Kucharek et al., 2004; Oka et al., 2005; Gedalin et al., 2008; Gedalin, 2016b), acceleration of pickup ions (Lee et al., 1996; Zank et al., 1996; Zilbersher and Gedalin, 1997; Ariad and Gedalin, 2013), and injection into the diffusive mechanism (Scholer et al., 2002; Giacalone, 2005). Thus, the structure of the shock front is the central problem of the shock physics. The shock structure can be studied within in situ measurements only at heliospheric shocks. Qualitative understanding of the shock structure substantially improved due to these high quality observations and also due to numerical simulations. The frontier of the observational shock studies has shifted recently towards the processes occurring within few ion convective gyroradii in both directions from the ramp along the shock normal (Dimmock et al., 2012; Wilson et al., 2012, 2014; Johlander et al., 2016; Burgess et al., 2016; Eselevich et al., 2017; Wilson III et al., 2017; Gingell et al., 2017). "

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