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Shock dynamic and generation of suprathermal ions during variable upstream solar wind conditions

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A collisionless shock is a dynamic, self-regulatory, system that response to the solar wind energy input. At the shock, the solar wind kinetic energy is converted into plasma heating and ion acceleration. If thermalization processes downstream of the shock cannot manage to balance energy input, the shock starts reflecting suprathermal ions and the shock front becomes non-stationary. Drastic changes in upstream plasma conditions results in drastic changes in the dynamic of the shock and the generated suprathermal ion population.
We have performed 2D-hybrid simulations to study the effects of density enhancements and depletion on shock reformation and energetic particle release and its associated wave generation. We compared these results with observation from STEREO (for interplanetary traveling shocks) and CLUSTER/MMS (for the Earth's bow shock). It appears that shock reformation is highly impacted by density inhomogeneities and long-term density depressions/enhancements survive downstream of the shock and may from their own discontinuity generating waves and suprathermal particles.