Abstract Submitted
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Micro and macro-instabilities driven by cosmic rays accelerated in front of strong shocks[1] NIKOLAI BUKHARIN, MIKHAIL MALKOV, PATRICK DIAMOND, University of California, San Diego — Cosmic rays (CR) are thought to be accelerated in strong shocks such as supernova remnant shocks. Their acceleration, however, significantly modifies the shock environment and thus influences the acceleration process itself. The paradigm of enhanced CR acceleration by scattering them off the self-generated Alfven waves seems to explain the supernova remnant origin of galactic CRs up to the energies $\sim 10^{15}$ eV. At the same time recent improved observations and analyses suggest a possibility of acceleration of CRs to even higher energies ($10^{17} - 10^{18}$eV) in the same sources. This requires a thorough reconsideration of the backreaction of accelerated particles on the shock structure and on the MHD turbulence that helps to confine and accelerate particles. We consider the Alfven wave instability driven by the CR cloud ahead of the shock in a regime of strong rms magnetic field (exceeding an ambient field) which is more appropriate for an enhanced acceleration. The second part of this study deals with the structural stability and bifurcation of the shock which also strongly influences the acceleration rate by altering the flow velocity gradient and the shock compression.

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