Abstract Submitted
for the DPP15 Meeting of
The American Physical Society

**Cosmic Ray Transport with Magnetic Focusing and the "Telegraph" model**[1] ROALD SAGDEEV, UMD, MIKHAIL MALKOV, UCSD — Cosmic rays (CR), scattered by MHD waves, must propagate diffusively. However, because some of the particles diffuse unrealistically fast, an alternative CR transport model based on the "telegraph" equation was put forward. Though, its derivations often lack rigor and transparency leading to inconsistent results. We apply the Chapman-Enskog method to the CR transport. No "telegraph" $\partial^2 f/\partial t^2$ term emerges in a proper $t \gg 1$ asymptotic expansion. Nevertheless, this term may be *converted* from the $\partial^4 f/\partial z^4$ term of that expansion. However, both the telegraph and hyperdiffusive terms are important only for a short relaxation period associated with the initial CR anisotropy/inhomogeneity. Then, the system evolves diffusively in both cases. The term conversion is possible only *after* this relaxation period. *During* this period, the telegraph solution is argued to be unphysical. Unlike the hyperdiffusion correction, it is not uniformly valid and introduces implausible *singular* components to the solution. These dominate the solution during the relaxation period. Because they are shown not to be inherent in the underlying scattering problem, the telegraph term is involuntarily acquired in an asymptotic reduction.

[1]Supported by NASA ATP-program under the grant NNX14AH36G

Mikhail Malkov
Univ of California - San Diego

Date submitted: 22 Jul 2015 Electronic form version 1.4