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Superdiffusion in turbulence and shock acceleration
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Cosmic ray (CR) transport and acceleration are determined by the properties of turbulent magnetic field. We use the models of magnetohydrodynamic turbulence that were tested in numerical simulation, in which turbulence is injected at large scale and cascades to to small scales. I shall address, in particular, the cross field transport of CRs. I shall demonstrate both analytically and numerically that particles are superdiffusive on small scales. We consider both super- and sub-Alfvenic cases. In the sub-Alfvenic case, the transport in the perpendicular direction is proportional with M_Aˆ4, consistent with our earlier analytical prediction. Implication for shock acceleration is discussed and we show that the difference between acceleration at perpendicular shock and parallel shock is marginalized in the presence of superdiffusion.

キーワード: turbulence, superdiffusion, particle, shock, acceleration, transport
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