



Proton fire hose instabilities and alpha/proton drift

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Parallel and oblique proton fire hose instabilities are investigated in the presence of a small abundance of alpha particles with a non zero drift velocity with respect to protons. Hybrid simulations show that both instabilities scatter protons and alpha particles in the perpendicular direction with respect to the ambient magnetic field and decelerate both species with respect each other; especially the oblique fire hose effectively diffuses ions owing to its non quasi-linear evolution. The parallel fire hose is typically the dominant instability but the oblique fire hose has often a maximum growth rate comparable to that of the parallel one and simulations show that the oblique instability may be active even when the parallel one is marginally stable. Consequently, both instabilities are relevant in the solar wind context.