# Non-linear cosmic ray induced plasma phenomena in accelerators, around sources and around galaxies

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The transport of cosmic rays is heavily affected by non-linear processes that in fact represent the very reason why particles get accelerated in environments such as collisionless shock waves. However, the same phenomena occur in the environment around the putative sources, and may be responsible for some puzzling pieces of observations, such as the so-called TeV halos. Current driven instabilities also occur after escape of cosmic rays from their host galaxies, and lead to strong effects of the intergalactic medium around such galaxies. Here I review these phenomena, the basic underlying physics and their phenomenological implications ranging from particle acceleration to escape from sources and galaxies.