Cosmic rays play key roles in the dynamics and energy balance of interstellar, circumgalactic, and galaxy cluster scales. The coupling between these ultralow density, relativistic particles and the magnetized thermal gas is mediated by a broad spectrum of plasma waves extending from kinetic to macroscopic scales, some of which are excited by velocity space anisotropy of the cosmic rays themselves. I will review these instabilities and discuss the mechanisms by which they arise, highlighting the importance of mesoscales, which has only recently become appreciated.