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Linearly unstable modes and nonlinear saturation mechanism in coronal current-driven plasma

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We investigate the linear stability of a current-driven system in magnetized coronal plasma for all direction of propagation, which is referred to the direction of magnetic field and drift velocity. We consider a configuration that frequently occurs in solar coronal current sheets: an electron drift along magnetic field lines with stationary background ion. This configuration leads to preferential development of electrostatic modes that account for anomalous transports (anomalous resistivity, heat conduction etc.) of turbulent plasma inside current-sheet layer. We mainly focus on low-frequency branches including ion-acoustic, Buneman and lower-hybrid mode (modified two-stream instability). The principle effect of resulting instabilities is the large amplitude electrostatic wave developed therein plays a role as obstacle, so that its potential barrier stops some electrons, which accounts to anomalous resistivity. To study the linearly unstable modes, we use kinetic as well as multifluid description, which is a dispersion solver for multifluid model. Also, to consider the essential physics we apply different equation of state, which is more close to real situation, on different plasma species. The estimation of saturation level of turbulence is made by considering particle trapping in the generated potential wells as a key mechanism in strong turbulence. This investigation is used as a prerequisite step to a nonlinear treatment, which is carried out by means of the kinetic simulation of turbulence in plasma, as well as development of the connection between large and small scale phenomena in plasma.