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Evaluation of null-point detection methods on simulation data

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We model the measurements of artificial spacecraft that resemble the configuration of CLUSTER propagating in the particle-in-cell simulation of turbulent magnetic reconnection. The simulation domain contains multiple isolated X-type null-points, but the majority are O-type null-points.
Simulations show that current pinches surrounded by twisted fields, analogous to laboratory pinches, are formed along the sequences of O-type nulls. In the simulation, the magnetic reconnection is mainly driven by the kinking of the pinches, at spatial scales of several ion inertial lentghs. We compute the locations of magnetic null-points and detect their type. When the satellites are separated by the fractions of ion inertial length, as it is for CLUSTER, they are able to locate both the isolated null-points, and the pinches. We apply the method to the real CLUSTER data and speculate how common are pinches in the magnetosphere, and whether they play a dominant role in the dissipation of magnetic energy.