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Similarities between theoretical models for magnetic confinement fusion plasma and magnetosphere-ionosphere coupling

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High temperature magnetized plasmas are found in the magnetic confinement fusion devices and in the earth's magnetosphere. Here, we discuss theoretical and simulation models commonly used for studies of the fusion and space plasmas, focusing on low-frequency phenomena such as the magnetohydrodynamic (MHD) and the drift wave turbulences.
The fusion plasma is confined by the strong magnetic field, while the near-earth magnetospheric plasma is constrained by the dipole field. The reduced MHD equations are useful for studying low-frequency phenomena in the two plasmas, since they are characterized by low-beta values. We have recently carried out nonlinear simulations of quiet auroral arcs by applying the reduced MHD model to the magnetosphere-ionosphere coupling system. The obtained results are reported in the presentation.
Gyrokinetic theory and simulations for studying the turbulent transport in fusion plasmas have quite rapidly developed in a few decades. The gyrokinetics enables us to theoretically investigate the micro-turbulence that is largely beyond the applicable range of the MHD model. Here, we also present our gyrokinetic simulation model for the magnetic fusion plasma and discuss the possibility of its application to the magnetospheric plasma.

References
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