

MULTI-SCALE SIMULATION FOR PLASMA SCIENCE

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Abstract. In order to perform a computer simulation of a large time and spatial scale system, such as a fusion plasma device and solar-terrestrial plasma, macro simulation model, where micro physics is modeled analytically (closure) or empirically, is usually used. However, kinetic effects such as wave-particle interaction play important roles in most of plasma phenomena and result in anomalies. This limits the applicability of macro simulation models. In a past few years several attempts have been performed to overcome this difficulty.

In my talk, we would present two types of multi-scale simulation method for nonlinear plasma science. First one is the Micro-Macro Interconnected Simulation Method (MMIS), where micro model and macro model are connected dynamically through an interface and macro time and space simulation is performed. Second one is the Equation Free Projective Integration Method (EFPI), where macro space and time scale simulation is performed by using only a micro simulator and sophisticated numerical algorithm. A few paradigmatic examples of multi scale simulation methods will be presented and discussed in more detail.