SYNS 1: Numerical Simulation I

Zeit: Donnerstag 14:00–15:00 Raum: HS Biochemie (groß)

Hauptvortrag SYNS 1.1 Do 14:00 HS Biochemie (groß)
Kinetic Dissipation of Solar Wind Turbulence — •Gregory G. Howes — University of Iowa, Iowa City, IA, USA

The identification of the key physical mechanisms by which the turbulence in the solar wind is dissipated remains a fundamental unsolved problem in heliospheric physics. I will present a theoretical model of the turbulent cascade from the large scales of energy injection, through the transition to kinetic turbulence at the scale of the ion Larmor radius, down to the electron scales at which the turbulent energy must ultimately be dissipated. Kinetic simulations of the magnetized turbulent cascade in the solar wind at the scale of the ion Larmor radius support the hypothesis that the frequencies of turbulent fluctuations in the solar wind remain well below the ion cyclotron frequency both above and below the ion gyroscale. I will present the first nonlinear kinetic simulations of kinetic Alfven wave turbulence in the dissipation range from the ion to electron Larmor radius scales.

Hauptvortrag SYNS 1.2 Do 14:30 HS Biochemie (groß)
Multiscale Simulations of Magnetohydrodynamic Flows — •Rainer Grauer — Institut für Theoretische Physik I, Ruhr-Universität Bochum

Many problems in magnetized plasmas are inherently multiscale in nature where the small scale dynamics at the limit of the MHD approximation has a major impact on the dynamics on global scales. Prominent examples are magnetic reconnection, filamentation instabilities and turbulence. In most applications, the flow is compressible and should be treated numerically with an appropriate conservative scheme. A common technique to handle the multiscale nature in these flows is the application of block structured adaptive mesh refinement to resolve the small scales without too much effort. In this talk, I will give an overview of various techniques for conservation laws, methods to deal with the div $B = 0$ problem and ways to treat special complications which arise in adaptive mesh refinement simulations on massive parallel machines (# CPUs > 8.000).

Since the topics mentioned above are not only multiscale but also multiphysics problems, I will give an outlook on the next step for coupling multiscale fluid simulations on global scales with kinetic simulations in nonideal regions.