Modeling Kinetic Aspects of Global MHD Modes

2 – 6 December 2013 @Snellius

This workshop brought together researchers from several different research communities within fusion plasma physics to discuss common problems faced in the simulation of global magnetohydrodynamic (MHD) modes and instabilities in high temperature tokamak plasmas. These problems arise from the collisionless nature of the plasmas involved and from the presence of significant populations of energetic ions or electrons. These energetic particle populations arise from the various plasma heating methods, or from the fusion produced energetic alpha particles.

A total of 19 researchers from 7 countries participated in the workshop including specialists in plasma fluid closures, RF heating and current drive, plasma fluid modeling, and gyrokinetic modeling. In addition the participants represented the theoretical and computational physics as well as numerical mathematics communities. The main problems discussed during the workshop were introduced in a series of six tutorial lectures which evoked lively discussions. In addition six spontaneous presentations were given by workshop participants on their recent research and on specific issues that came up during the workshop.

A number of questions were identified that were subsequently discussed in smaller groups. Final conclusions are still difficult to draw, as more time is needed to work out possible answers identified in these discussions. A major result of the workshop was the initiation of two benchmark activities. The first benchmark concerns a comparison of tearing mode simulations between 3D reduced MHD codes and global gyrokinetic codes. In the second benchmark the m=1 internal kink mode in a large aspect ratio tokamak will be modeled in a number of different gyrokinetic codes including PIC as well as Vlasov codes.

A final lecture on ‘Space Weather Prediction’ completed the workshop and showed the similarity of problems faced in the simulation of laboratory fusion plasmas as well as space and astrophysical plasmas.