A General Formulation of Perfectly Matched Layers for Mixed Hyperbolic-Parabolic Systems and its Application to Simulations of Viscous Compressible Flows

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This seminar will start with a review of the development of Perfectly Matched Layers (PMLs) for *hyperbolic* systems. Starting with Berenger's, by now classic, paper on PMLs for Maxwell's equations we will point out some results in the literature which have been important for the development of PMLs for other *hyperbolic* systems. The focus of our discussion will be on the stability and well-posedness of general linear hyperbolic Cauchy problems, on domains truncated by a PML, but we will also make some remarks on the stability of the PML truncation of wave-guide problems in elasticity. For these later problems, a new type of instability has been observed (see, Adams et al. in Wave Motion).

In the second part of the seminar we will present some new results on the development of a PML model for mixed *hyperbolic-parabolic* systems. The new model is a straightforward extension of our (Hagstrom, Kreiss & A) general model for *hyperbolic* systems. By explicitly constructing solutions of a related transmission problem we prove that the new model is perfectly matched. The importance of the perfect matching property will be clearly illustrated by numerical experiments performed for two linear applications: an advection-diffusion equation and the linearized Navier-Stokes equations. We end by presenting the non-linear version of our PML and its application to the compressible Navier-Stokes equations; numerical experiments for this application will also be presented.