

## **Review before third exam**

December 4, 2001

**Systems of Hyperbolic Equations (although covered before second exam, we did not really test any of the material. We will include these sections for third exam)**

- Finite difference schemes and their stability on shallow water equations on staggered and non-staggered grids.
- Accuracy of solutions, in terms of phase speed and group velocities, of inertial gravity waves presented on staggered and non-staggered grids
- Methods for dealing with insignificant fast waves

### **Boundary conditions for hyperbolic equations**

- The concept of well posedness for wave equations based on characteristics
- Wave reflection at computational boundaries. Analysis of reflection with simple advection /wave equation
- Open boundary conditions
- Other way of controlling wave reflection

### **Methods for Elliptic Equations**

- Basic methods for solving simple elliptic equations, e.g., SOR and ADI
- Analysis of error reduction with iterative methods
- Rational for and the general procedure of multi-grid methods for solving elliptic equations

### **Semi-Lagrangian method for advection**

- SL versus Eulerian methods
- Stability of SL methods
- General procedure of the implementation of SL methods
- Non-interpolation SL method
- Attractive aspects of SL methods and their weaknesses?

### **Spectral Methods**

- Grid point versus Spectral methods
- General Galerkin procedure
- Application of spectral methods to simple linear and nonlinear equations
- The solution procedure
- Comparison of spectral methods to grid point methods