

# Physics Issues and Tasks

S. C. Jardin

PPPL

SWIM Workshop

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Indiana U.

# RF Issues (Berry)

## AORSA:

- algorithmic issues:
  - need to revisit inner loop optimizations, interpolation on velocity-space integrals
  - coupling particle-based distribution functions back to AORSA
- coupling to non-bounce-averaged (4D) Fokker-Plank codes formulated

## TORIC:

- physics issues
  - non-Maxwellian distribution function needs to be completed
  - QL operator implemented
  - treatment of conductivity, etc

## RAY-TRACING (e.g. GENRAY)

- physics status
  - non-Maxwellian distribution function needs to be implemented
  - formalism for initial ray distribution
  - treatment of mode conversion (may or may not be important for SWIM)

MATH PROBLEM: How to represent a wave as a collection of rays

# Fokker Plank (Harvey)

- Needs improved radial transport operator
  - discussions with Hirshman
- Need finite-banana-width quasi-linear RF operator
- Need fully implicit 3D solve rather than split solve
  - **Practical??? Possible MATH problem**
- Needs restart capability to do time-dependent problems
- Needs to be parallelized...
  - **Possible MATH/CP problem**
- Runaway avalanche during ITER startup...
  - **Possible SWIM application**
- Need way of transferring distribution function to NOVA-K.

# Equilibrium Issues

- Add Flow and non-scalar pressure to equilibrium code
  - Graduate student with D. Keyes
- 2-fluid equilibrium for initializing nonlinear code
  - Being worked on by N. Ferraro (Graduate Student)
- Need for equilibrium refinement for stability analysis
  - Now typically use JSOLVER
  - Glasser developing new high-accuracy method
- How to interface hot-particle data to NOVA-K
  - Possible Grad student with N. Gorelenkov (J. Park)

# Slow-MHD Issues

- How best to add neoclassical (bootstrap current) terms to MHD codes
  - Held approach of non-local closures
  - Spong approach using DKES
- Best way of adding RF source terms to fluid equations
  - Giruzzi-like model ?