Two Topics:

I. Paradigms for Rainband-Inner-Core Interactions

II. RAINEX Modeling Plans

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I. Paradigms for Rainband-Inner-Core Interactions

•Perhaps we can divide these ideas into two classes:

A. Quasi-symmetric processes

B. Essentially asymmetric processes

A. Quasi-symmetric processes:

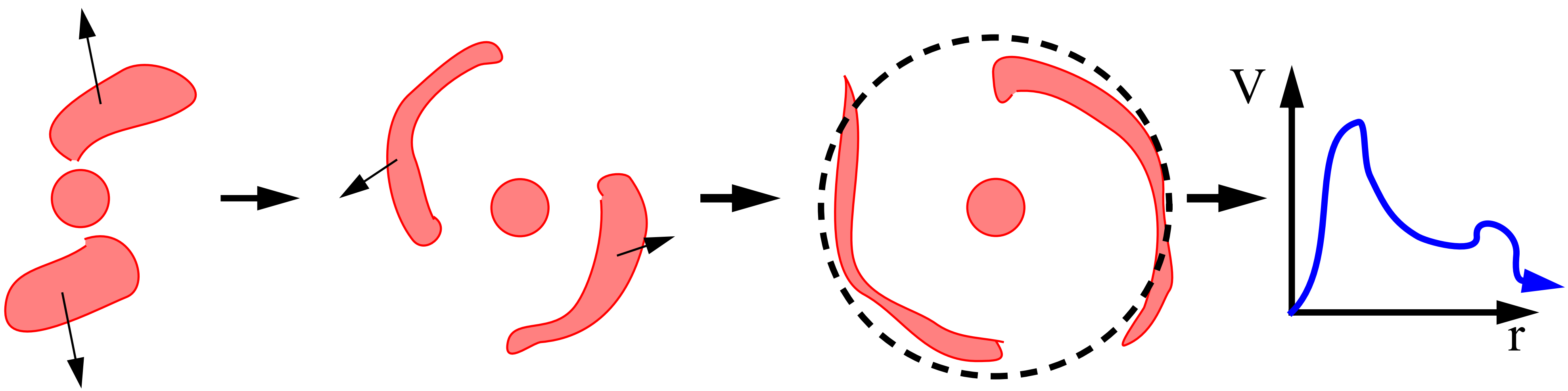
Secondary eyewall formation and replacement

1. Secondary eyewall replacement as symmetric, nonlinear instability

But - where does the *initial* secondary wind max come from?

2. Radiating Vortex-Rossby waves accumulate in the *stagnation* region:

Radial group velocity goes to zero as waves are sheared and get thinner.



Issues: Inner-core bands/VRWs don't seem to propagate outward

Accumulation point determined by initial structure

Radial inflow changes accumulation point?

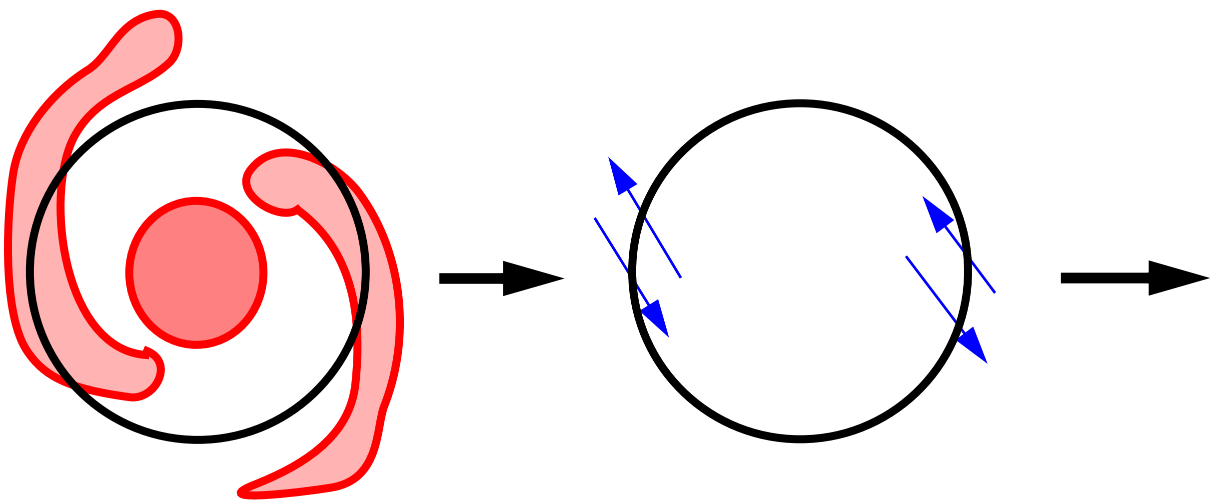
B. Asymmetric Interactions

1. Eddy momentum transport by asymmetric wind fields:

Positive PV/Vorticity associated with rainband convection

generates asymmetric wind field

Wind asymmetries result in net transport of momentum *inward*



$\overline{u'v'} < 0$ (inward)

Doesn't seem outer bands could affect inner core this way.

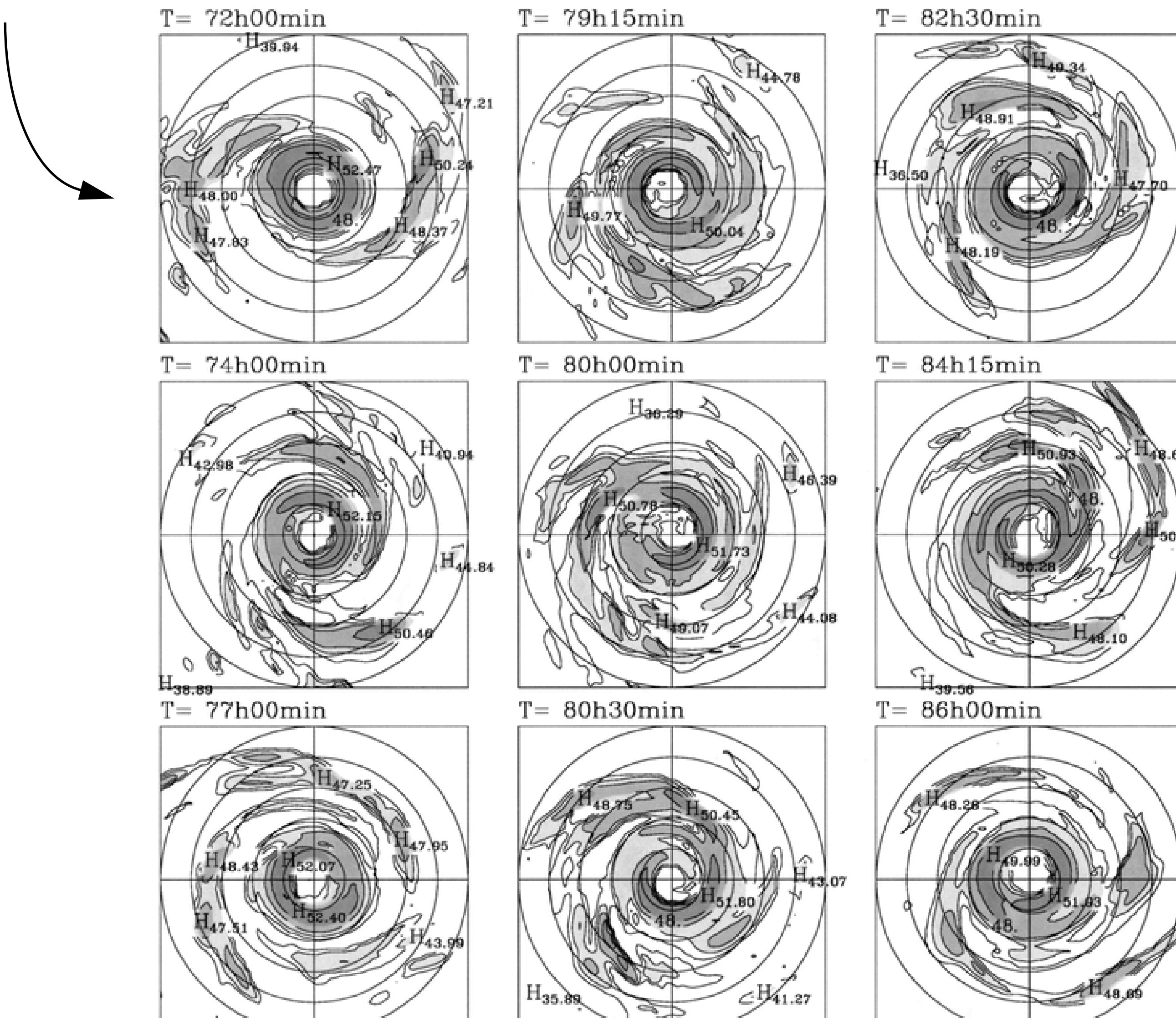
Positive effects of axisymmetrization have been brought into question.

2. Spiral Band "Penetration"

Inward moving spiral band disrupts eyewall, then recovery cycle

Seen in at least two papers:

Wang 2002 (spontaneous), Chen and Yau 2003 (landfalling).



3. Large, “stationary” bands.

Negative influences:

Disruption of inflow

Stationary wavenumber one forcing (longer range influence)

Large bands often seen in less-than-favorable environments:

Vertical shear

Dry air

Cooler air

Are large stationary bands the mechanism by which shear and other “negatives” first affect the inner core? (Shuyi’s Hypothesis)

II. RAINEX Modeling Plans

- Again, two classes:

A. Pre-Season

B. In-Season

A. Pre-Season

1. Goal: To simulate, identify, and evaluate the interaction mechanisms

2. Models:

   High resolution MM5 (Chen et al.)

   Medium resolution WRF (Nolan et al.)

3. Analysis:

   Full decomposition of most fields into symmetric and asymmetric parts:

$$\frac{\partial \bar{v}}{\partial t} + \bar{u}\frac{\partial \bar{v}}{\partial r} + \bar{w}\frac{\partial \bar{v}}{\partial z} + \frac{\bar{u}\bar{v}}{r} + f\bar{u} = -\frac{1}{r^2}\frac{\partial}{\partial r}\overline{(r^2 u'v')} \quad ....$$

   and into various wavenumbers:

$$\overline{u'v'} = \sum_{n=1}^{N} \overline{u_n v_n} \quad \text{(small amplitude limit)}$$

B. In Season

1. Near real-time MM5.

2. Near real time HWRF.

3. Motivation: Guidance for morphology changes and interaction events

4. Obstacles:
   a) CPU Time

   b) Global model/analysis data stream

   c) Runtime complications, RSMAS infrastructure, disks, etc.

   d) Initialization of mature storms

      Global model storms are too weak, too broad

      Run from GFDL initial conditions?