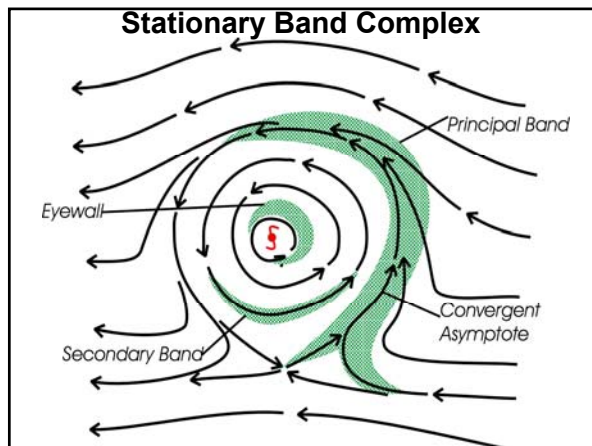


Vorticity

- Rotational part of fluid motion
- Circulation is the length of a closed path times the flow locally parallel with the path
- In any flow, the circulation around the path will equal the relative vorticity that it encloses
- Vorticity includes
 - Relative vorticity due to the wind
 - Planetary vorticity due to the Earth's rotation
 - Absolute vorticity is the sum of relative and planetary vorticities
- In most ways, vorticity behaves like a physical substance
 - It is "conservative", i.e. difficult to create or destroy
 - But it can be concentrated or dispersed

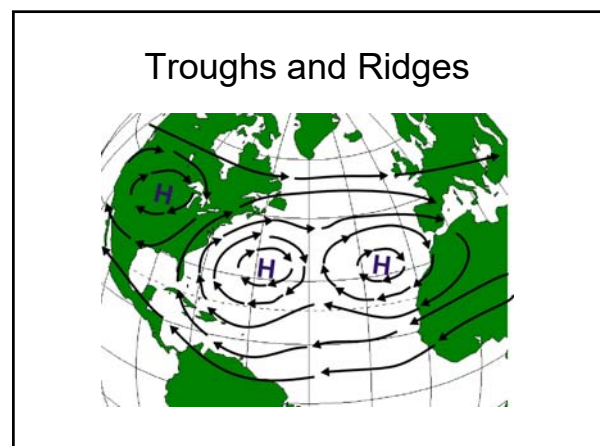
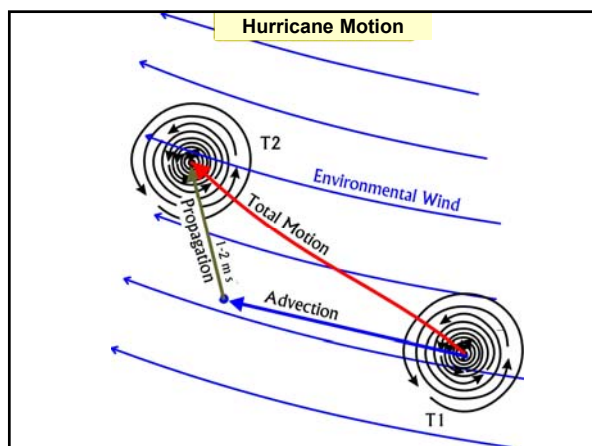
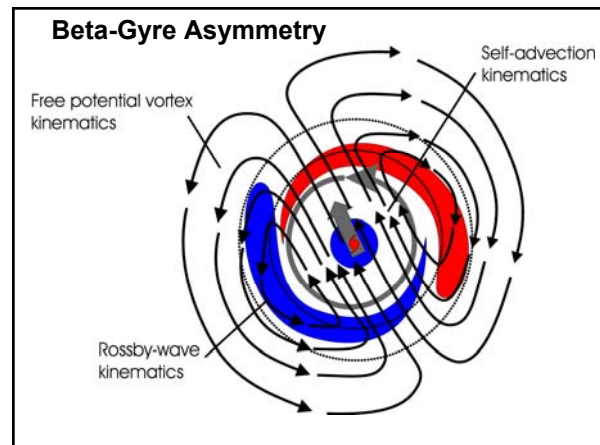
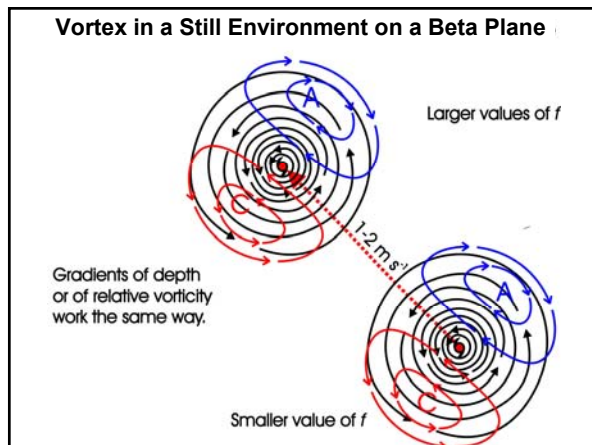
A Vortex in a Uniform Flow

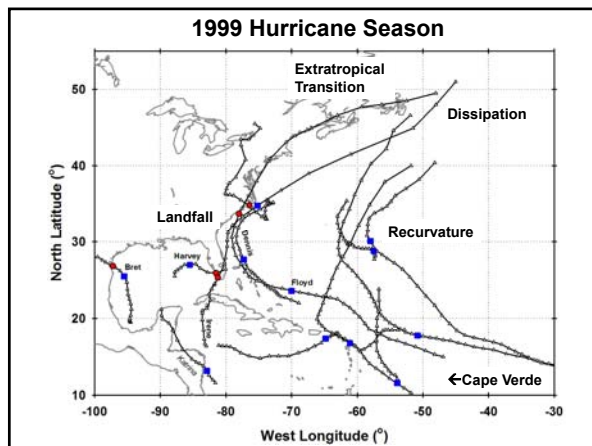
- The environmental Steering Current pushes the cyclone's vorticity downstream
- Carrying the vortex with it
- If the vortex is absolutely circular it doesn't rearrange it's own vorticity
- If the surrounding flow has no vorticity, the vortex doesn't interact with it either—apart from its being pushed downstream



Conservation of Absolute Vorticity

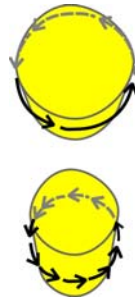
- Only the locally vertical part of the planetary vorticity is important here
- Start with nonrotating air at some latitude
- Displace air poleward
 - Planetary vorticity increases
 - Relative vorticity decreases
 - I.e. becomes anticyclonic
- Displace air equatorward
 - Planetary vorticity decreases
 - Relative vorticity increases
 - I.e. becomes cyclonic
- This effect causes the "Beta Gyres"



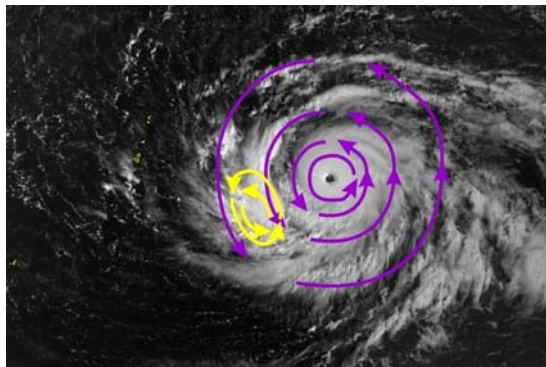


Vorticity Stretching

- If a distribution of vorticity is stretched vertically
- The vorticity concentrates
- The length of the path decreases
- And the swirling wind increases
- Stretching of planetary vorticity by vertical motion is main source of vorticity
- Friction is the main sink—along with vortex squishing



Storm Propagation Through Vorticity Stretching
Caused by Embedded Convection



SUMMARY

- **Track Characteristics**
 - East to West motion equatorward of 30°
 - West to East poleward of 30°
 - Recurvature
 - Most move Northward
- Poleward & westward motion due to Earth's rotation, Beta Gyres
- Move with steering flow—the prevailing wind around the storm
- Bermuda and Azores Highs separated by a trough
- Propagation due to convection
- Fujiwhara rotation as in extratropical transition
- **FOR NEXT TIME: TERMINATION**
- **EXAM #1: Monday, 16 OCT**