

# Meteorology 311 - Fall 2023 - Final Exam Review

## Air Masses, Fronts, Jet Streaks

### Air Masses

- Air mass classification and general identification of air masses on a map

### Fronts

- Front type identification and front location.
- Front type id: Movement of the cold air.
- Front location: temperature discontinuity, pressure discontinuity, wind shift, dew point discontinuity, etc.

### Jet Streaks

- Quadrant identification construction and identification.
- Areas of upward and downward motion.
- Physical justification of upward and downward motion regions.
  - “Skier” explanation, PVA/NVA explanation
- Direct and Indirect circulations.

## Remote Sensing (Satellite and Radar)

### Satellite remote sensing

- Characteristics of Visible, IR, and Water Vapor imagery.
- Strengths and weaknesses of each.

### Radar

- Definitions and general characteristics of Doppler and dual polarization radars

## Numerical Weather Prediction, MOS, and FOUS

### Numerical weather prediction

- Finite differencing techniques (centered, upwind)
- Primarily “Model Types” and “Important Features” slides in PowerPoint presentation.

### MOS/FOUS

- MOS: Model Output Statistic, FOUS: Forecast Output – United States
- What are MOS and FOUS?
- Characteristics, strengths, and weaknesses of MOS systems.

- Reading a MOS report.

## Divergence, Vorticity, and Upward Motion

### Natural coordinates

#### Divergence

- Mathematical form (Cartesian coordinates)
- If I want you to use natural coordinate form, I will provide it.
  - However, you should be able to explain this form.
- Where does it come from?
  - Acceleration/Deceleration of air parcels.
  - Confluence/Diffluence
  - Very difficult to see if there is a net convergence or divergence from looking at maps alone. Need to do the calculation.
- Why is convergence/divergence important at low levels? What is the result of each?

#### Vorticity

- Mathematical form (Cartesian coordinates)
- If I want you to use natural coordinate form, I will provide it.
  - However, you should be able to explain this form.
- PVA/NVA
- Why is PVA/NVA important? What is the result of each?

#### Upward Motion

- Equation is on equation sheet.
- Vertical motions vs. vertical velocity.

## Balanced Wind Approximations

### Geostrophic Wind

- Equation is on the equation sheet.
- What is it and where does it come from?
- Where does it work best and why?

### Gradient Wind

- Equation is on the equation sheet.
- What is it and where does it come from?
- Where does it work best and why?
- How does it differ from the geostrophic wind?

- How does it differ from the real wind?
- Remember sign conventions for radius of curvature.
- Derivations and conclusions based on gradient wind.

### Thermal Wind

- What is it? Difference in geostrophic wind with height.
- If geostrophic wind backs with height: CAA
- If geostrophic wind veers with height: WAA
- What does WAA and CAA advection imply for vertical motions and thickness changes?
- Review thickness equation.

**Good Luck!**