

TROPICAL SYNOPTIC METEOROLOGY

Unit 1: General review and global circulation concepts

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- Approximately 3-4 weeks
- Review of basic dynamic and physical meteorology
- Review of midlatitude weather and comparison with tropics
- Exploration of global circulation concepts and tropical circulations

Learning Objectives

- Define basic spatial and temporal scales of motion in the atmosphere
- Recall the basic force balances found in midlatitude synoptic flows, and understand why this balance is a poor approximation in the tropics
- Distinguish among polar, midlatitude, and tropical weather phenomena in terms of their frequency and size
- Identify the origin of an air mass based on its temperature and humidity
- Describe the general structure of a midlatitude cyclone in terms of front and conveyor belt concepts, and the limitations of the conceptual models
- Be able to identify jet streams and jet streaks in upper air charts and on satellite imagery
- Describe the general circulation of the atmosphere and the mechanisms that support the existing pattern
- Identify the semi-permanent highs and lows in the tropics and subtropics
- Describe the seasonal migration of the tropical circulation systems, such as the equatorial trough and ITCZ, and their hemispheric differences
- Describe the typical zonal and meridional distribution of cloud depth in the trade wind regime

Topics

- Space and time scales relevant to meteorology
- Fundamental dynamics: force balance, continuity, scale analysis
- Air masses and fronts
- Midlatitude weather systems and cyclones
- Difference between tropical, midlatitude, and polar weather systems
- General circulation and the role of the tropics
- Jet streams and jet streaks
- Spatial and temporal climatology of tropical circulation features

Learning Activities & Assignments

- Exploring the general motion of weather systems around the globe
- Reviewing seasonal changes in circulation across the tropics
- Monitoring the trade wind inversion
- Synoptic weather analysis of the tropics and midlatitude regions
- Analysis of tropical and midlatitude synoptic systems

Case Studies

- Midlatitude cyclone and jet streak over the Caribbean
- Cases of Tropical-Extratropical Air Mass Interactions