

References:

منابع:

An Introduction to Dynamic Meteorology, Holton, 2004

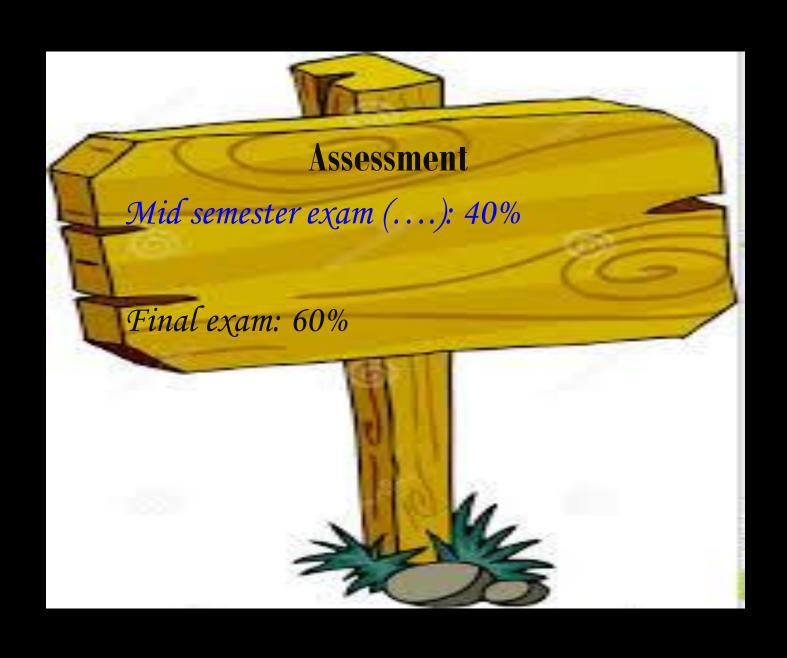
Meteorology for Scientists and Engineers - Stull

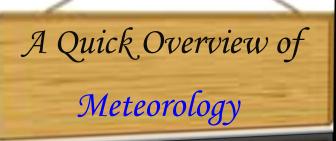
General Meteorology – Byers

هواشناسی عمومی ترجمه: بنی هاشم، حاجبی، بهروزیان

هواشناسی عمومی دکتر قائمی – انتشارات سمت

Internet





نظری اجمالی به هو اشناسی

Meteorology Definition

Meteorology is devoted to the attainment of an increased understanding of the atmosphere and the development of methods for applying that knowledge to practical problems.

Although this field is usually associated with weather prediction, it also has significance in environmental, energy, agricultural, oceanic, and hydrological sciences.

Meteorology is a science

Foundations based upon principles of physics and chemistry

Processes work on several scales, spanning from microscopic to planetary

What Meteorologists Do?

- Weather Forecasting
 - Government (National Weather Service)
 - Specialized Forecasts
- Research
 - Field Work
 - Simulation and Modeling

Applied Meteorology

The application of meteorological knowledge to other disciplines

- agriculture
- · air pollution
- · architecture
- · ecology
- · energy
- fisheries
- forestry
- transportation

شاخه ها و دروس اصلی در هواشناسی: The Branches of Meteorology:

Physical Meteorology

هواشناسي فيزيكي

به فرآیندهای فیزیکی که در جو روی می دهد می پردازد. یعنی سیر تغییرات و تبدیلات انرژی را مطالعه می کند.

Atmospheric electricity

Atmospheric optics

Cloud and precipitation processes

The planetary boundary layer (PBL) and transfer processes

Solar and terrestrial radiation

Remote sensing (radar, satellite, etc.)

Dynamic Meteorology

هواشناسی دینامیکی

The theoretical study of atmospheric motion with (at least) two important goals.

- to provide understanding of the many facts involved in the phenomenon of atmospheric motion.
- to provide a rational basis for the prediction of future atmospheric events.

Synoptic Meteorology

هواشناسي سينوپتيكي

The study of the structure and evolution of atmospheric systems

- 1) analysis of atmospheric disturbances
- 2) synthesis of dynamical and physical principles and their impact upon everyday weather
- * cyclones and anticyclones
- * fronts and air masses
- * jet streams
- * thunderstorms and tornadoes
- * hurricanes and typhoons
- 3) weather forecasting

<u>Typhoons</u>



<u>Thunderstorm</u>





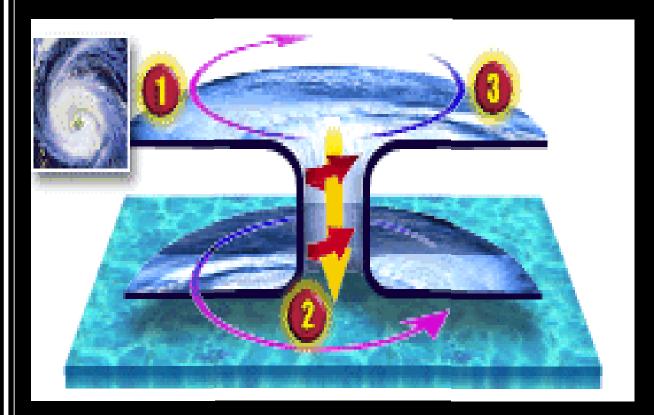
<u>Tornadoes</u>

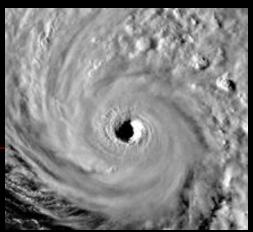




Hurricanes

Heavy rain – Flooding -- Strong Winds -- Very Large Waves and Storm Surge -- Possibly Tornadoes





The Scales of Atmospheric Motion

The Microscale

small scale motions (< 1 km; < 1 hr)

The Mesoscale (urban)

medium scale motions (< 1000 km; < 1 day)

The Synoptic Scale (continental)

"weather-map" scale motions (< 10,000 km, several days)

The Global Scale

very-large scale systems (>10,000 km, weeks)

هدف در این درس:

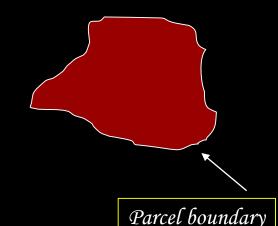
بررس و حل معادلات حاكم بر جو.

مطالعه پدیده های هواشناسی با استفاده از مفاهیم دینامیکی.

نکته: در دینامیک ذره و در هواشناسی بسته هوا که از ذرات بیشماری تشکیل شده است مورد استفاده قرار میگیرد.

As the parcel moves assume no mixing with environment

Pressure inside = pressure outside



The 7 Fundamental Variables

- Temperature (T)
- Water Vapor (q)
- Pressure (p)
- \blacksquare Density (ρ)

- Wind Vector (v):
 - u (zonal)
 - v (meridional)
 - w (vertical)

Atmospheric Motion

- 5 equations that govern atmospheric dynamics!
- 1- Hydrostatic equation: (pressure force vs. gravity)
- 2- Continuity equation (Conservation of mass): relates convergence of horizontal winds with vertical motion.
- 3-Thermodynamic equation: balance of heating & heat transport (Conservation of energy)
- 4-5- Vorticity/Divergence equation: sum of rotation of motion and rotation of Earth is conserved. (Conservation of angular momentum)