

MET 3003

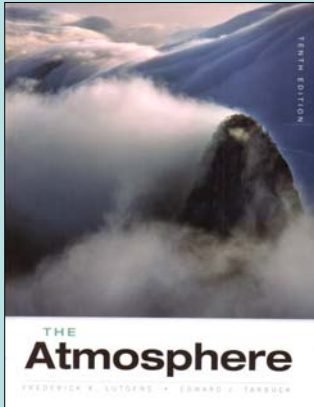
Lecture 1: Meteorology
8JAN07

Course Organization

- Mon & Wed 11:00 AM -12:15 PM, GL-137
- H. E. Willoughby, 305-348-0243,
- PC327B, hugh.willoughby@fiu.edu
- Office Hours MW 1:00 -2:00 PM, TU, 9:00-10:00 AM, or by appointment
- MAC 2311 (Calculus I) and PHY 2048 (General Physics) or my permission
- On-line syllabus at:
http://www.fiu.edu/~willough/met_3003/0_Syllabus.htm
- On-line notes linked to syllabus
- Daily weather...
- Name, Major, Course goals???

TEXT:

Lutgens & Tarbuck, *The Atmosphere*, 10th Edition



Grades:

Weighting	
Homework	20%
Exam #1	20%
Exam #2	20%
Final	40%
Total	100%

Grading Scale	
100-90	A
89-80	B
79-70	C
69-60	D
below 60	F

Meteorology

- **Meteorology:** form Greek, *meteoros* (lofty) + *logos* (discourse)
- Founded by **Aristotle**, 350 BCE
- Usually considered the scientific study of Atmospheric phenomena, especially day-to-day weather
- One of the **Earth Sciences**, which also include
 - Geology
 - Oceanography
 - Astronomy



Fields Within Meteorology

- **Climate:** The science of “average” weather, but the average doesn’t stay steady. I.e. Ice ages, el Niño, etc. Climatology is divided into applied and physical.
- **Physical meteorology:** Studies electromagnetic radiation, structure & composition, clouds & precipitation, atmospheric electricity, ..., but generally not weather.
- **Aeronomy:** Upper atmosphere with emphasis on composition and interaction with solar radiation.
- **Synoptic Meteorology:** Day-to-day weather and forecasting. Divided into Tropical and Middle Latitude
- **Dynamic Meteorology:** Equations that describe atmospheric motions and their solutions.

What kinds of people become meteorologists?

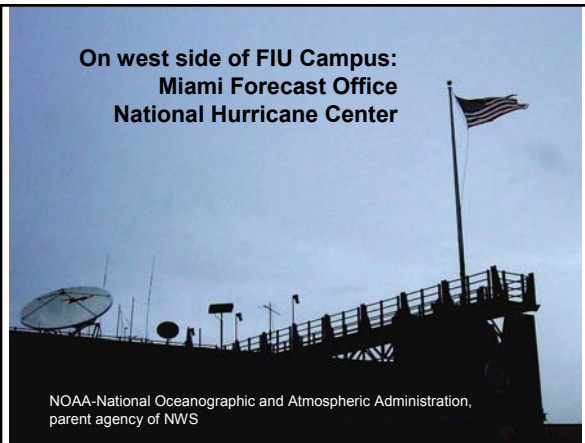
- Weather enthusiasts (weenies)
- Mathematicians and computer nerds
- Journeymen
- Sleepwalkers (used-to-be)
- More diverse work-force nowadays



Who hires meteorologists?

- National Weather Service (NWS/NOAA)
- Universities
- Research labs
- Military
- Broadcasting (competitive)
- Industry & Consulting

On west side of FIU Campus:
Miami Forecast Office
National Hurricane Center



NOAA-National Oceanographic and Atmospheric Administration,
parent agency of NWS

Earth System Science

- **System:** A group of interacting parts (components) that form a complex whole.
- Closed—Only energy can flow in or out
- Open—Energy *and* matter can flow in or out
- Systems are often characterized by a **response** to an imposed **forcing**
- **Black Box:** Know only the response for a given forcing, not what happens inside
- Feedback:
 - **Negative:** As the response increases the system acts to counteract it. Leads to oscillation of damping
 - **Positive:** As the response increases the system acts to reinforce it. Leads to runaway (exponential) growth.

“Spheres” in the Earth System



- **Geosphere or Lithosphere**—Rock
 - 6371 km radius
 - Core, Mantle, Crust
- **Hydrosphere**—Water
 - Seas covers 71% of surface
 - Average depth 3.8 km
- **Cryosphere**—Ice
 - Covers about 8% of Earth
 - Sometimes > 20 % of NH covered
- **Atmosphere**—Air
 - 100 km deep, by definition
- **Biosphere**—Life

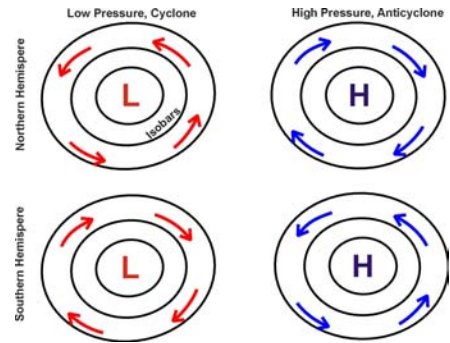
Weather Element

- A single observable property of the atmosphere that contributes to the physical state of the weather at a given place and time, for example:
 - Temperature, pressure or humidity,
 - Clouds, rain or snowfall
 - Visibility, sunshine
 - Winds...

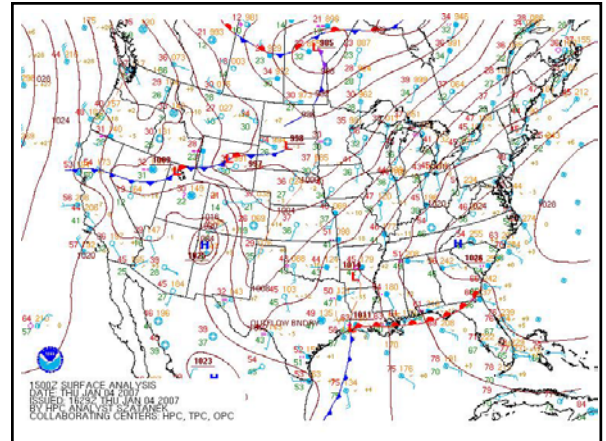
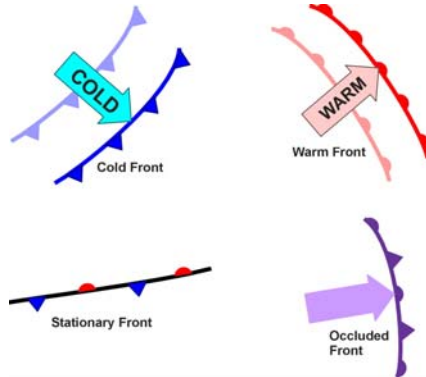
Weather Maps

- Positions and motion of long-lasting systems (cyclones & anticyclones) are shown weather maps.
- Other storms (e.g. thunderstorms) are too small and do not last long enough to be shown on weather maps.
- In midlatitudes storms move west-to-east; in the tropics east-to-west.
- **Fronts:** Boundaries (often moving) between air with different temperature and humidity,
 - Weather tends to happen along fronts.
 - Named for the relative temperatures that they bring when they pass, i.e. WARM, COLD, STATIONARY
- **Isobars:** Lines of constant pressure.
- Winds tend to blow **along** isobars.

Wind and Pressure Systems

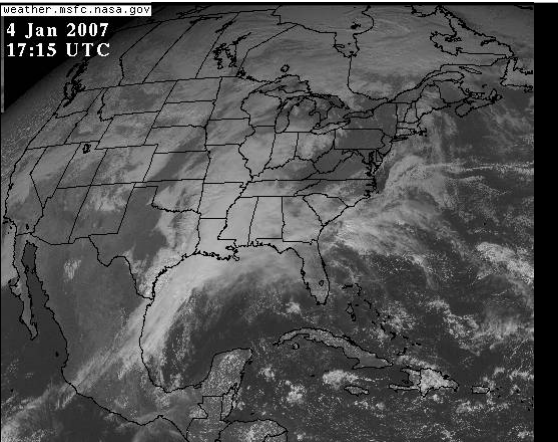


Fronts: Boundaries, often moving, separating air with different temperature and moisture content



weather.msfc.nasa.gov

4 Jan 2007
17:15 UTC



Summary

- **For next time: Finish reading Chapter 1 in L&T**
- Be sure you understand how the course will be organized and run
- Know the definition of **Meteorology** and what the principal subfields are.
- Know definitions of **System**, **Open** and **Closed** system, and **Positive** and **Negative Feedbacks**
- Know the definitions of the various "spheres" in the Earth System
- Know the definition of **Weather Element** and be able to cite examples.
- Be able to describe how the wind blows around cyclones (low p) and anticyclones (high p) in the northern and southern hemispheres
- Be able to recognize and describe **Cold**, **Warm**, **Stationary** and **Occluded Fronts**

