

**GEOG 3B**  
**Land Water and Life**  
**Summer 2016**

**Gengchen Mai**



# About Me



- **Name:** Gengchen Mai
- **Dept:** Geography, UC Santa Barbara
- **Lab:** STKO Lab (ELLSN 4829)
- **Email:** gengchen\_mai@geog.ucsb.edu
- **Major:** GIScience, Semantic Web  
Spatial Data Mining
- *B.S. From Wuhan University in Geographic Information System*



# Information about this Class



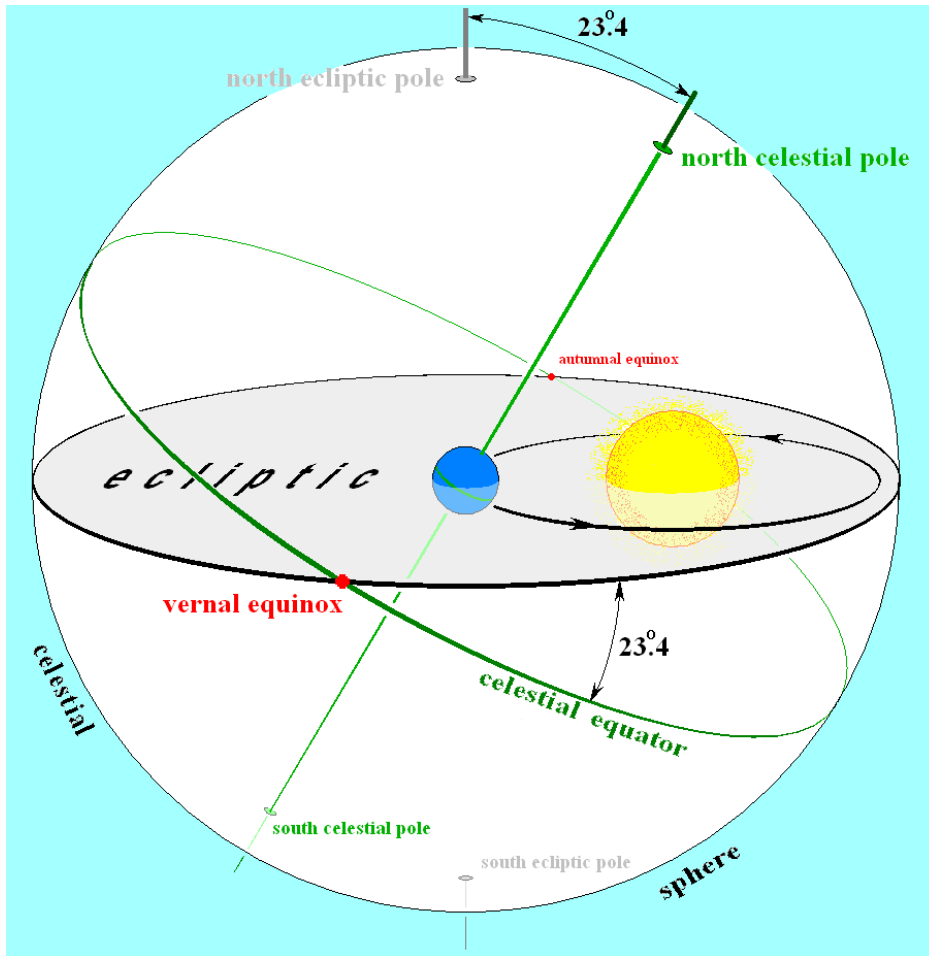
- Office hour: *Monday 10:35 -11:35 ELLSN 4839*
- Session: *Monday 14:00 -15:20 ELLSN 3621*
- *My office: ELLSN 4829*

# How will I organize every session?



Week	Date	Content
Week 1	8/01/2016	Lab: HW1 Review
Week 2	8/08/2016	Lab: HW1 due                      Climate Game
Week 3	8/15/2016	Lab: HW2 due                      Midterm: review
Week 4	8/22/2016	Lab: HW3 due, go over midterm, Biogeography walk campus
Week 5	8/29/2016	Lab: HW4 due                      Midterm II Review
Week 6	9/05/2016	Lab: No lab (Labor Day)

# Earth's axial tilt and season

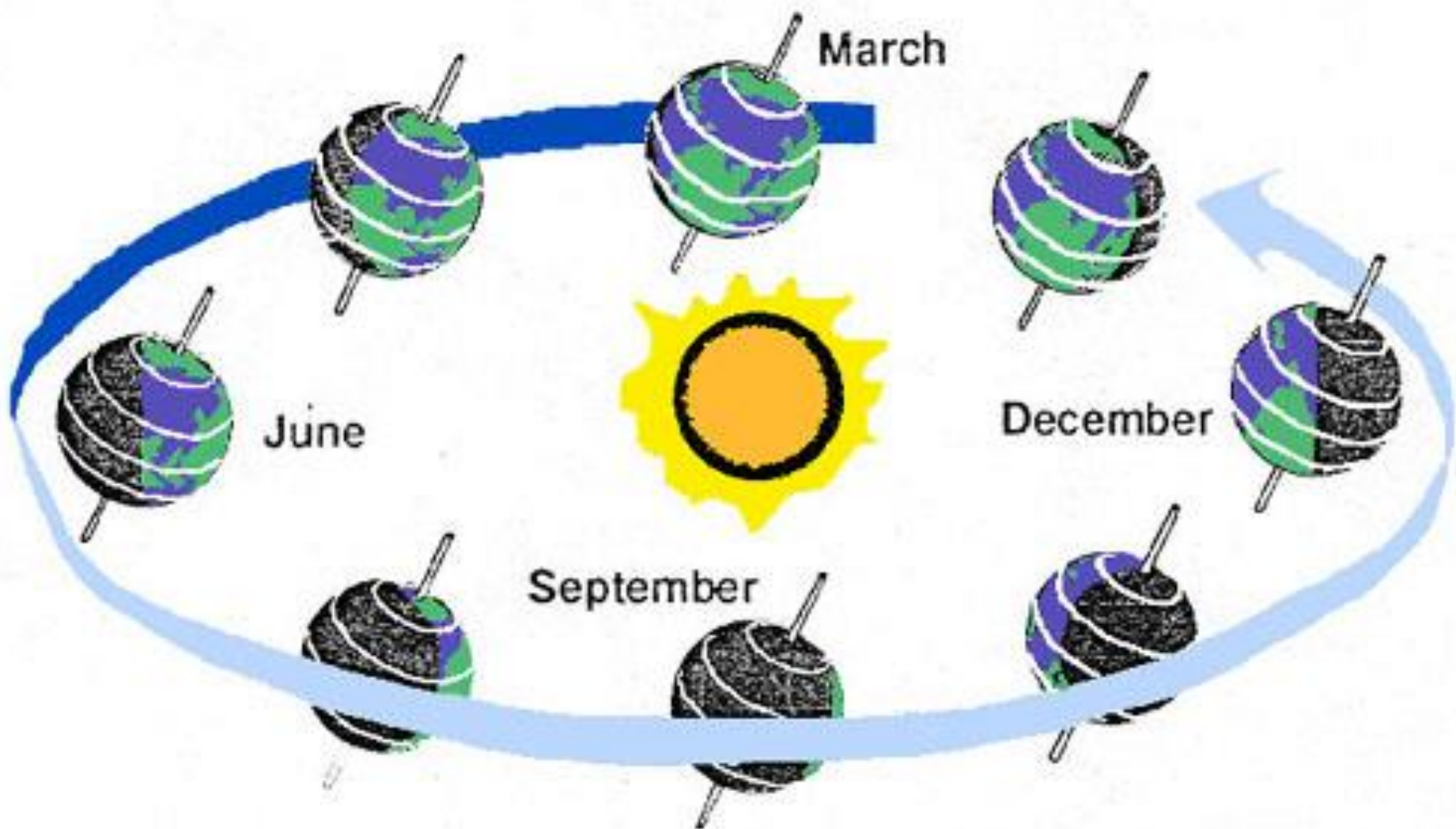


## Revolution of Earth

- *Ecliptic Plane*: The plane in which the earth rotate around the sun.

## Rotation of Earth

- *Earth's axis*: the rotate axis around which earth rotates.
- *Earth's Pole*: North Pole and South Pole (the Northern and southern endpoint of earth's axis).
- *Equatorial Plane*: the plane that is perpendicular to the earth's axis of rotation and midway between its poles.
- *Equator*: the intersection between the surface of earth with the Equatorial Plane.
- **Earth's axial tilt**: the angle between Ecliptic Plane and Equatorial Plane ( $23.45^\circ$ )



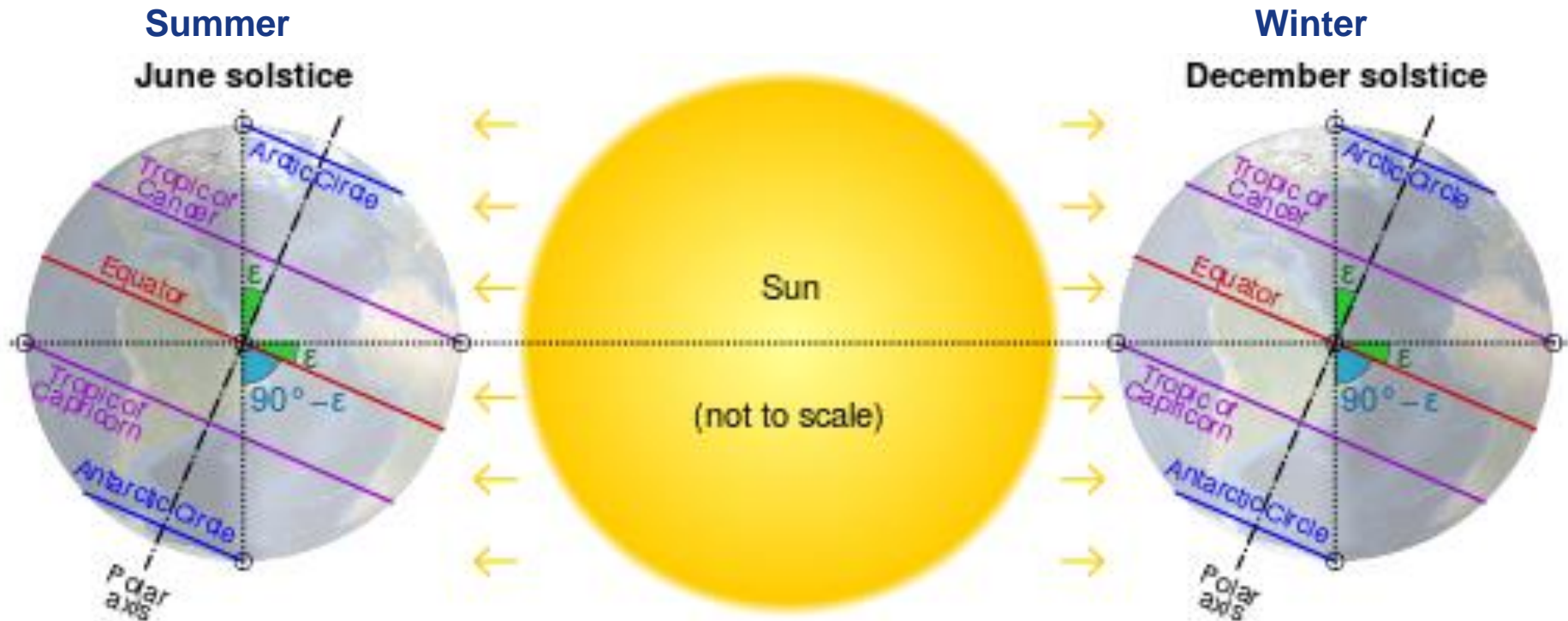
# Earth's axial tilt and season

Solar elevation angle: the angle between sunlight and the earth surface.

The Tropic of Cancer (Northern Tropic): the most northerly circle of latitude on the Earth at which the Sun may appear directly overhead (Solar elevation angle =  $90^\circ$ ).

The Tropic of Capricorn (Southern Tropic): the southernmost circle of latitude on the Earth at which the Sun may appear directly overhead (Solar elevation angle =  $90^\circ$ ).

## Northern Hemisphere



# Land-water circulation cell



Why can a hot air balloon rise after heating the air within the balloon?

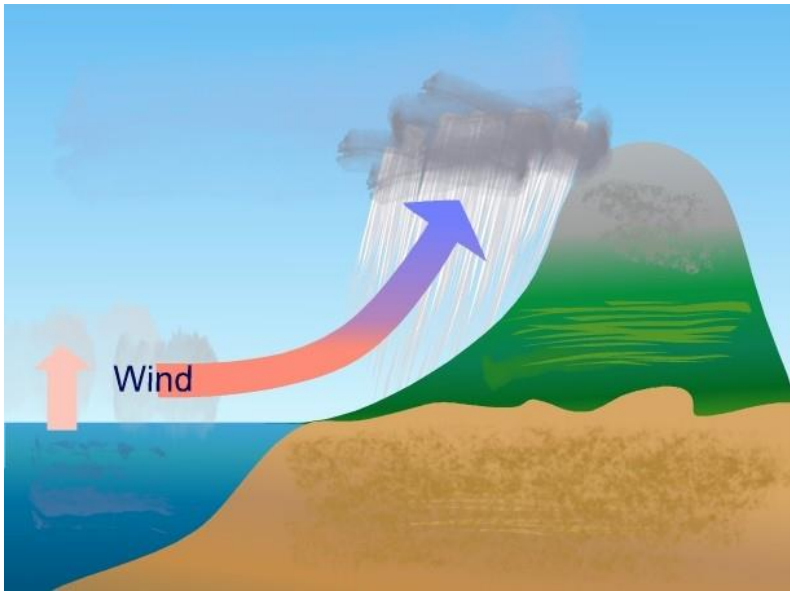
- Temperature the of air increases
- The density of air decreases
- The air rises and pushes the balloon upward
- *Temperature of air increases -> The air will rise*



# Land-water circulation cell

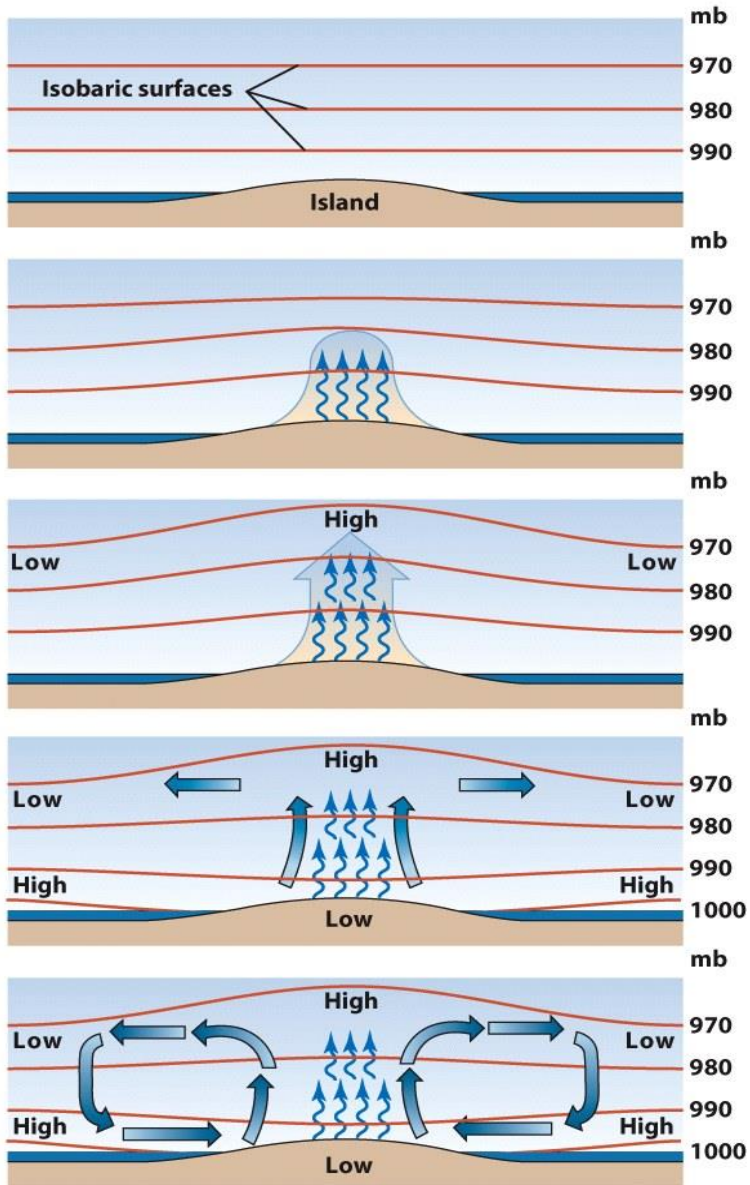


- It is also important to keep in mind that **warmer air can have more water vapor in it**. When the air rises, it will lose energy and becomes colder. The colder air can not hold a large amount of water vapor, the extra water vapor will become clouds and condense into raindrops. This is how rain is formed.
- **Convective precipitation**



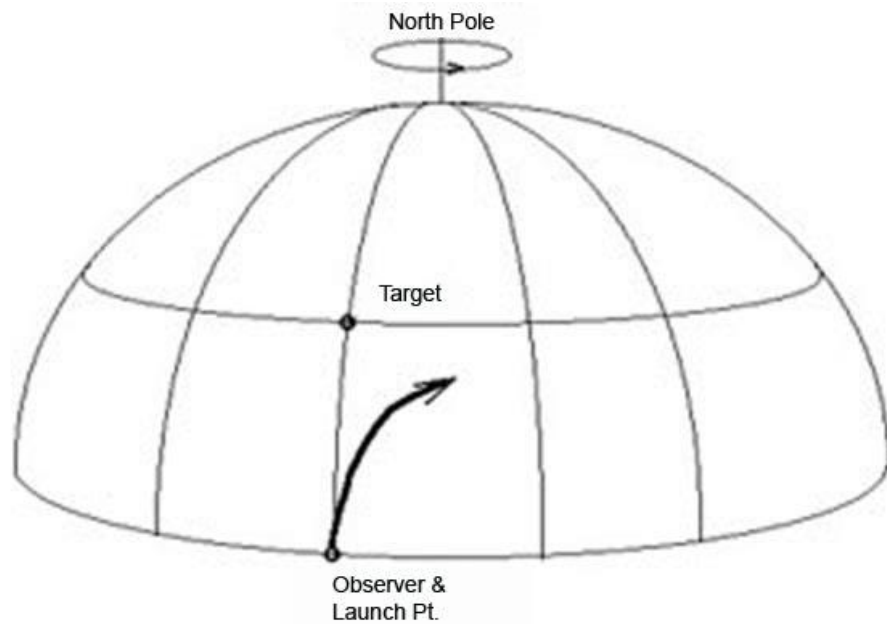
- If wind is blowing from the water body to the land and the warm moist air is climbing upward along one side of a mountain, the air temperature decreases during this process. What will happen??
- **Orographic precipitation**

# Land-water circulation cell

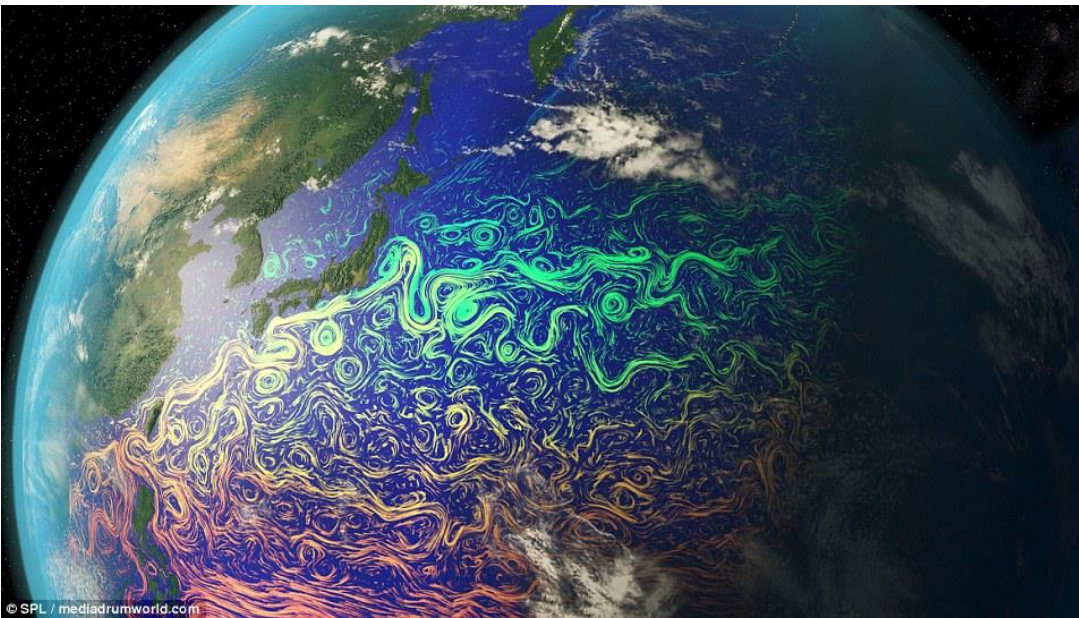


- Initial condition
- Different heating of land v.s. ocean
- Rising warm air
- Land high pressure at higher elevation -> outward flow
- Land surface low pressure -> inward flow

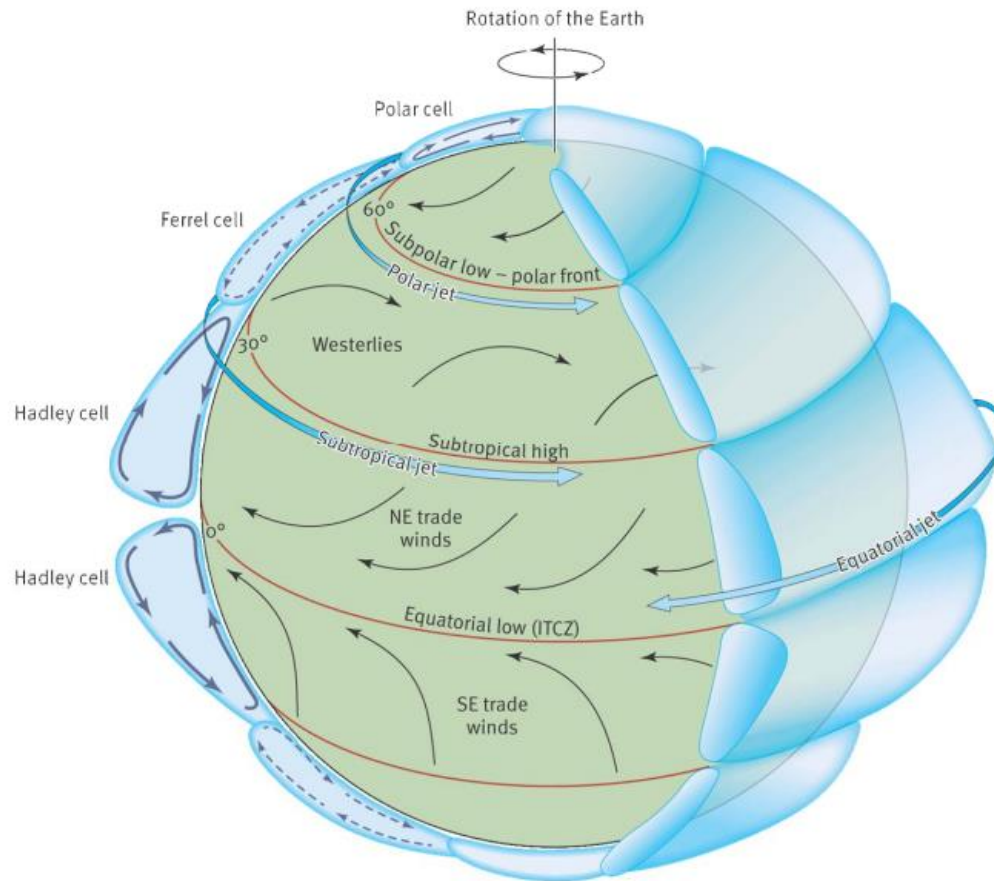
# Atmospheric circulation Model



- The coriolis force causes the winds to bend **right** in the **northern** hemisphere
- The coriolis force causes the winds to bend **left** in the **southern** hemisphere



# Simplified Model of Atmospheric Circulation in Three Dimensions

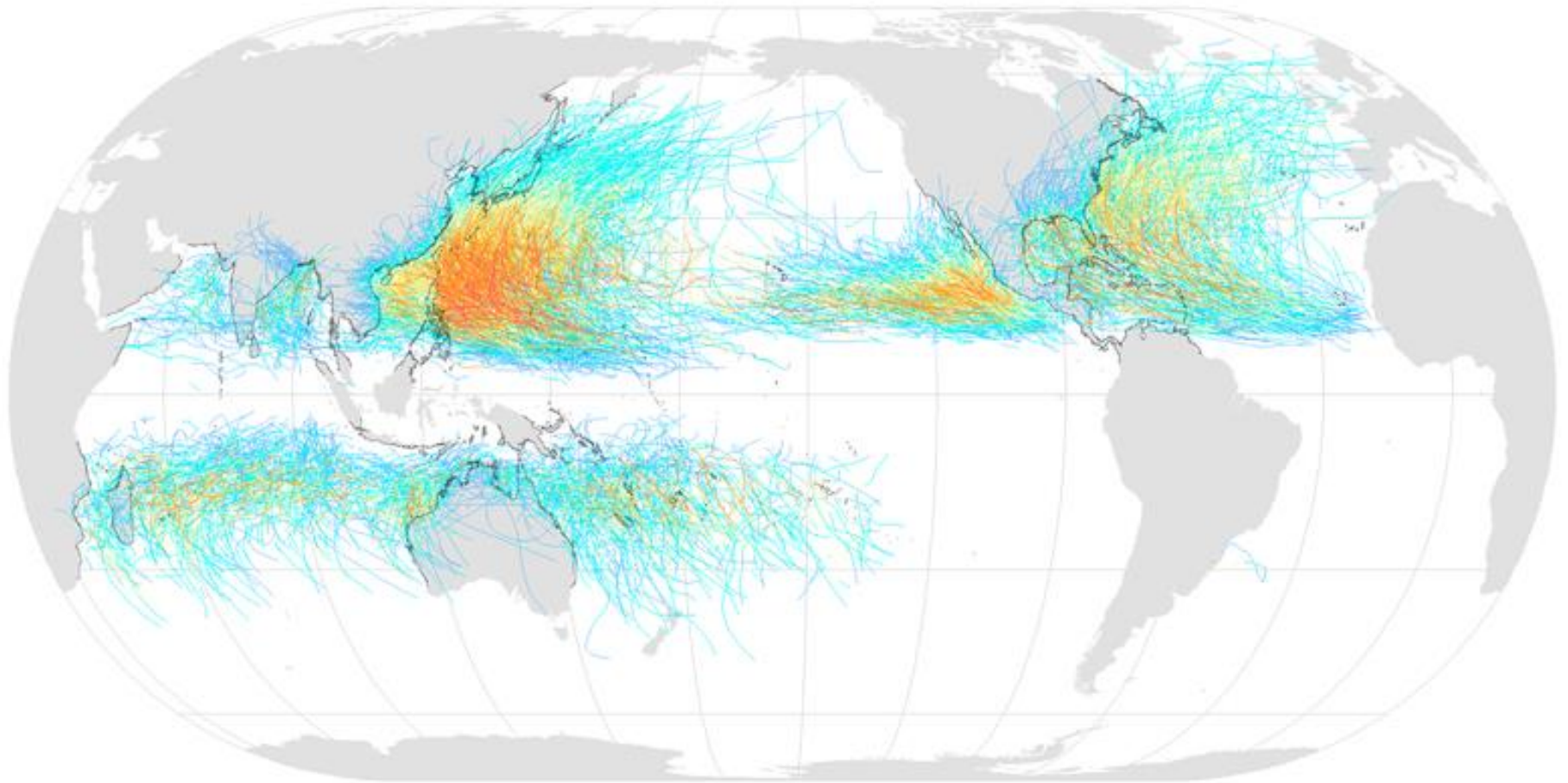


**Conceptual model of global atmospheric circulation pattern showing the major surface pressure belts, the prevailing surface wind systems, the upper-level jet streams, and the Coriolis deflection of surface winds.**

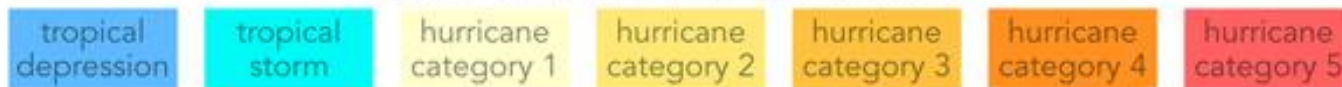
# Cyclones and Anticyclones



# Tropical Cyclones, 1945–2006

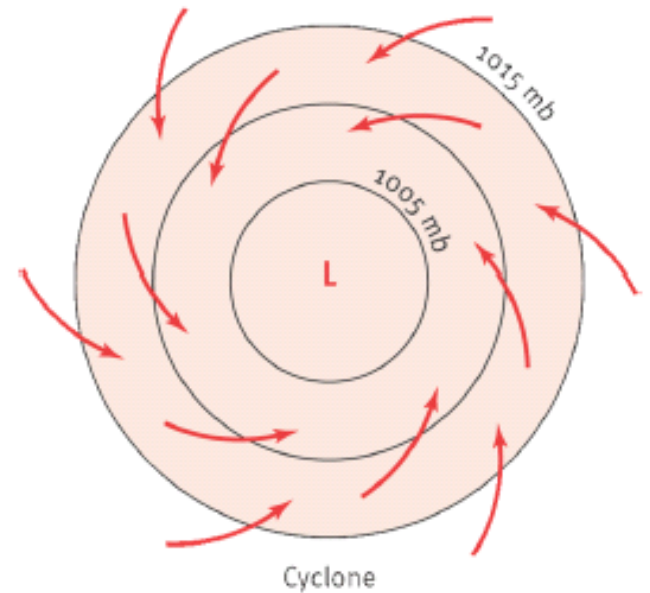


Saffir-Simpson Hurricane Scale:

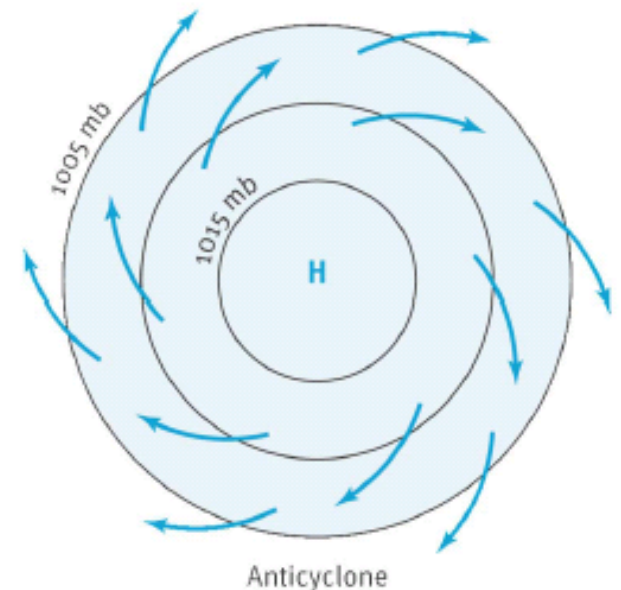


# Surface Pressure Systems

- Cyclones, or low pressure systems, have counterclockwise (in the N. Hemisphere, opposite in the S. Hemisphere) flow towards the low center, converging.
- Anticyclones, or high pressure systems, have clockwise (in the N. Hemisphere) flow outwards towards lower pressures, diverging.



A



B

# The schematic continent

