Review for Exam 5

GEOL 1147: Introduction To Meteorology Lab

Exam 5

Cover: Labs 5-10

Close-book Exam

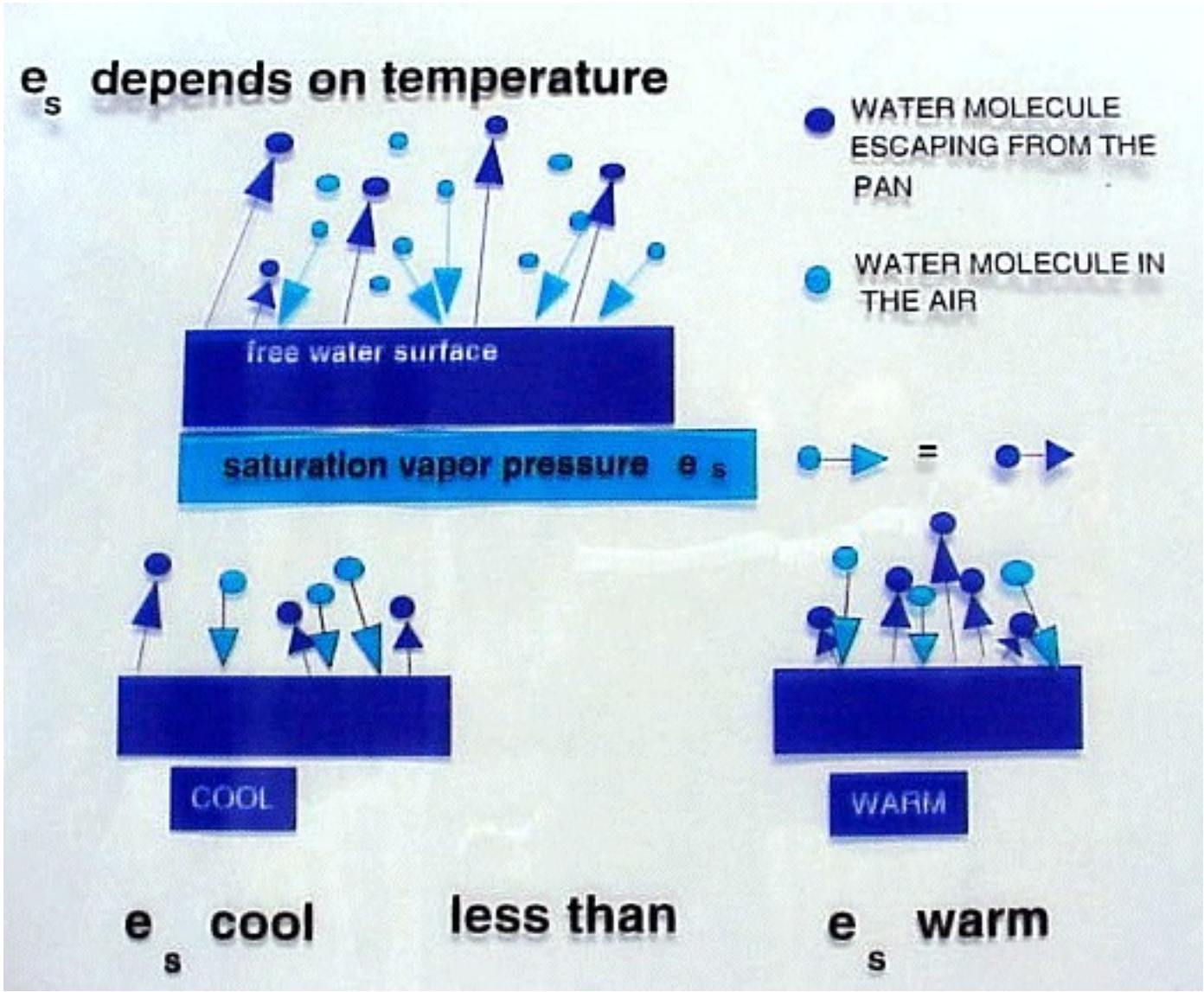
You can bring a calculator with you.

Exam counts 22.5% of the total grade.

Saturation vapor pressure e_s depends upon temperature

higher temperature, higher e_s,

more water vapor that the air can hold



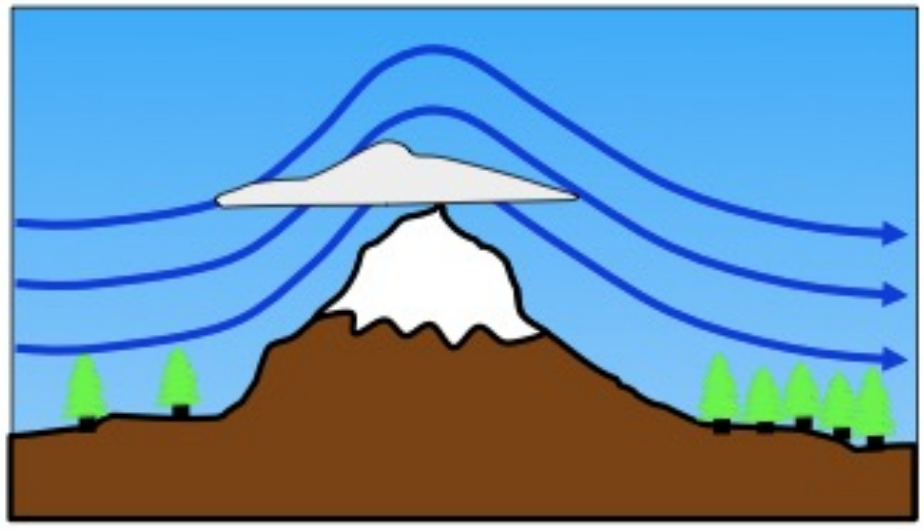
Moist adiabatic lapse rate

Decrease of temperature with height for saturated air

Γ_s always < Γ_d

Condensation Level (CL)

- The height at which the air parcel just reaches saturation is known as the condensation level (CL) (sometimes referred to as the Lifting (or Lifted) Condensation Level (LCL)).



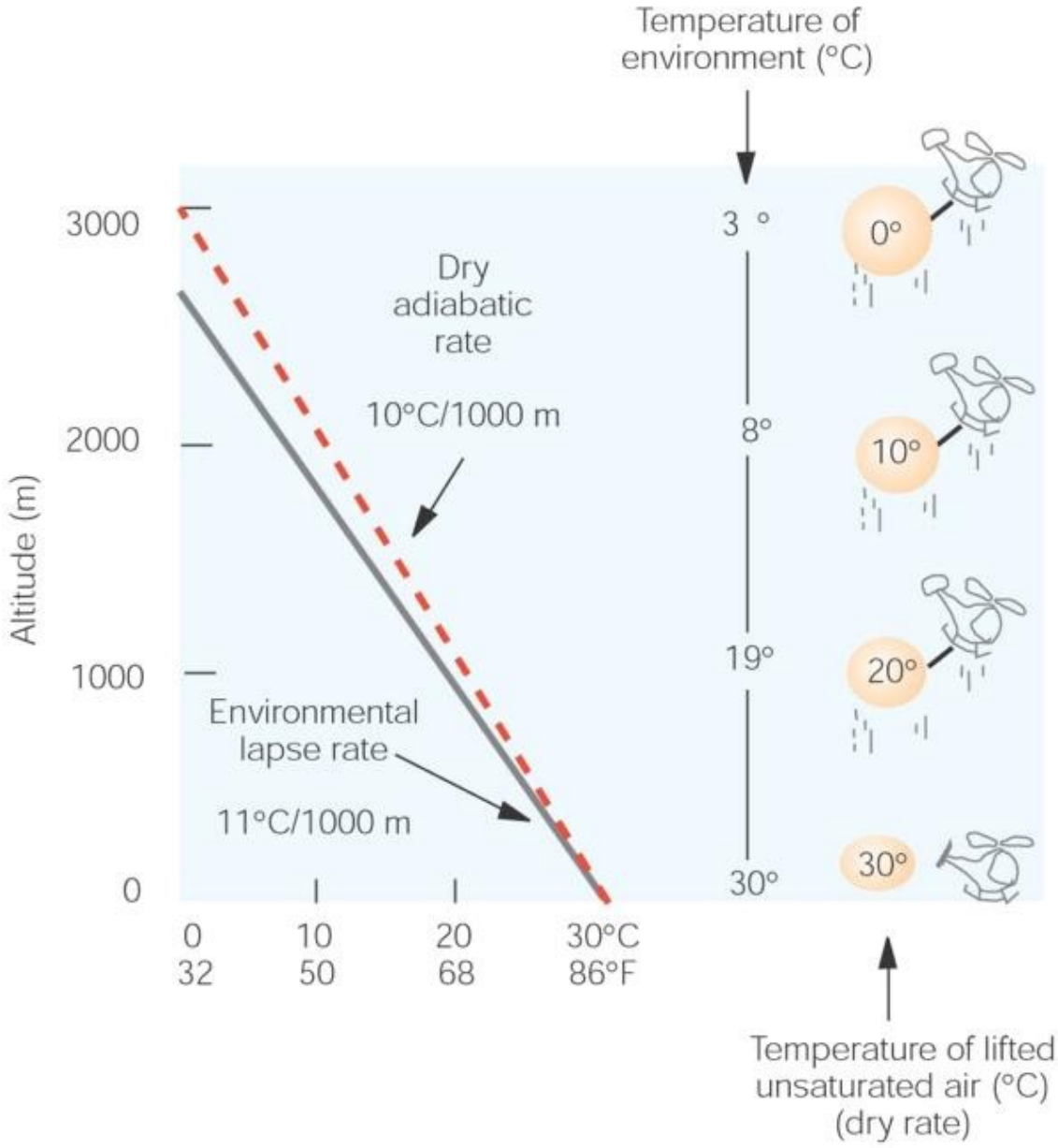
Stability is determined by comparing parcel's temperature with that of its environment

Simply speaking,

$T_{parcel} > T_{env}$ unstable

$T_{parcel} < T_{env}$ stable

$T_{parcel} = T_{env}$ neutral

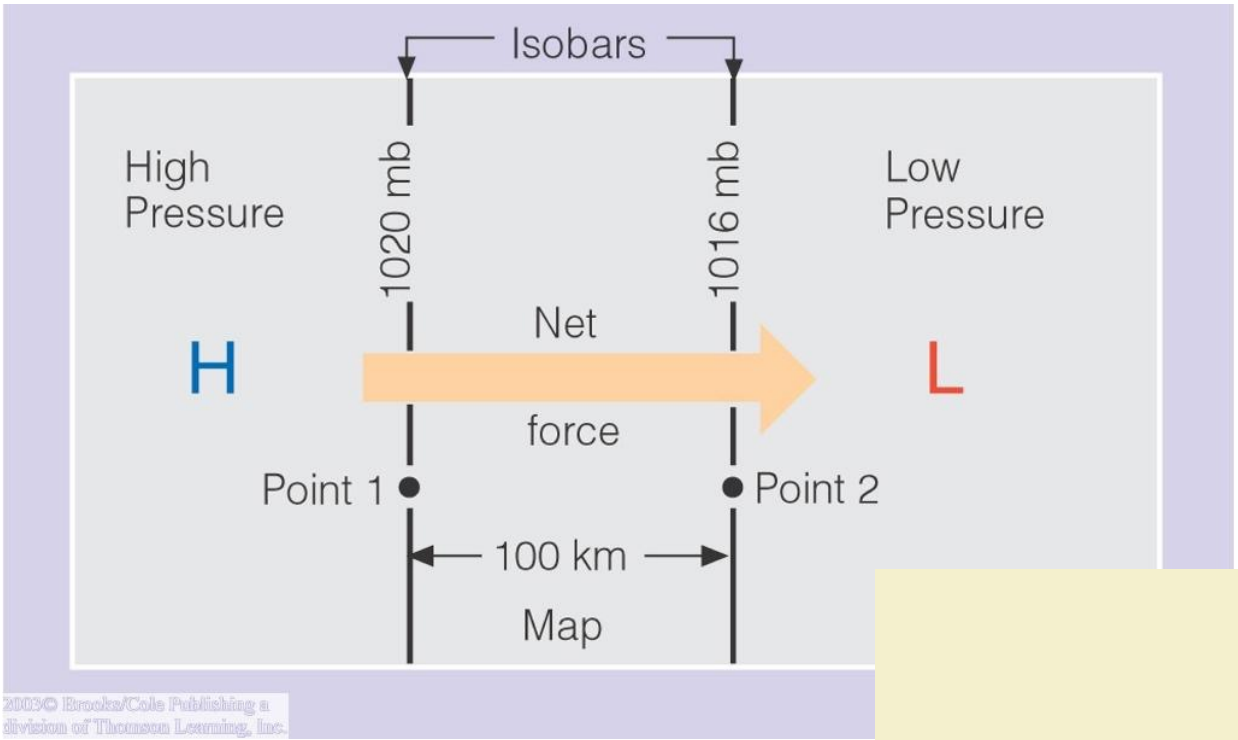


The rising, unsaturated air parcel at each level is warmer and lighter than the air around it. If given the chance, the air parcel would accelerate away from its original position.

Absolutely Unstable Atmosphere

Absolutely unstable conditions indicate that a lifted parcel of air, whether dry or moist, will be warmer than the surrounding environmental air, and hence continue to rise.

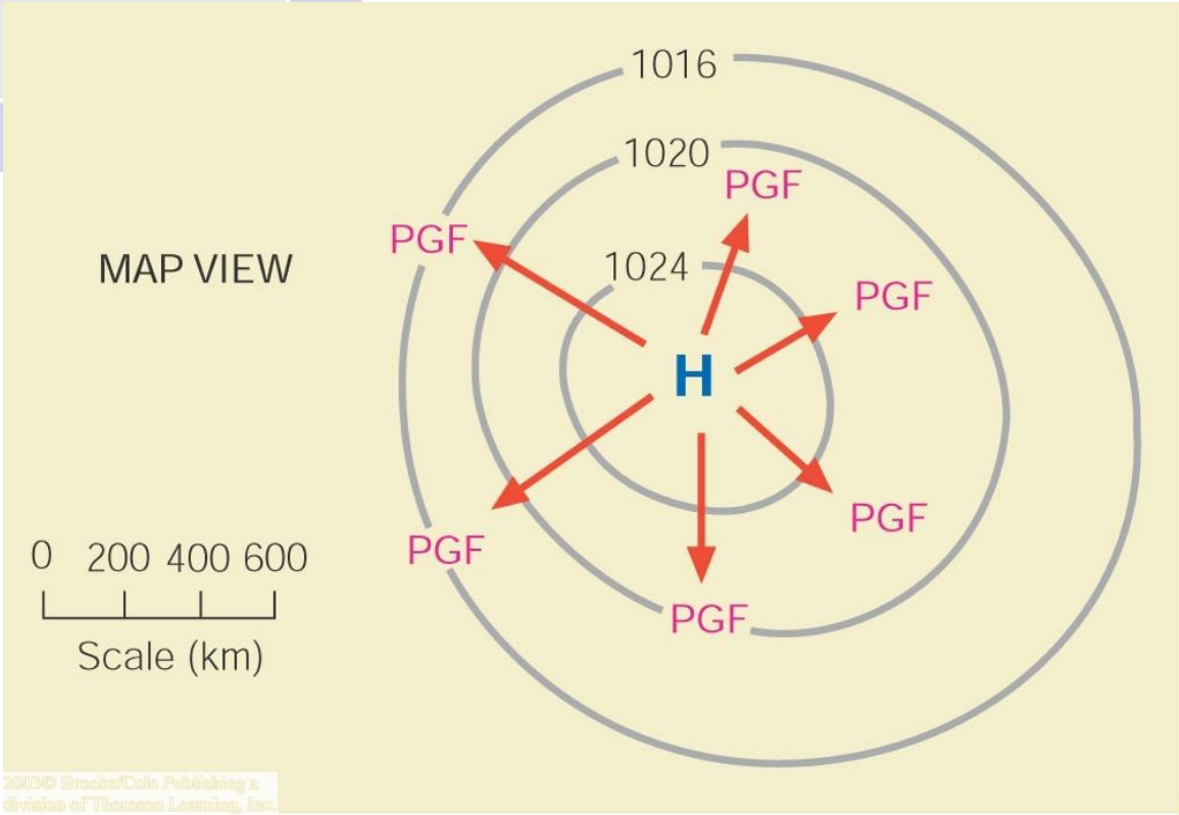
How to calculate pressure gradient force?



Pressure gradient force equals changes in pressure per changes in distance

$$PGF = (1/\rho) \cdot (\Delta P / d)$$

e.g., PGF = 1/(1kg/m^3)(1020 mb-1016 mb) / 100 km = 4 × 10^{-3} N/kg



What determine the magnitude of Coriolis force ?

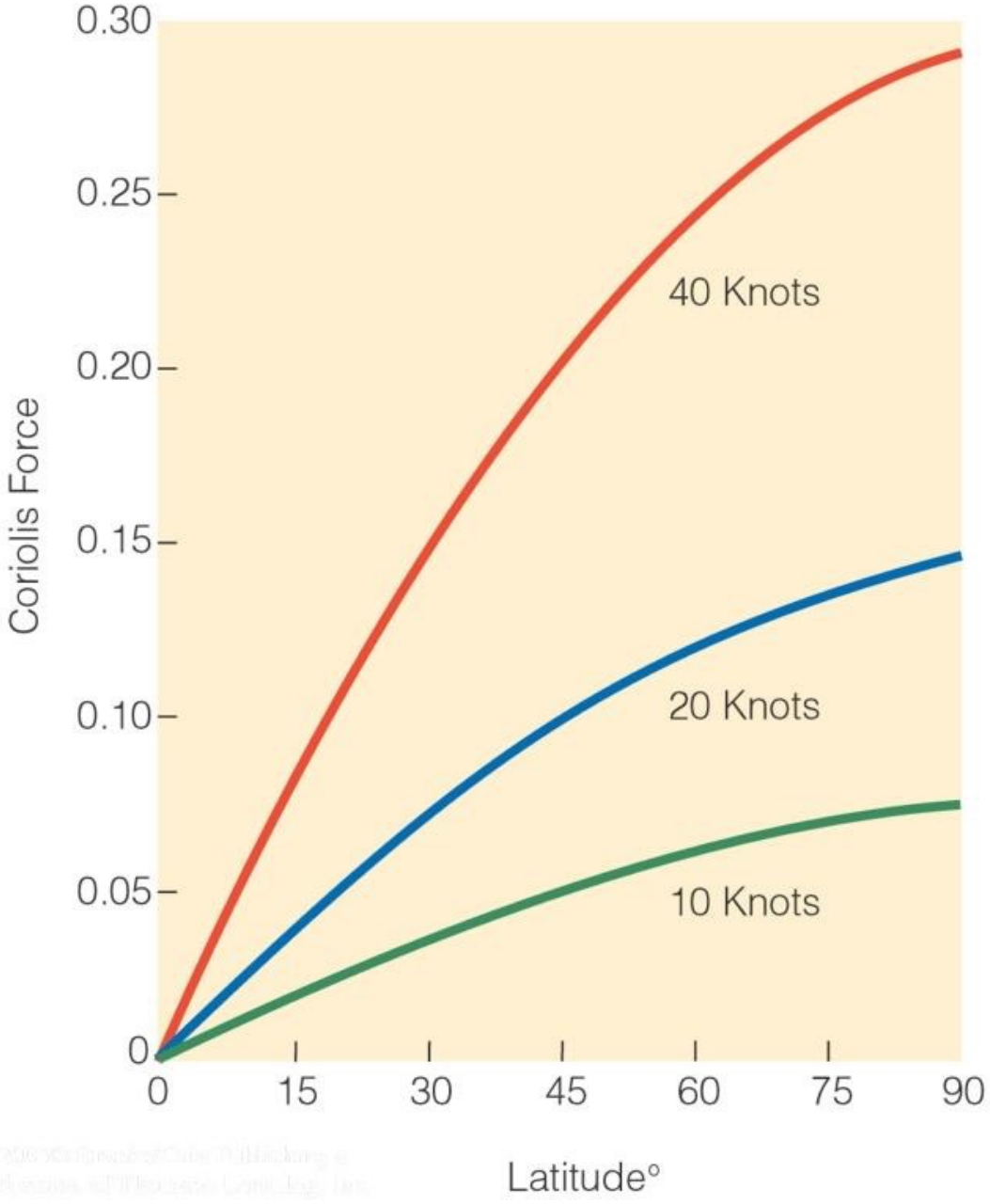
Coriolis force = $f \cdot V$

V is wind speed

f is the *Coriolis parameter*

$f = 2 \times$ earth's rotational rate $\times$ sin of latitude

Earth's ratation rate ($7.3 \cdot 10^{-5}$ radian/s)



Coriolis Force (*CF*)

- **Apparent force due to the rotation of the earth**

- **Magnitude depends on latitude and the speed of the air parcel**

  The higher the latitude, the larger the Coriolis force

  Zero at the equator, and maximum at the poles

  The faster air moves, the larger the Coriolis force

- **Causes the parcel to deflect**

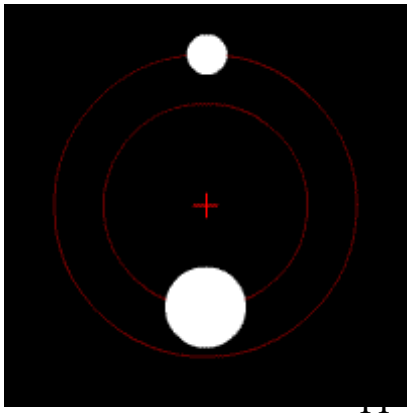
  to the right of its intended path in the northern hemisphere

  to the left of its intended path in the southern hemisphere.

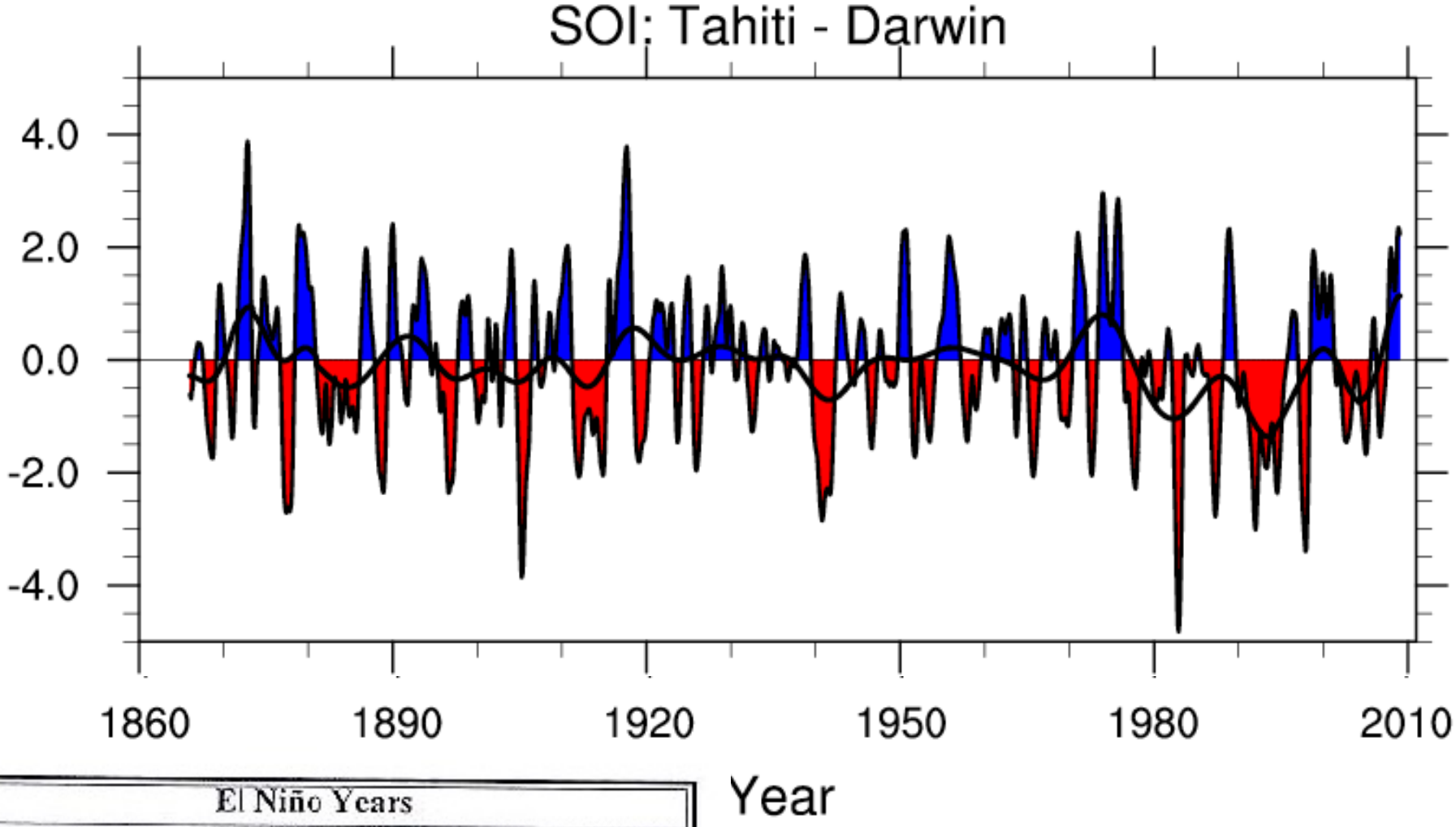
Only influence wind direction, no effect on wind speed !

Centrifugal Force

- Magnitude CENTF = mV^2/R
  - m is the mass
  - R the radius of curvature of the curved path
  - V is the speed of the air parcel
- Direction
  - Pointing away from the center of the curve
  - **The faster the speed and the tighter the curve of the path traveled (i.e., the smaller R), the larger the centrifugal force.**

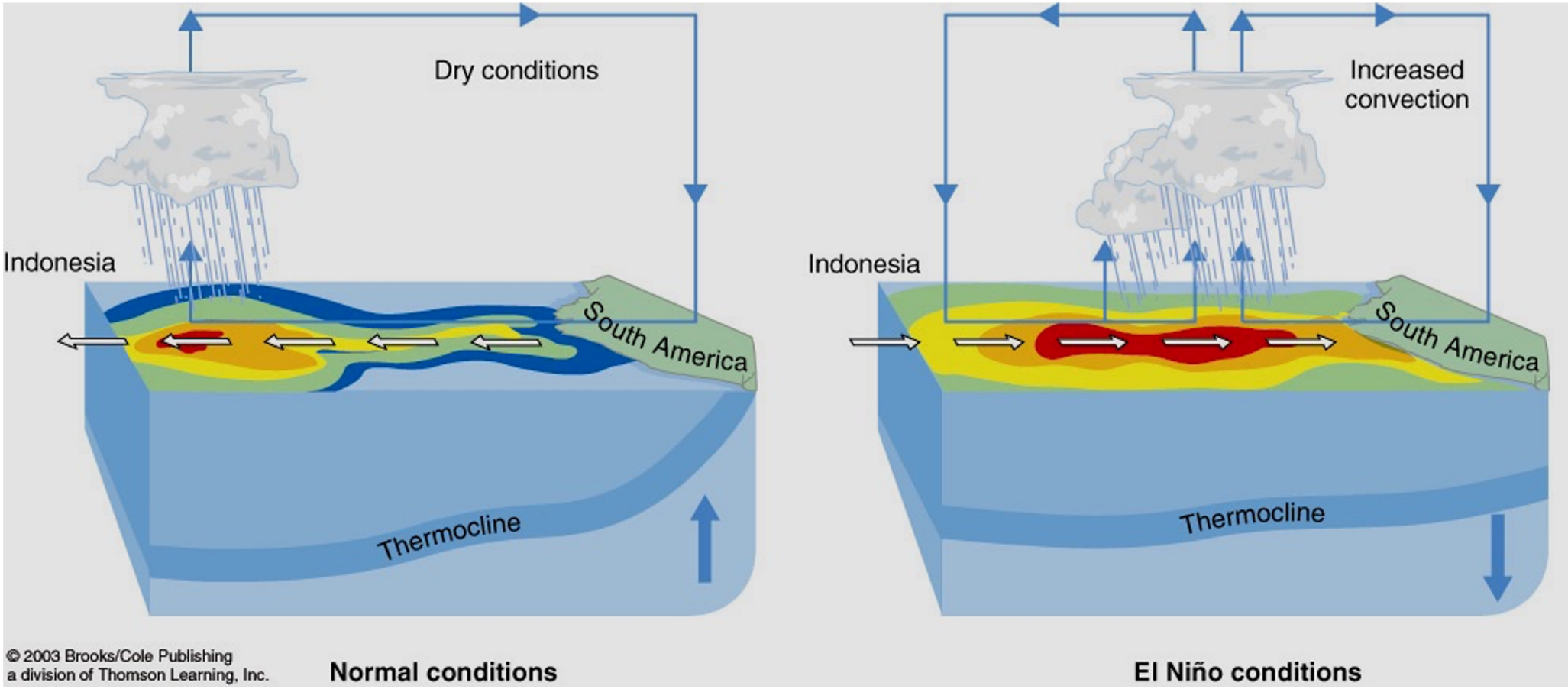


El Niño Southern Oscillation Index



El Niño Years			
1902-1903	1905-1906	1911-1912	1914-1915
1918-1919	1923-1924	1925-1926	1930-1931
1932-1933	1939-1940	1941-1942	1951-1952
1953-1954	1957-1958	1965-1966	1969-1970
1972-1973	1976-1977	1982-1983	1986-1987
1991-1992	1994-1995	1997-1998	

El Nino



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Normal conditions

El Niño conditions