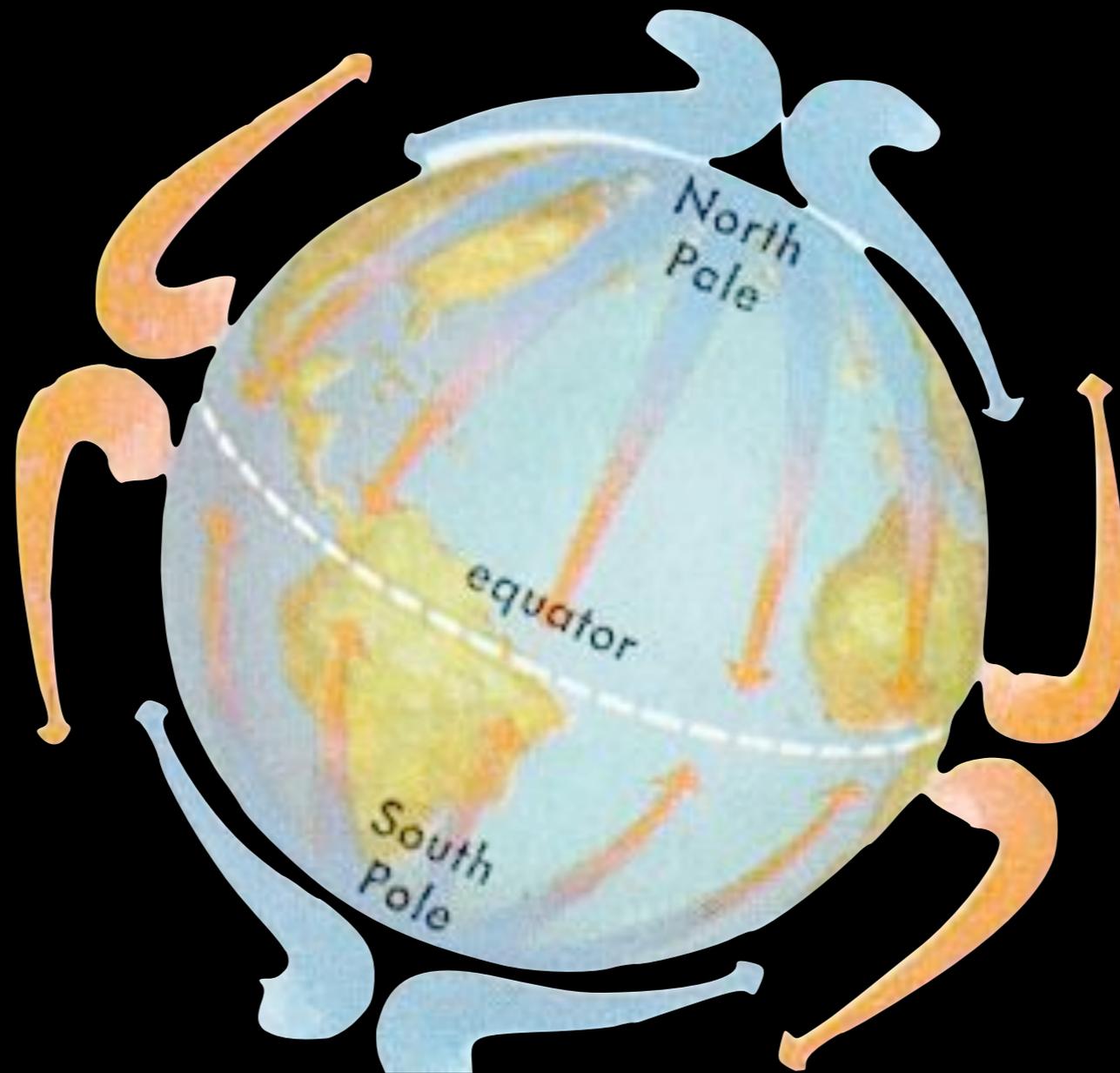
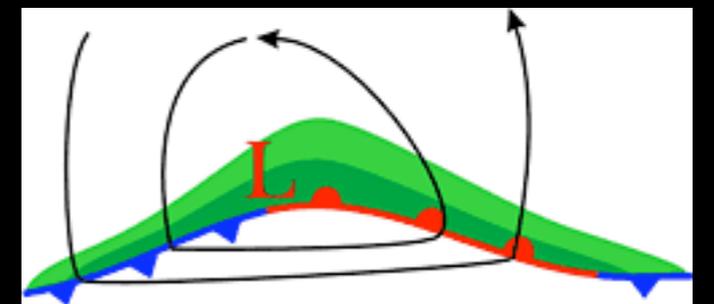
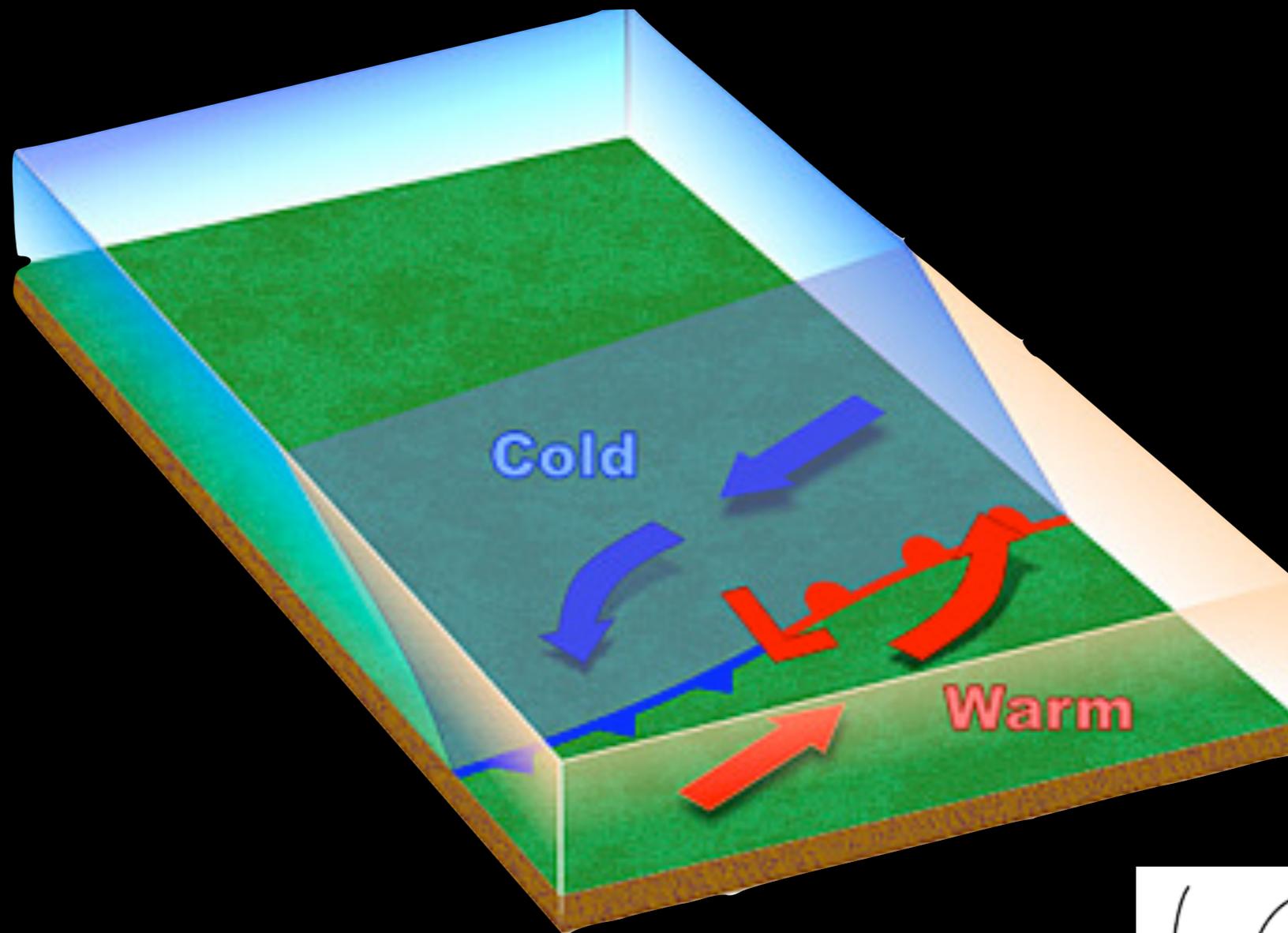


**Mike Bauer**  
**with George Tselioudis and Bill Rossow**

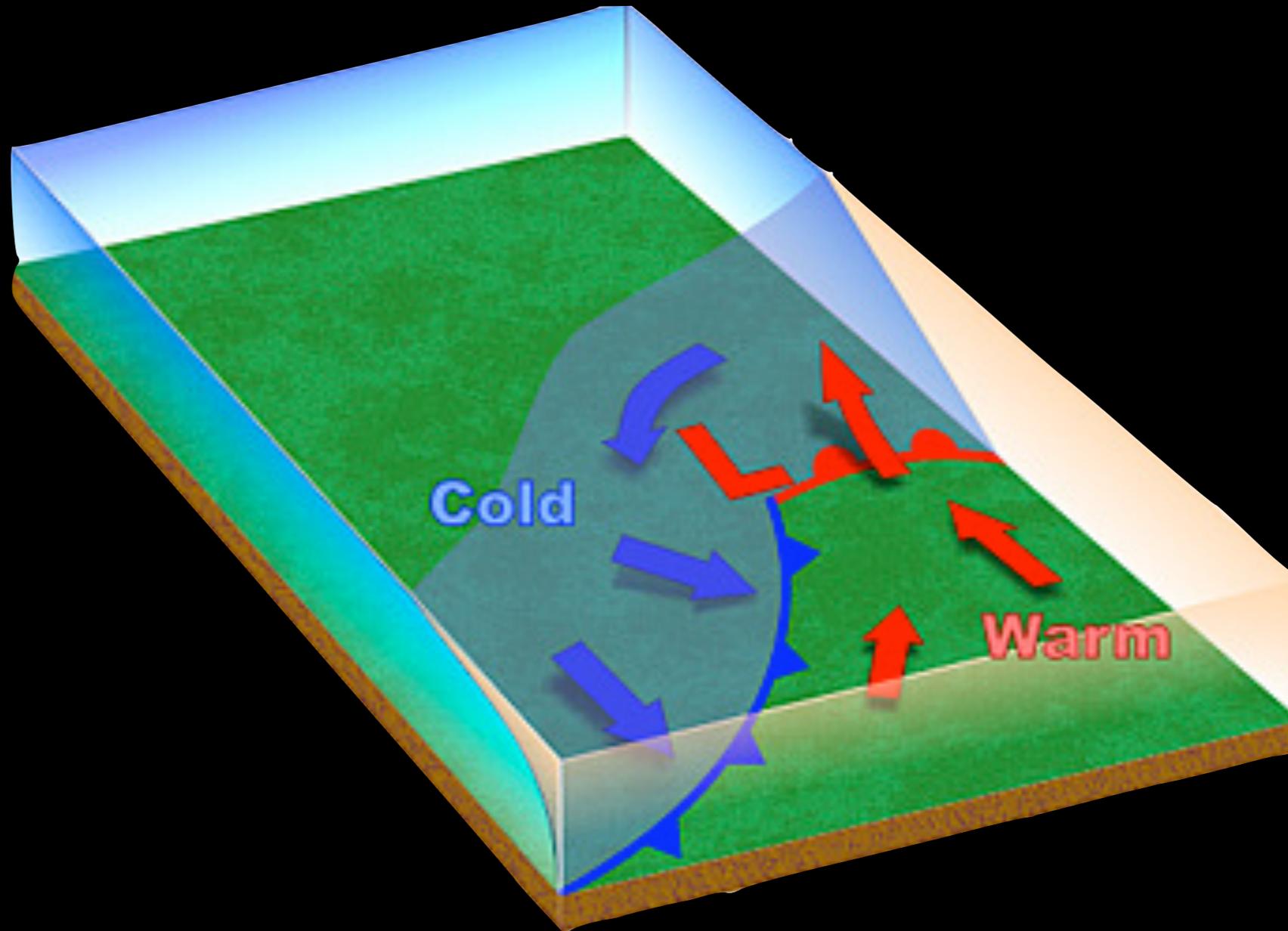
# Whirlwind Tour of Cyclones



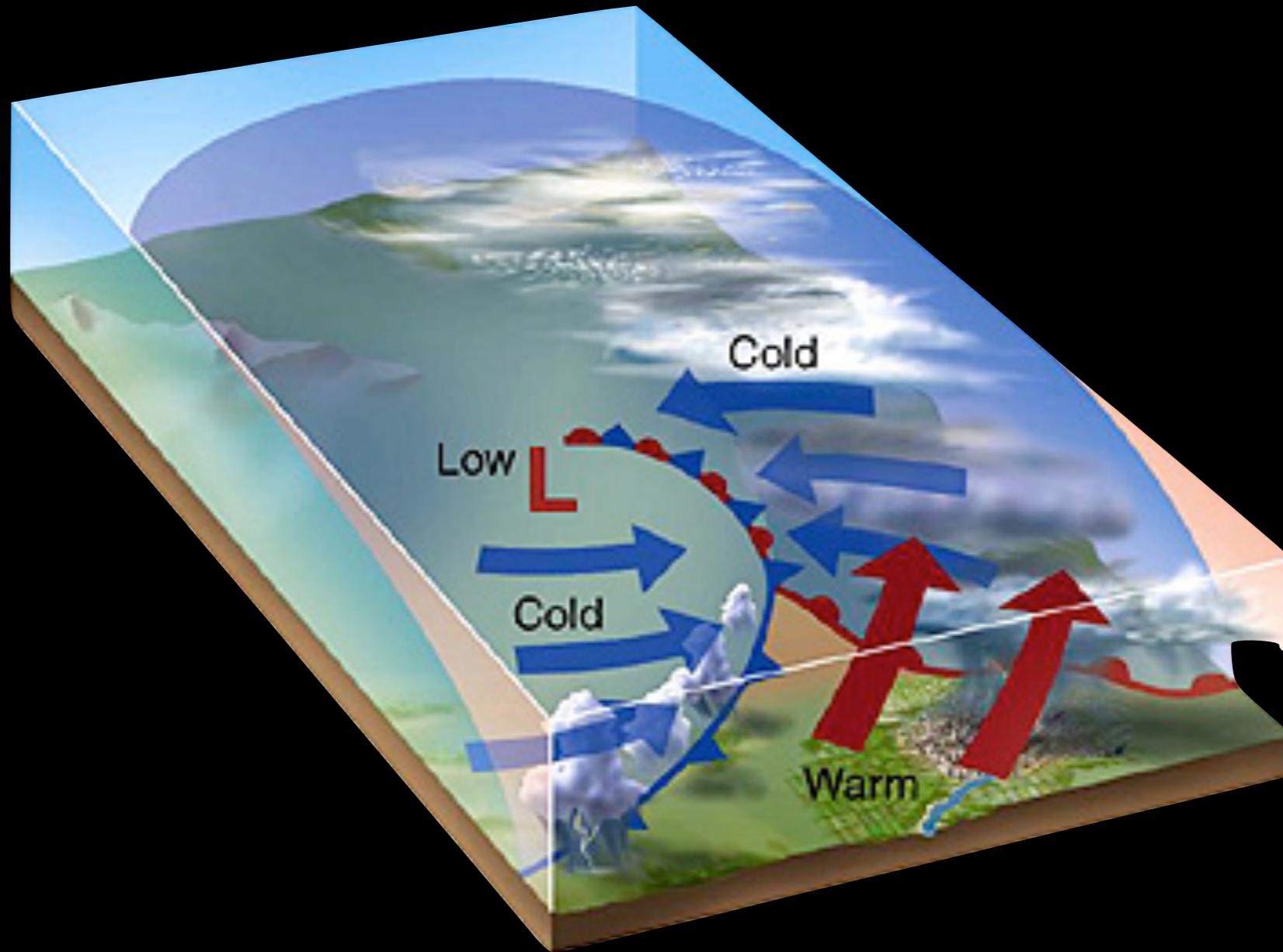
Solar heating leads to an overturning circulation.



Birth of a Cyclone (Low).



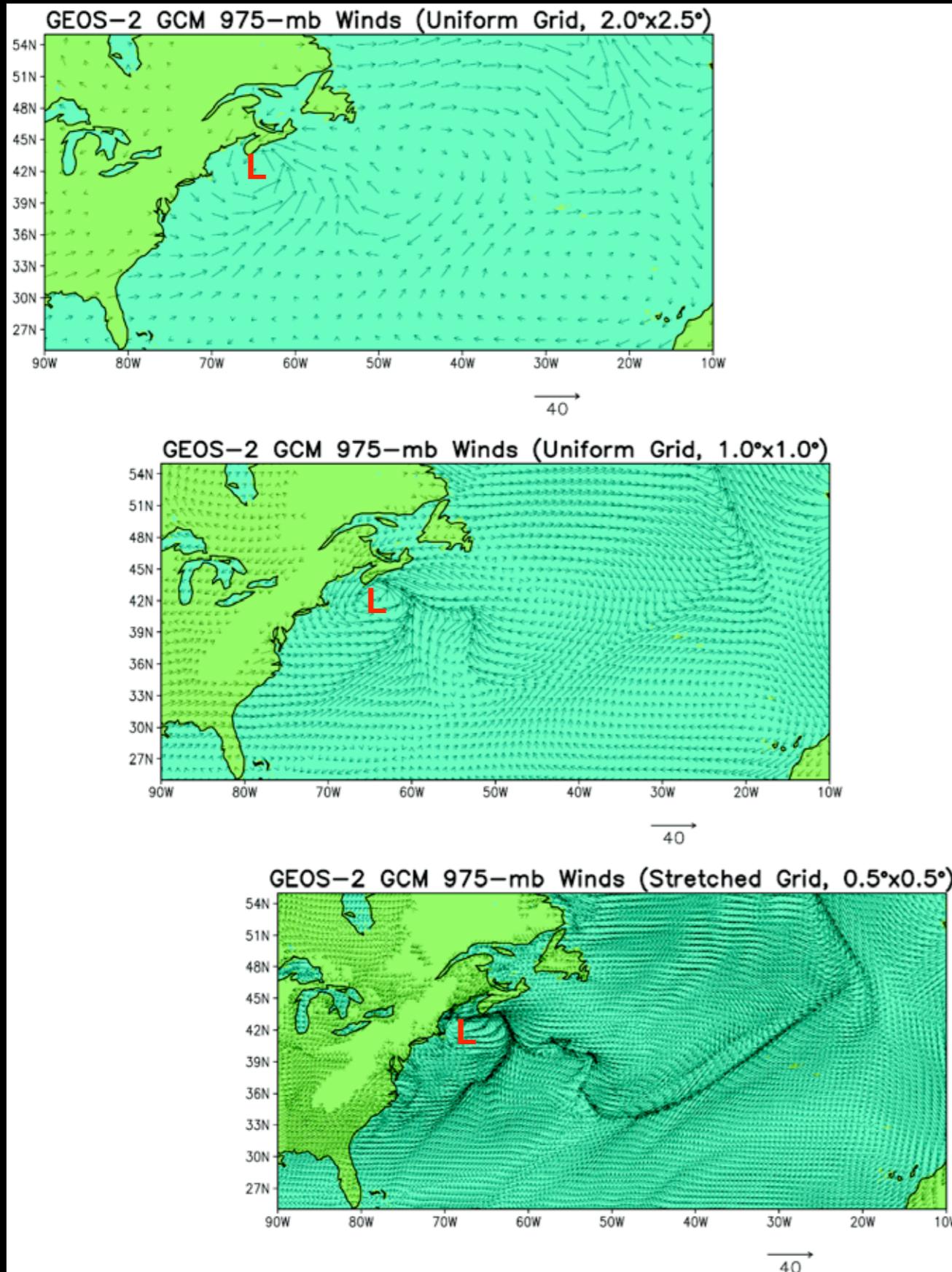
## 3D Circulation, Fronts and Net Transport.



Add Water Vapor...

Cyclone  
~1500 km

Fronts  
~100 km



← ~7 Grids

~0.5 Grid

← ~15 Grids

~1 Grid

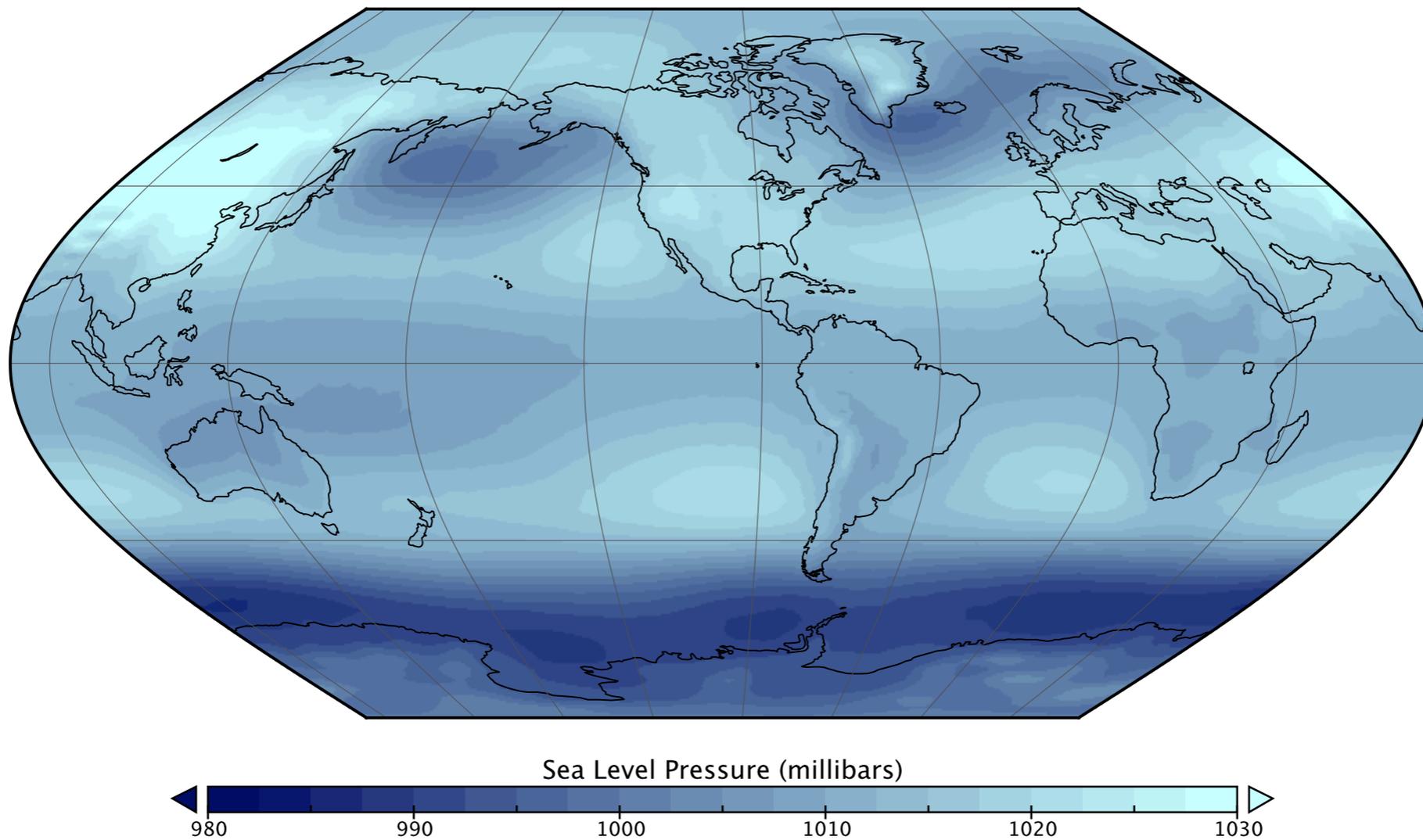
← ~30 Grids

~2 Grids

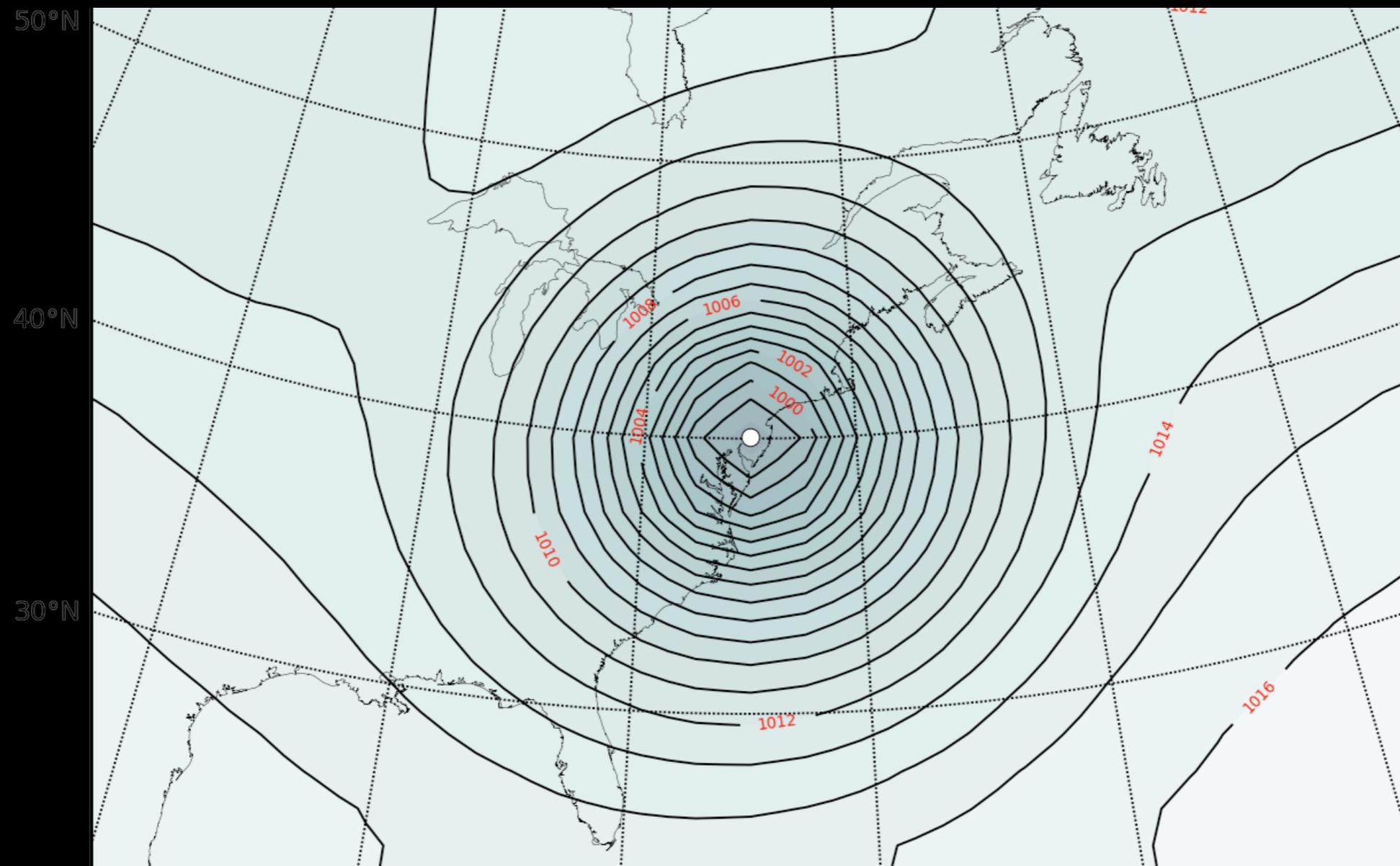
From: Conaty et al. 2001

# Alternative Climatology

NCEP/NCAR Reanalysis January Climatology (1948–2008)



# Traditional Method

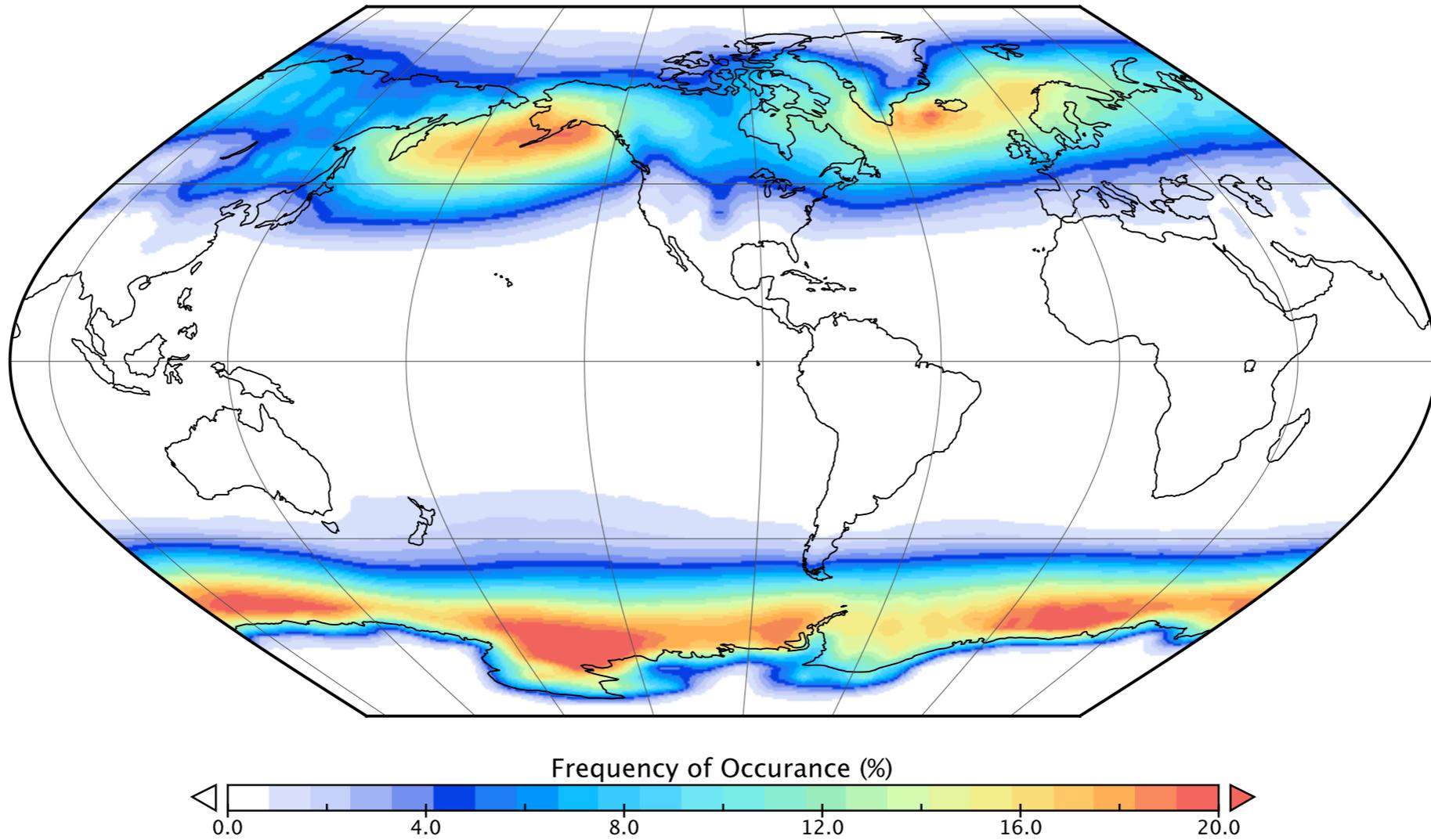


# Centers, Tracks and Composites

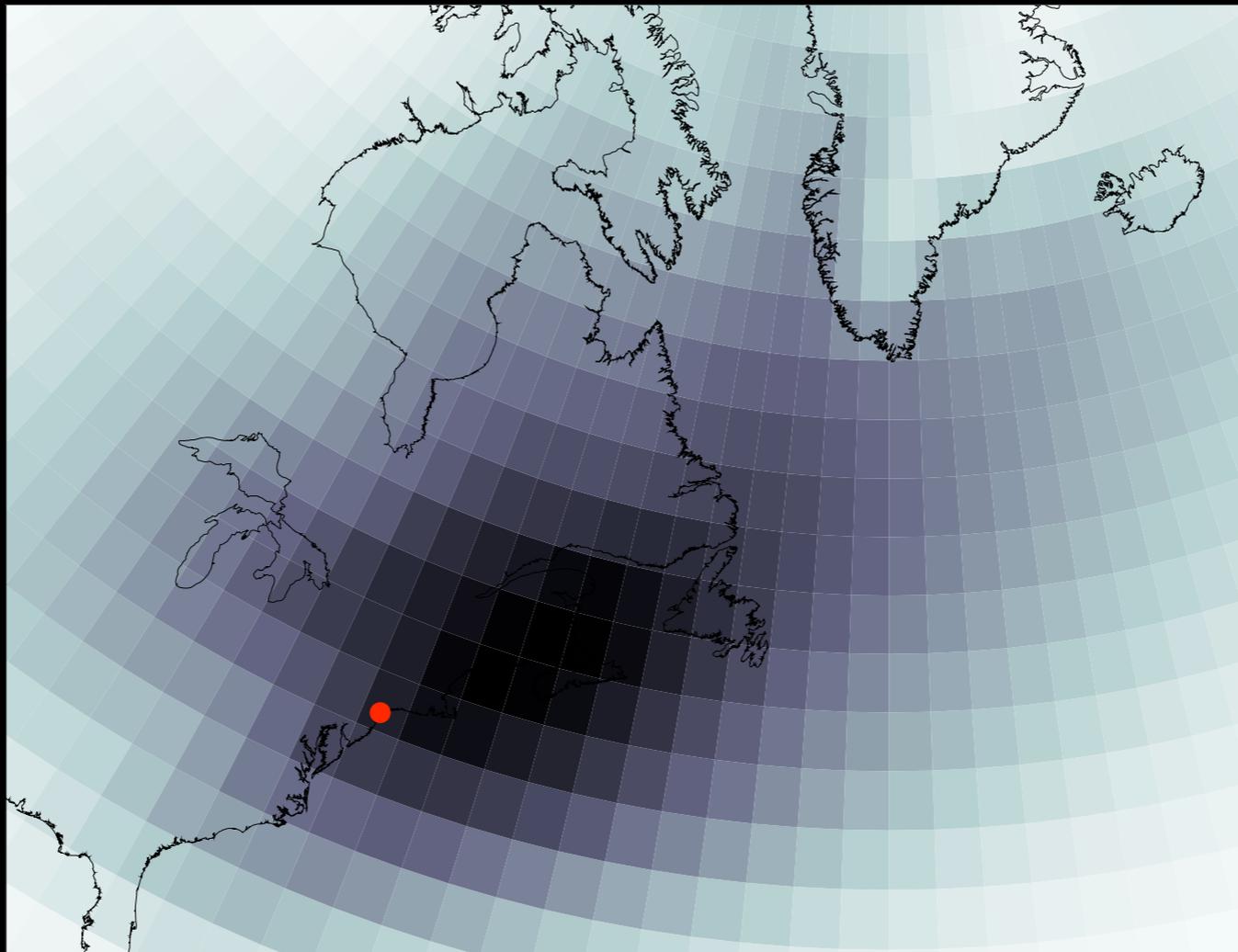
# Cyclones in Action

# Sample Uses

NCEP/NCAR Reanalysis January Climatology (1948–2008)



# Distributions



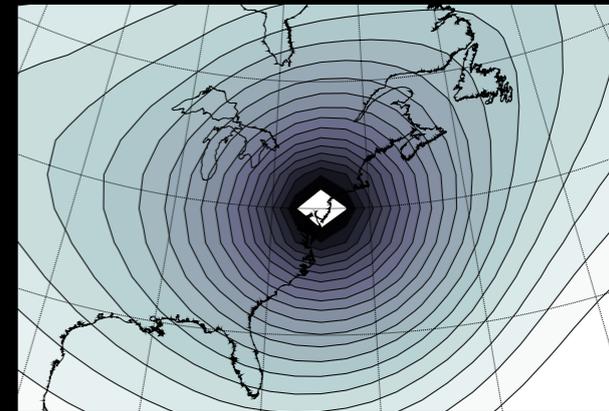
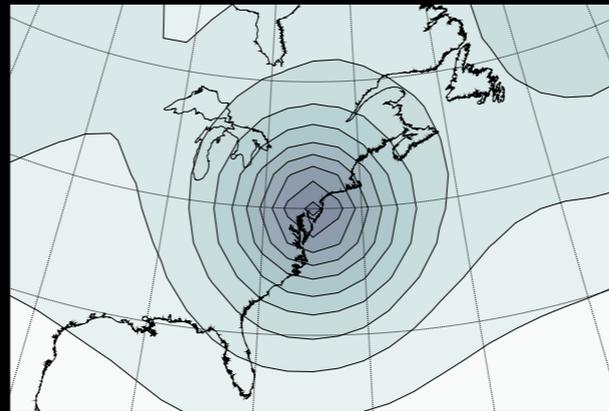
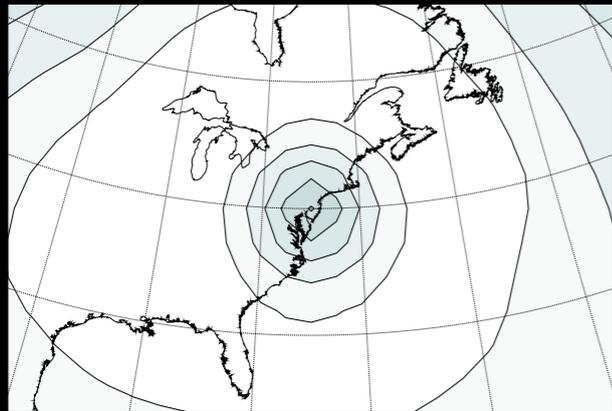
# Context/Data Sort

Weak

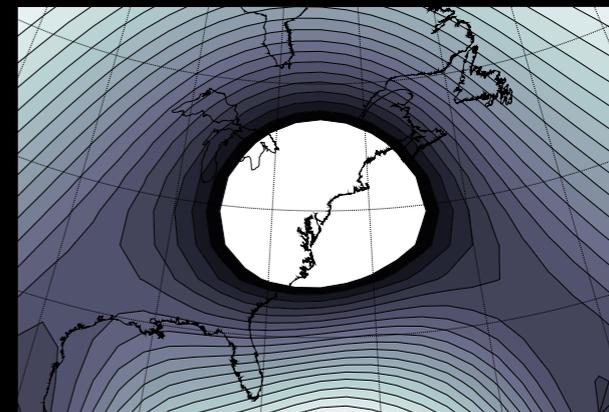
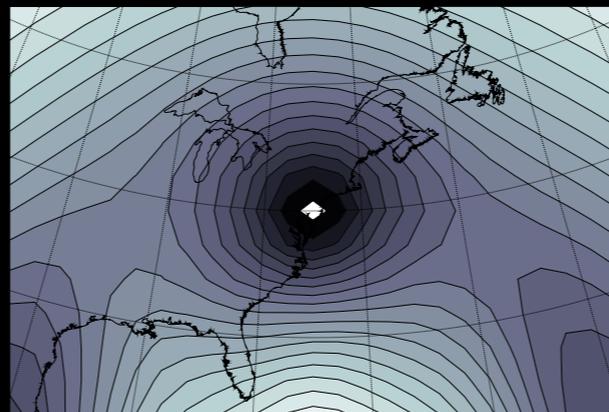
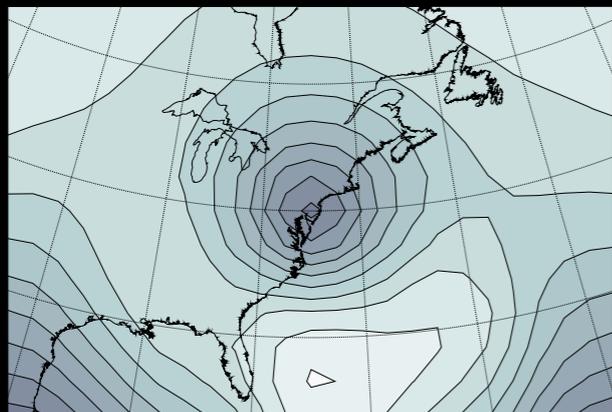
Moderate

Strong

NH  
DJF



SH  
JJA

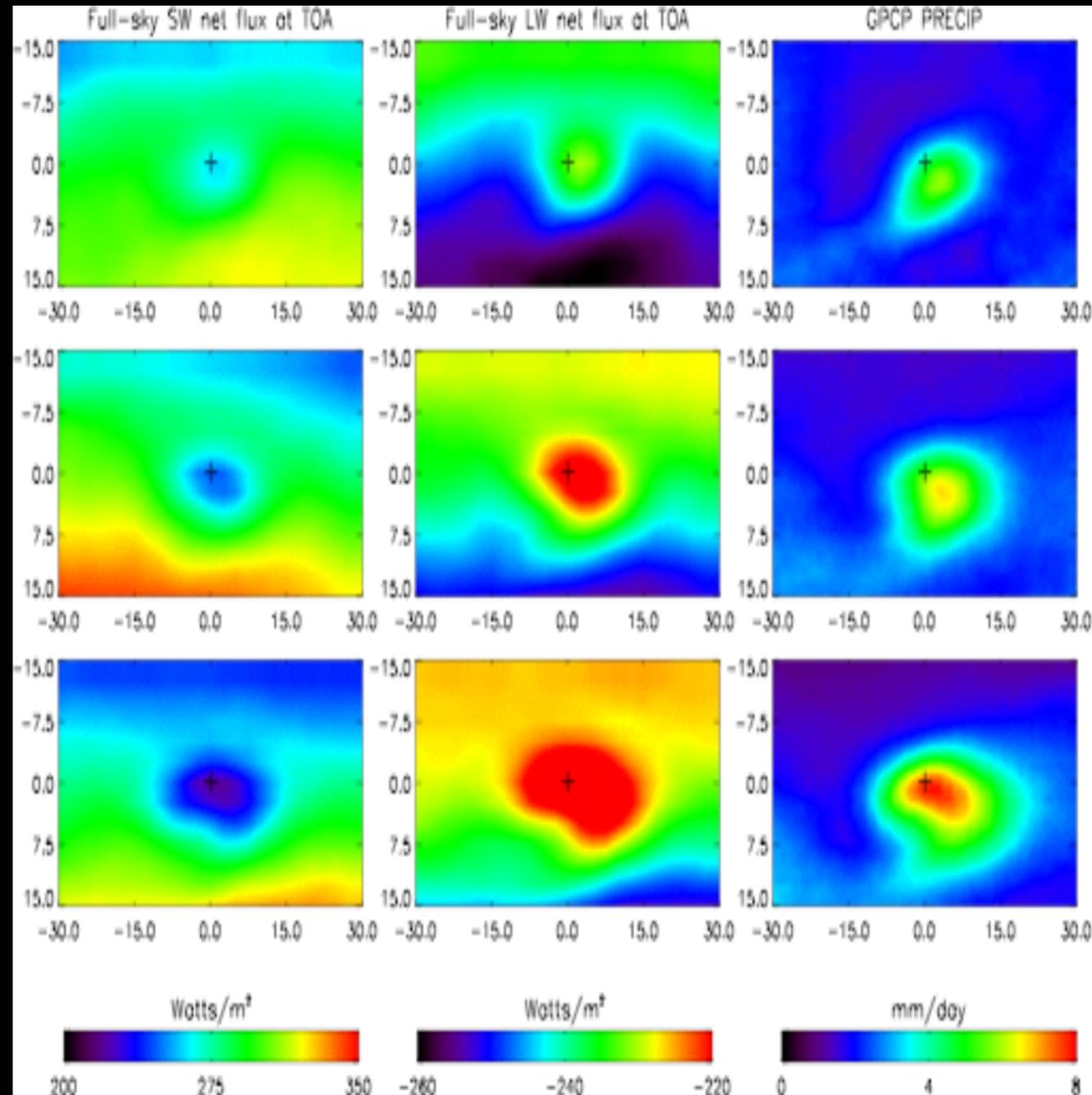


Composites

Weak

Moderate

Strong



Context/Data Reduction

# Python & Summary

```
# -----  
# Main Program Logic  
# -----  
# Read SLP field one time step at a time  
for step in xrange(start_tstep,end_tstep):  
  
    # Advance date.  
    datetime = get_datetime(time[step])  
    jd = get_jd(datetime,calendar='standard')  
  
    # Convert datetime into year, month, day, hour  
    yyyy = datetime.year; mm = datetime.month;  
    dd = datetime.day; hh = datetime.hour  
  
    # Get SLP field, make 1d integer array. To allow for exact comparisons  
    # impose a fixed accuracy (significant digits) via defs.accuracy  
    slp_step = N_array([PL[step, :]])  
    slp_step.shape = (im*jm) # reshape to 1d int array  
    slpint = slp_step.astype(numpy.int)  
  
    # If searching for high pressure reverse pressure field so  
    # that highs are lows.  
    if defs.find_highs:  
        slpint = slpint*-1  
  
    # Screen SLP field by defs.plim.  
    if defs.plim_filter:  
        tmp1 = N_less(slpint,defs.plim_filter)  
    else:  
        tmp1 = N_ones(N_size(slpint))  
  
    # Screen SLP field in tropics  
    if defs.tropical_filter:
```

- All Python
  - All Open Source, data set freely available.
  - Mostly OO.
  - Sometimes Parallel ... only SMP.
- Current Applications:
  - Climate Model Validation.
  - Satellite Data Reduction.
  - Weather sensitive : Ecology, Oceanography, Air Quality, Wind Energy and Insurance.

Questions? \* Questions? \* Questions?  
Questions? \* Questions? \* Questions?