# Satellites, Weather and Climate Module 32:

## *Blocking patterns*

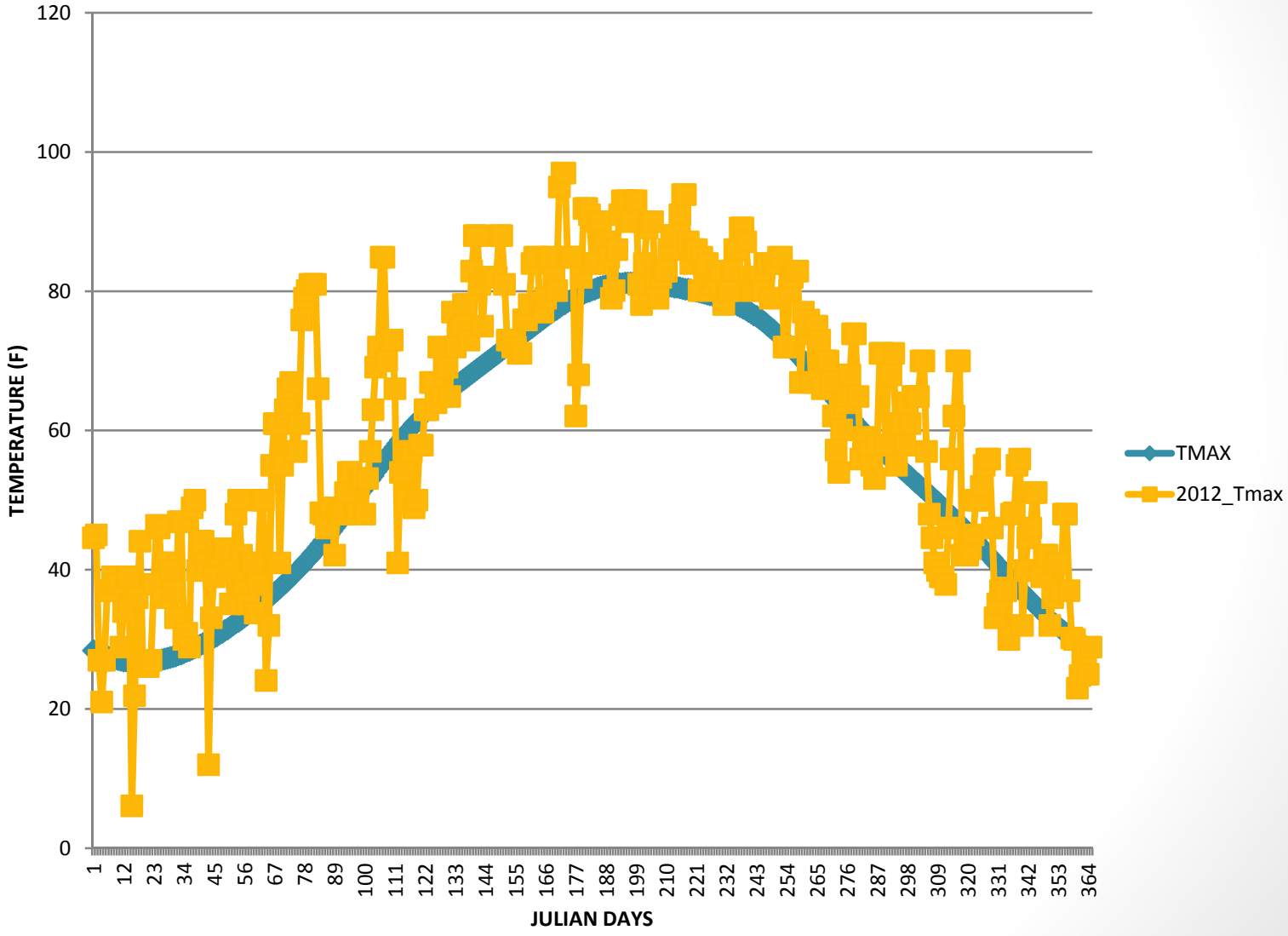
SWAC

The UNIVERSITY of VERMONT

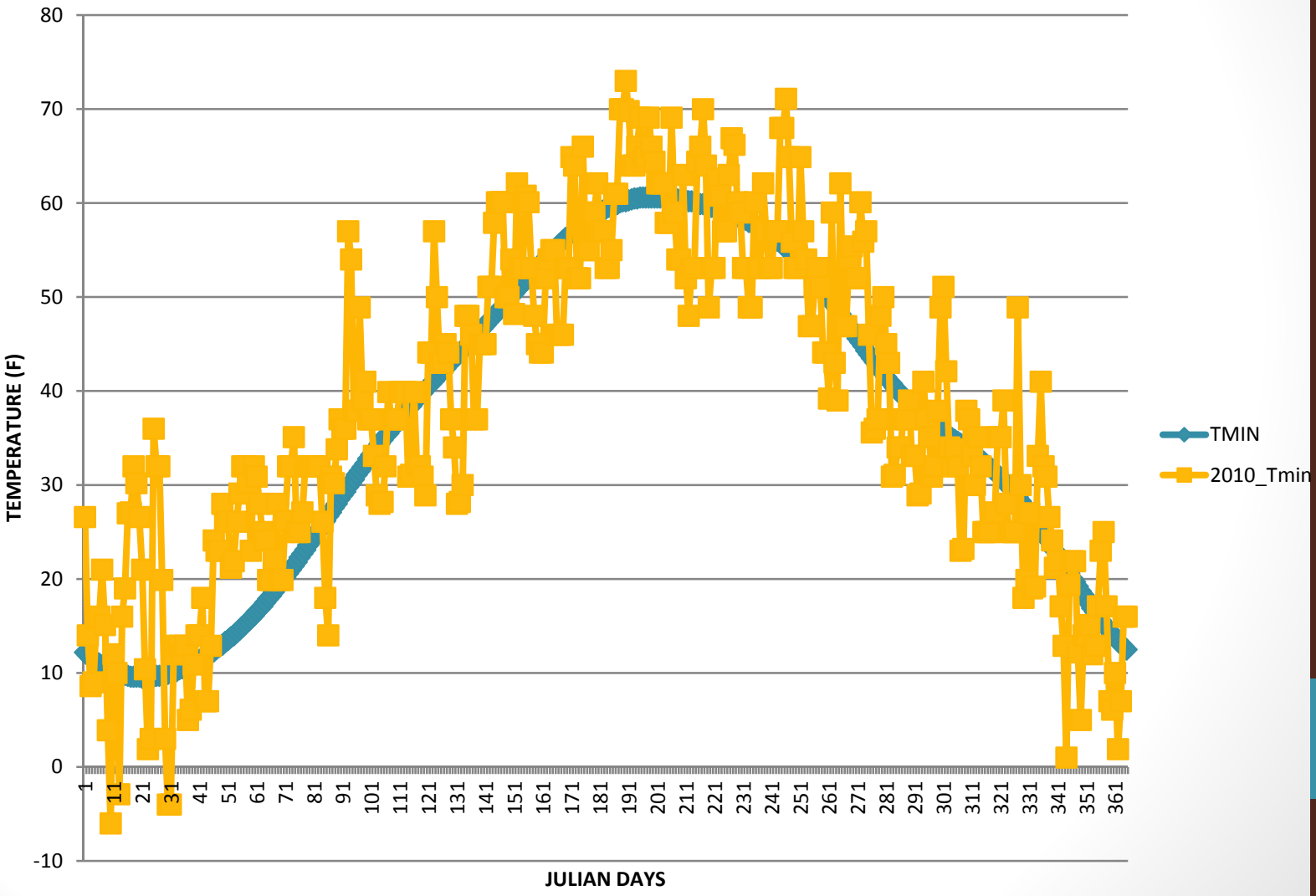
NSF

VERMONT

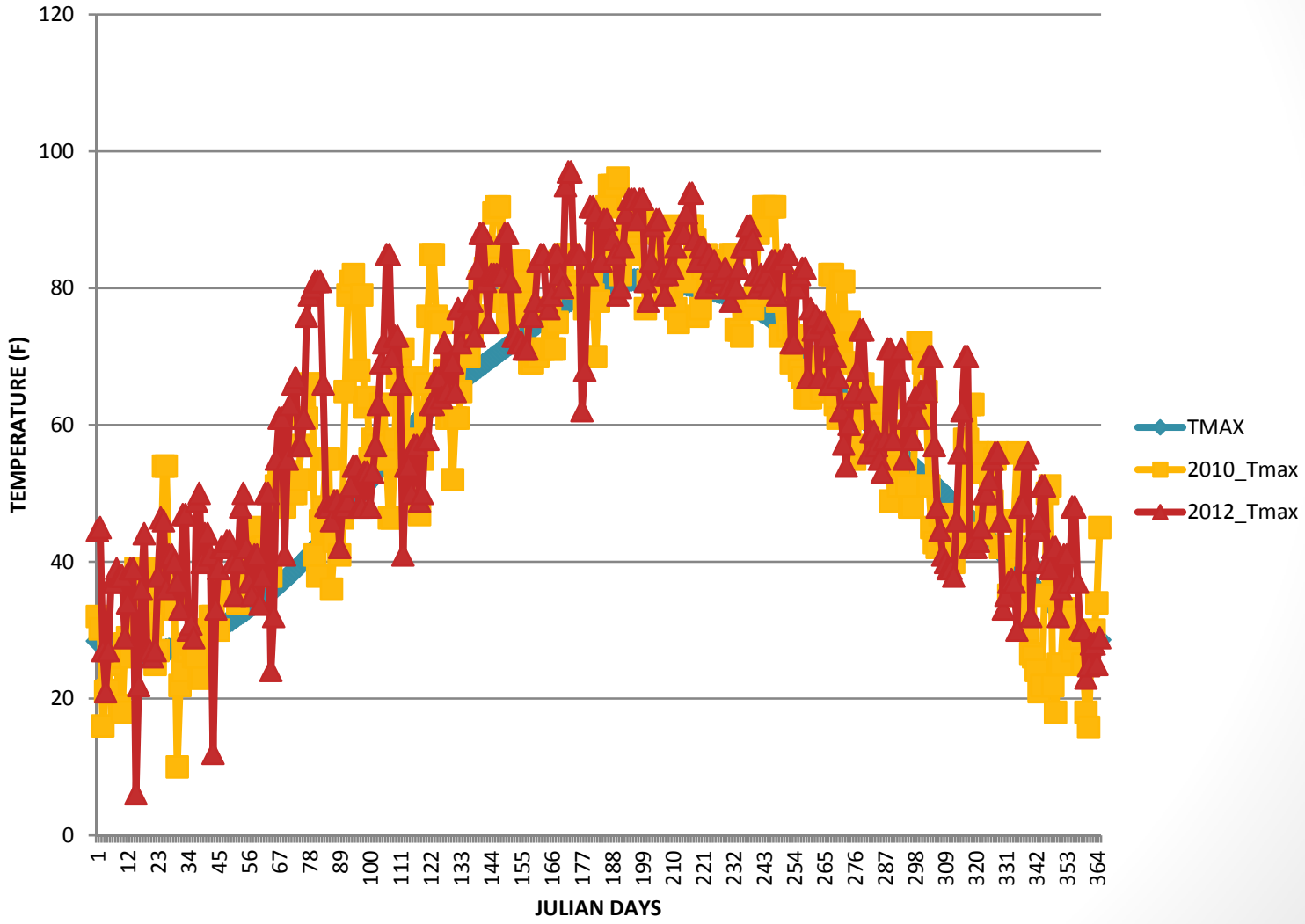
# Burlington maximum temperatures – 2012 relative to 1981-2010



# Burlington minimum temperatures – 2012 relative to 1981-2010



# Burlington maximum temperatures – 2010 & 2012 relative to 1981-2010



# Backward spring 2010

Photo credit: L-A. Dupigny-Giroux

- low temperatures in January – June
- land-locked stations colder
- winter freeze/thaw cycles – predictor
- snow, freezing rain – April to June
- summer killing frosts
- summer drought
- NW flow

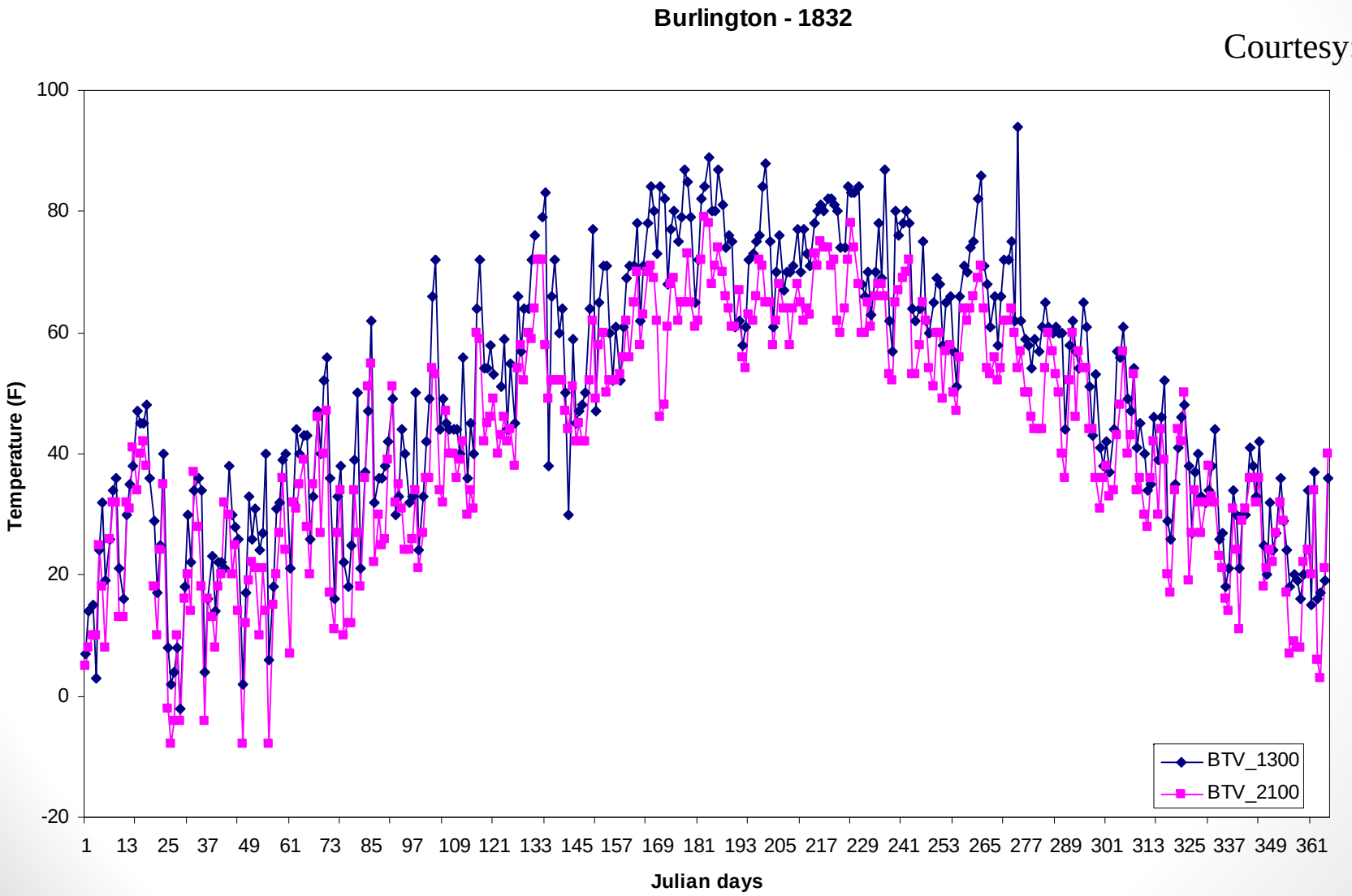
# Frosts in May 2010

- **"Late spring frost injury to hardwoods** is widespread.
- Over 200,000 acres of damage have been observed during aerial surveys, with the heaviest damage to sugar maple.
- Christmas tree growers are reporting heavy frost damage to balsam fir, the worst in many years if not ever."

June 2010

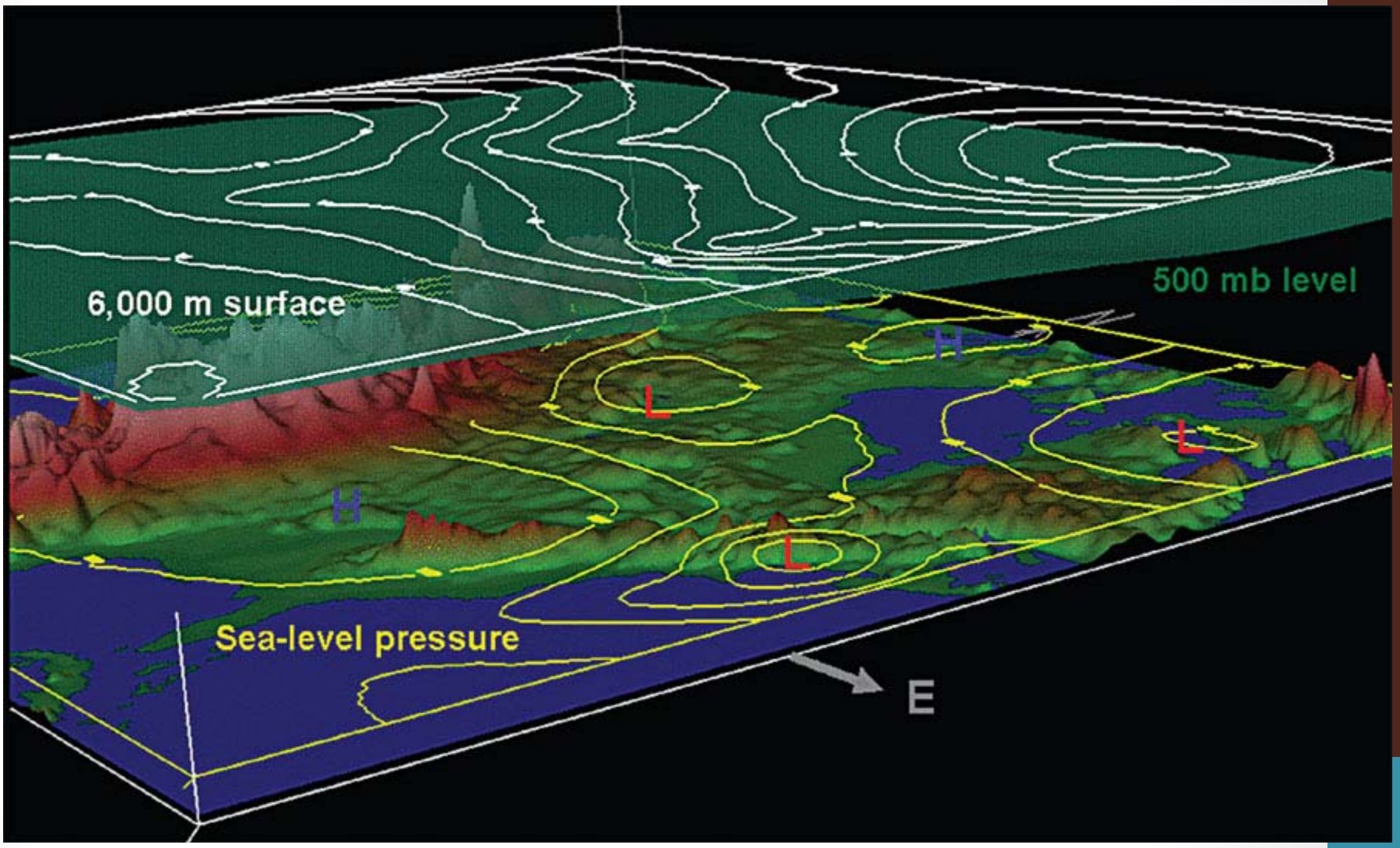
http://www.vtfpr.org/protection/documents/VTFPR_May2010FrostDamageUpdate.pdf

# “A summerish January, a winterish spring”

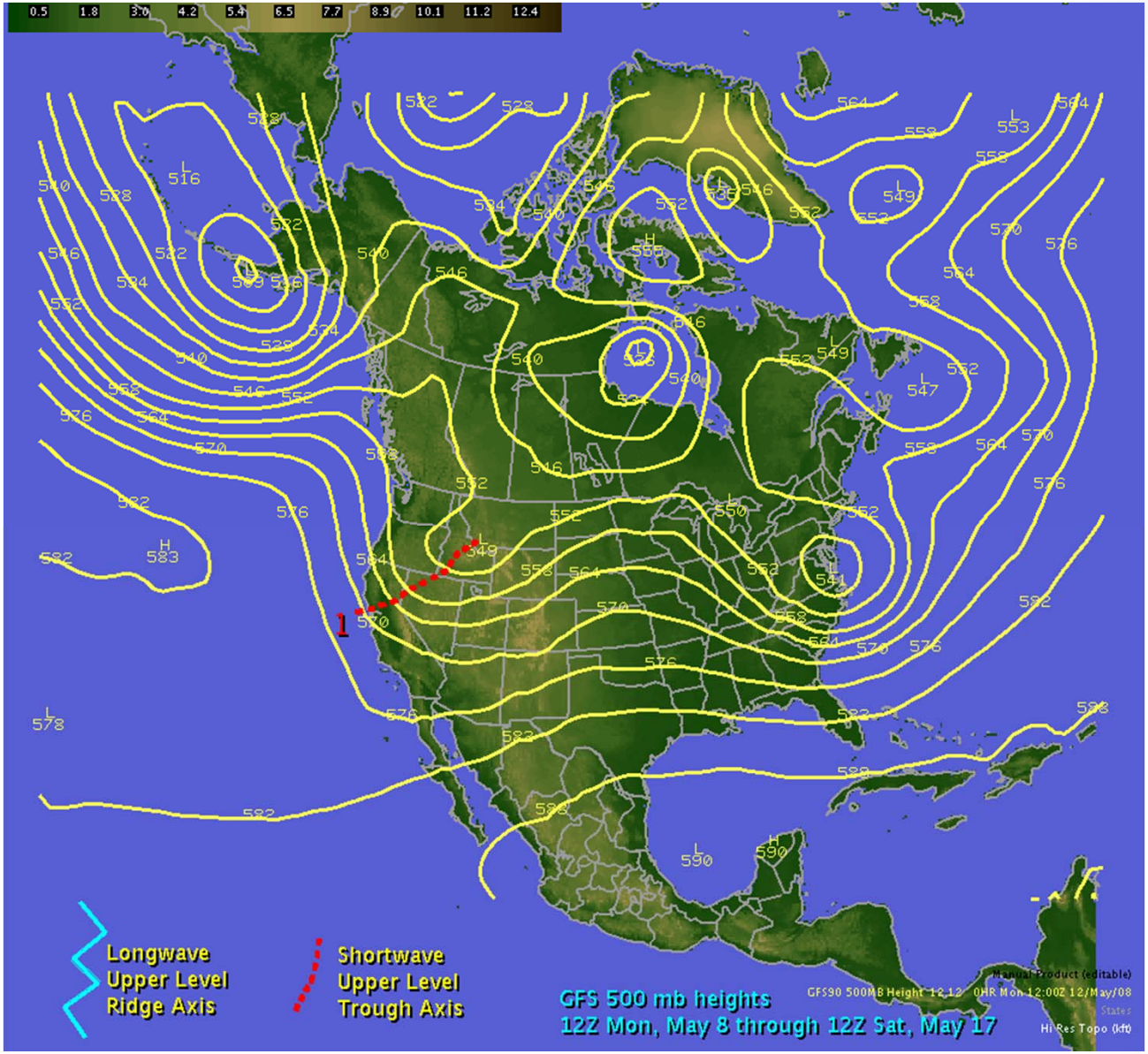



Courtesy: CDMP

# Need for weather map interpretation

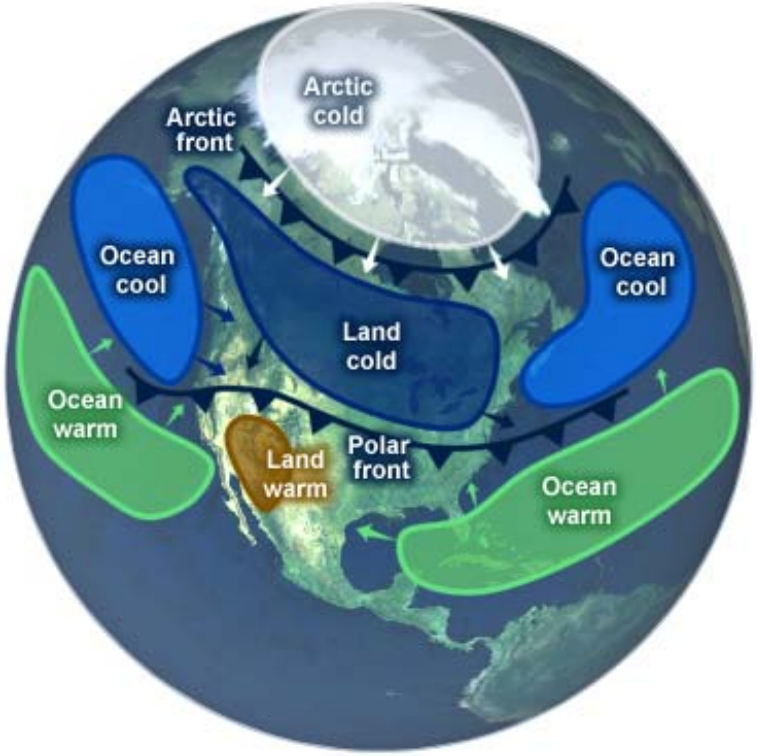



http://www.vos.noaa.gov/MWL/dec_08/Images/Art2Fig2.jpg




http://www.wrh.noaa.gov/slc/general/AFD_FAQs.php#5

# Fronts






- located by the leading edge of the cold air

  not sufficient to use temperature alone to locate it (front zone may fall between stations)

  use change in dew point (higher in warm air)

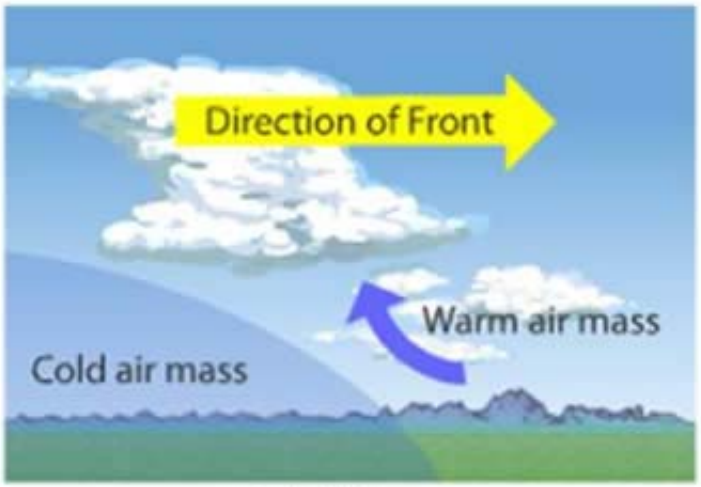
# Types of fronts

cold

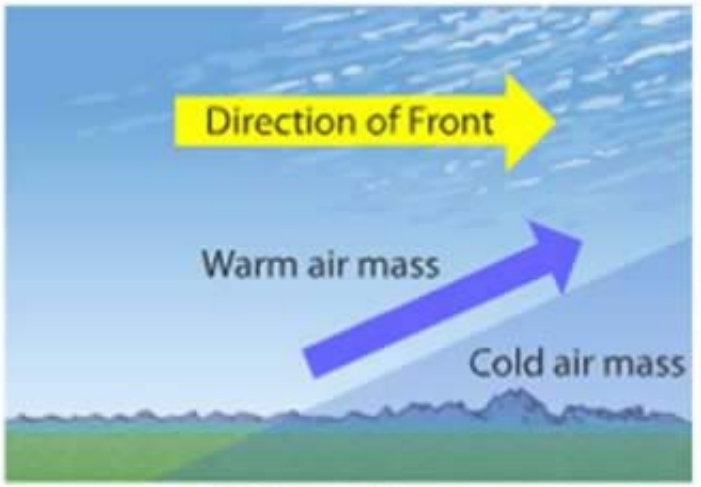
warm

occluded

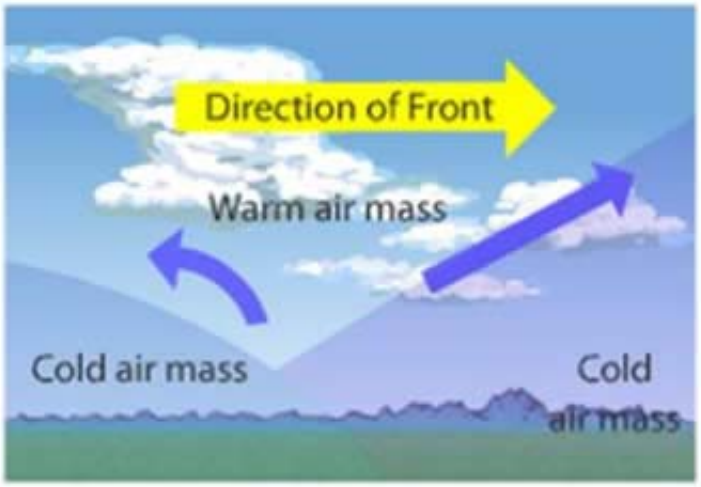
stationary



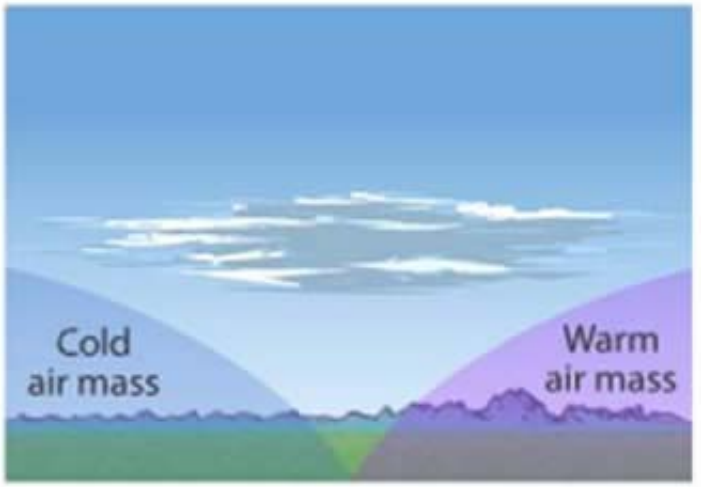

Cold front




Warm front

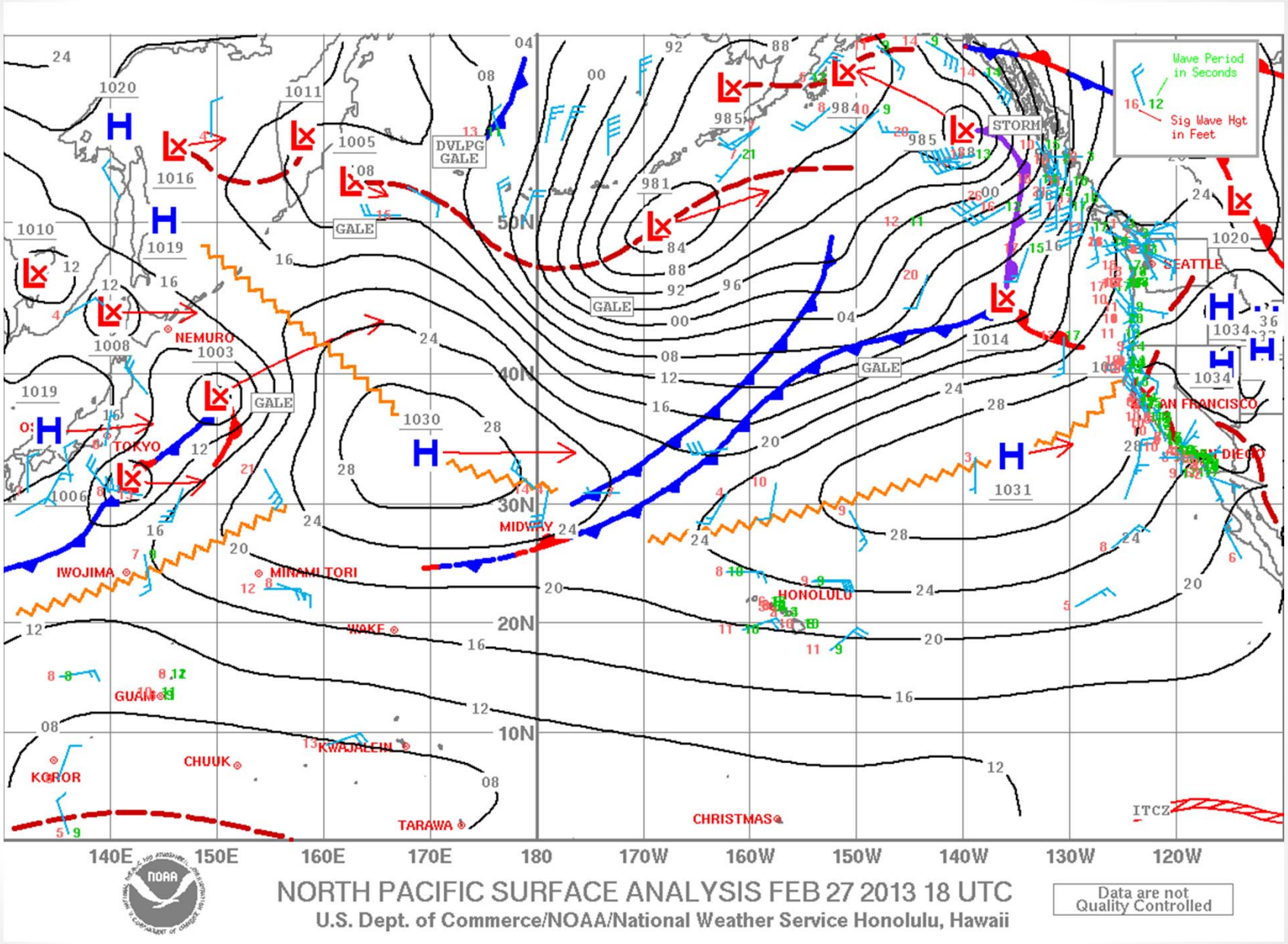



Occluded front



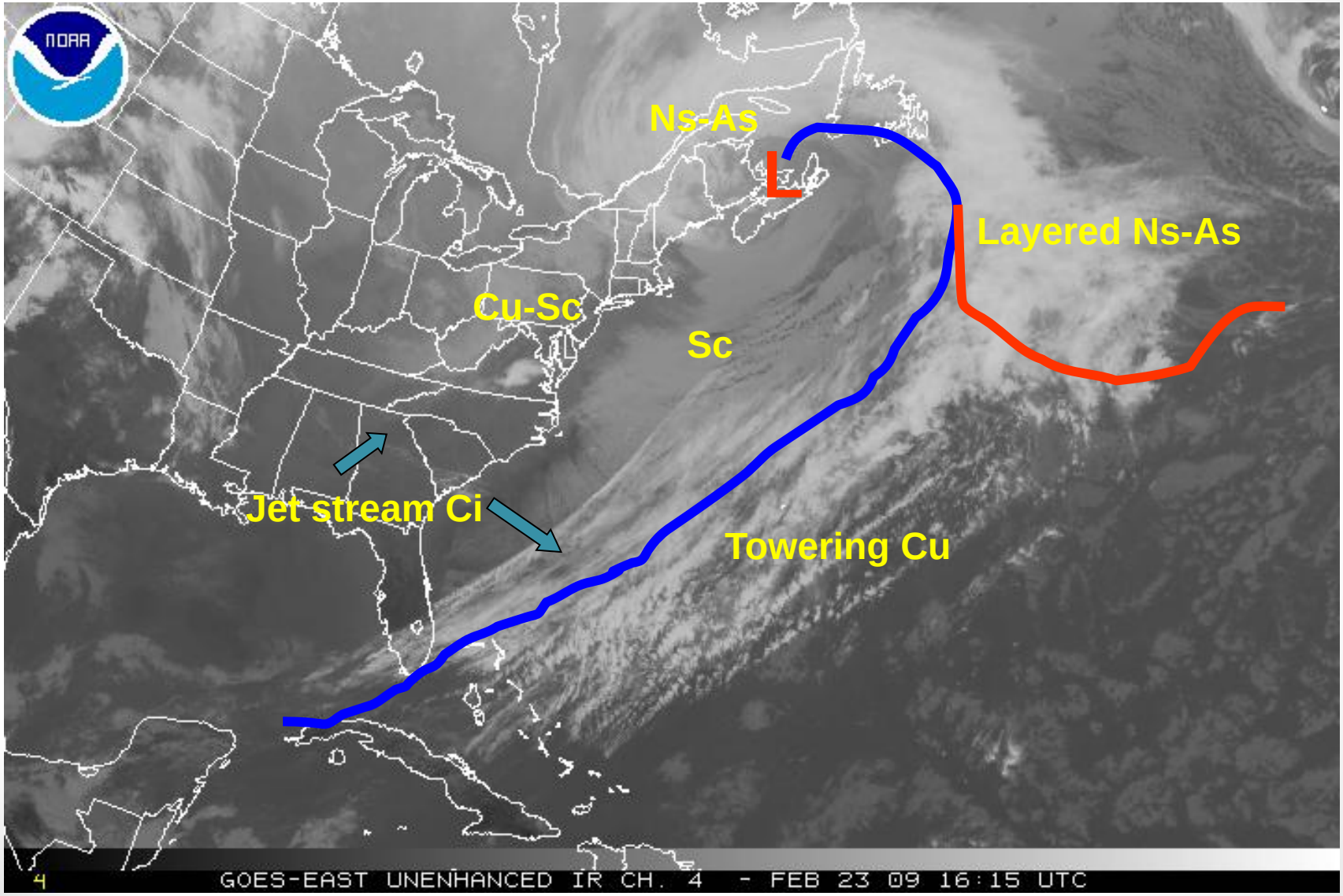

Stationary front

http://www.aps.k12.co.us/gateway/academics/science_dept_pages/votodian/10-11/AirMassesFronts.html




http://www.prh.noaa.gov/hnl/graphics/npacloop.gif

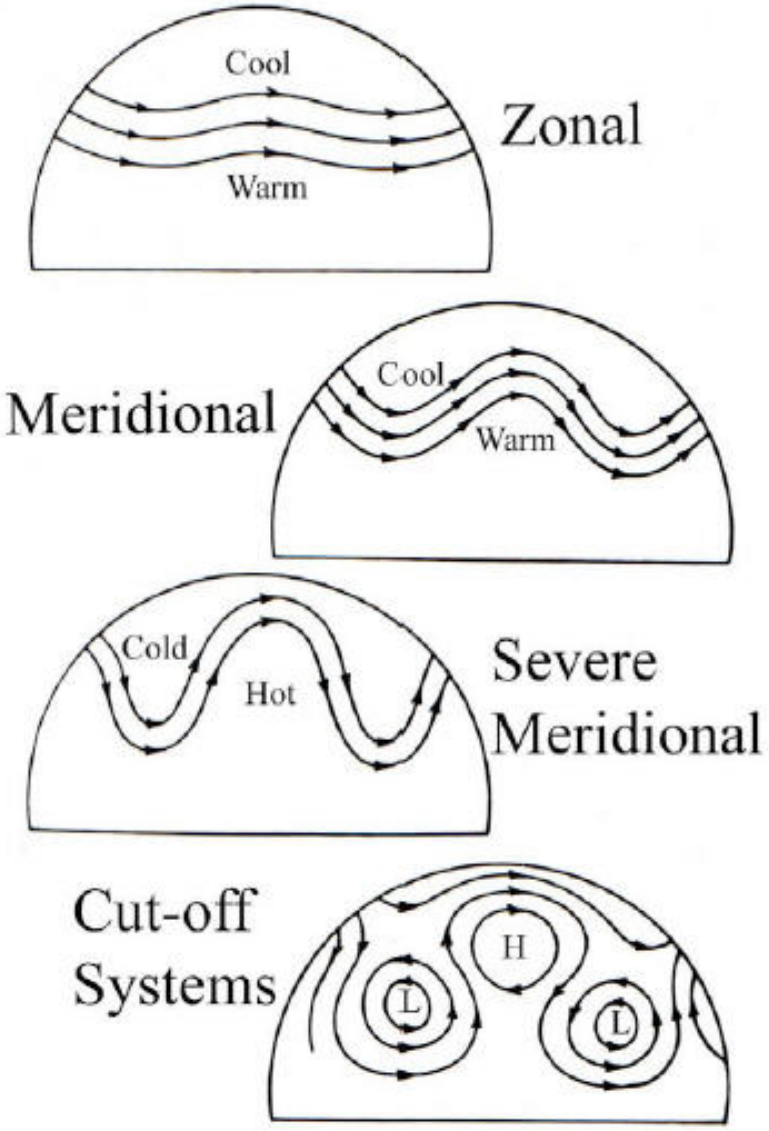
# Mature storm system and cloud distribution



# Upper level flow

- zonal, meridional
- blocking - blocking high, blocking low - block zonal flow
- cutoff vortices = low to the south of the jet stream and high to north
  - regular vortices have lows north of the polar jet and highs south of the jet
- deep trough = one that extends far to the south, but still in the westerlies

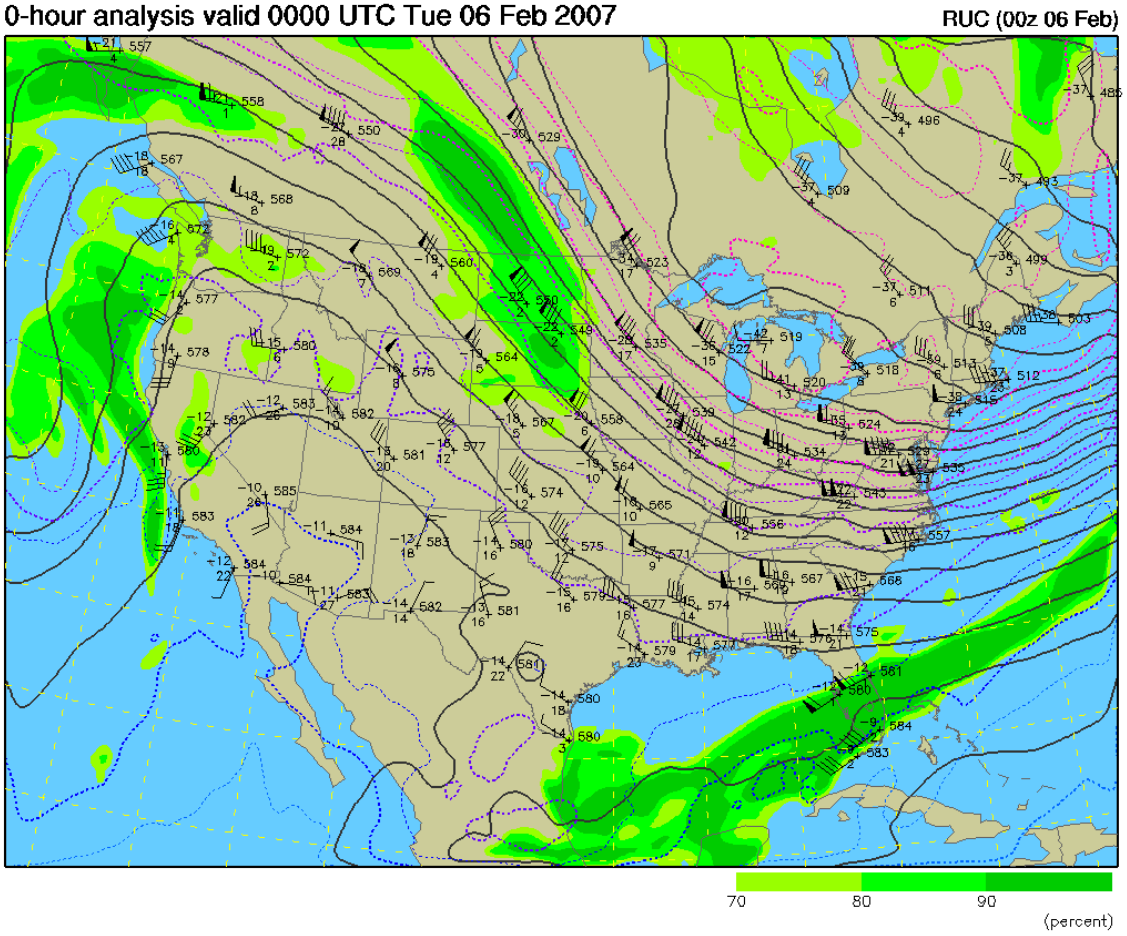
# Wave Amplitude



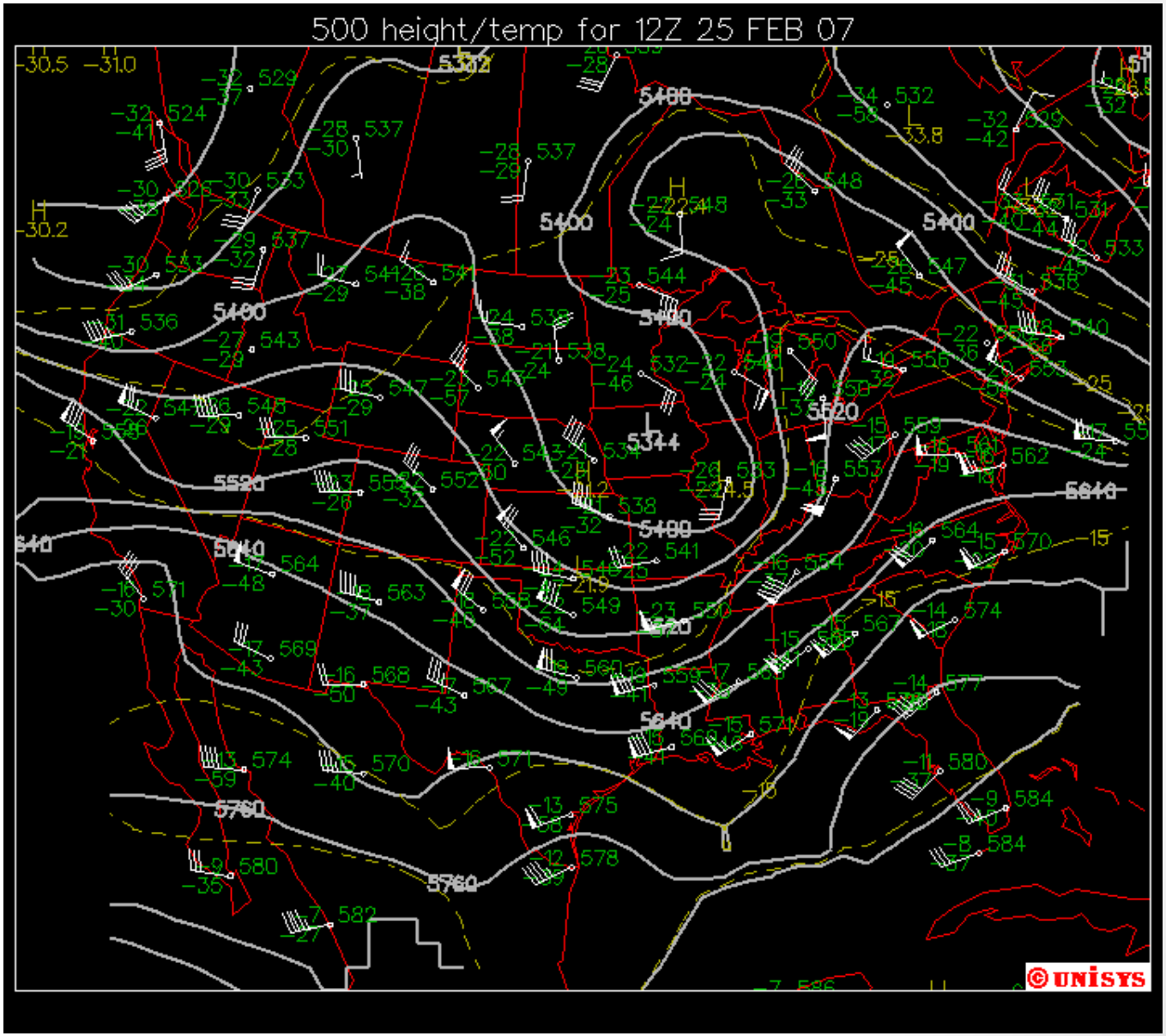

- Beside wave length and speed, a wave's amplitude is an important characteristic.
- Measured by the trough/ridge distance with latitude.
- Short waves have lower amplitude, progress quickly east.
- Long waves & standing waves have higher amplitudes & considerable variability in amplitudes.

500 mb rawinsonde data 00z Tue 06 Feb 2007

# 500 mb Heights (dm) / Temperature (°C) / Humidity (%)

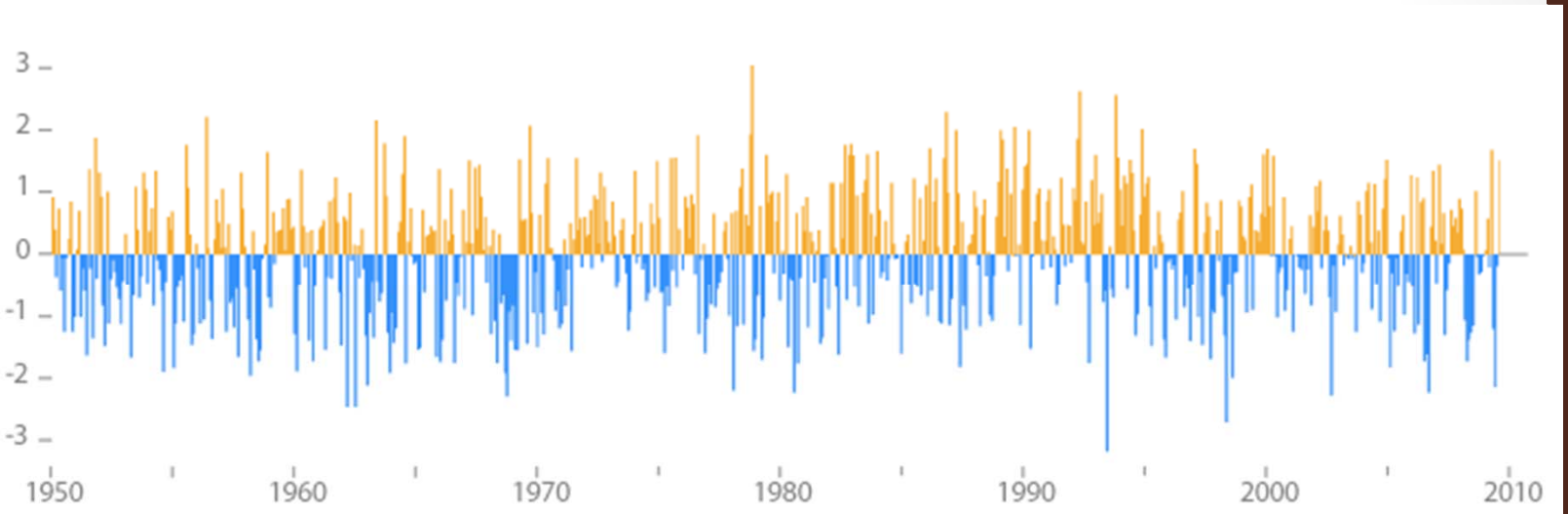


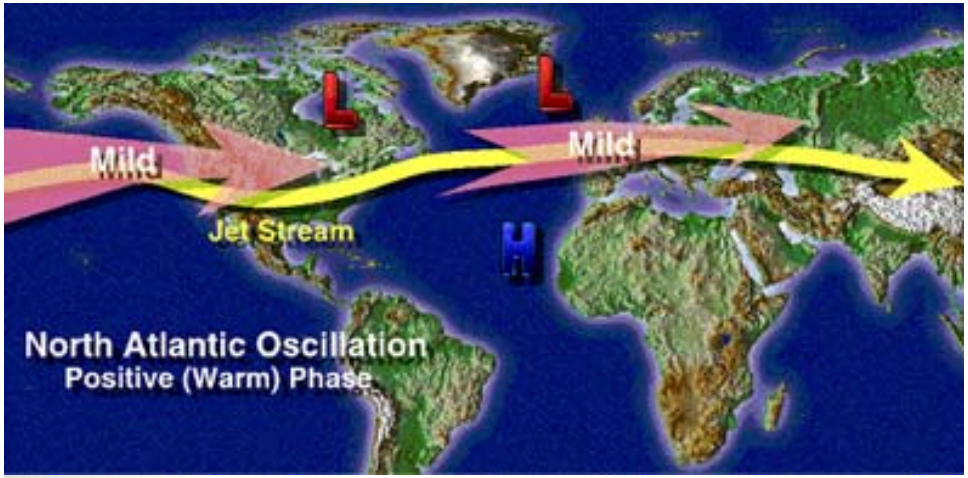
# 500mb height for 12Z 25 February 2007

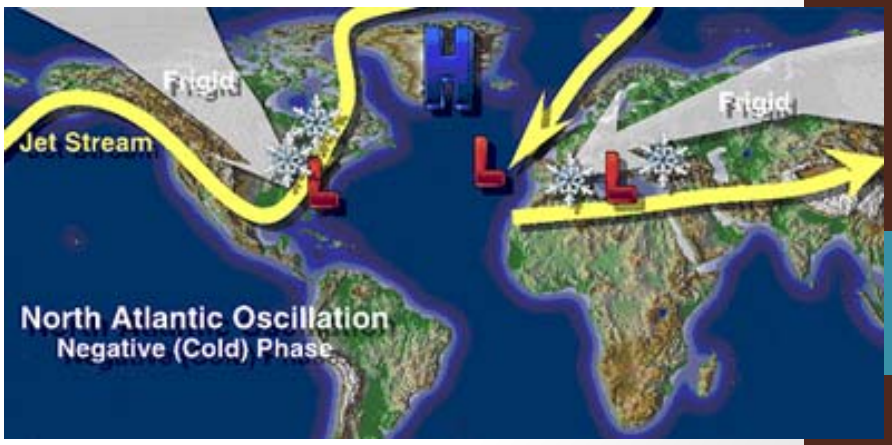


# Role of telconnections

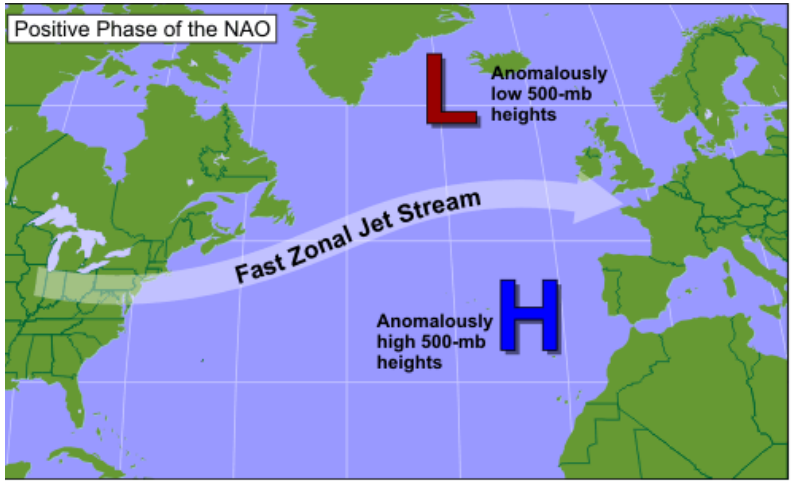
# North Atlantic Oscillation

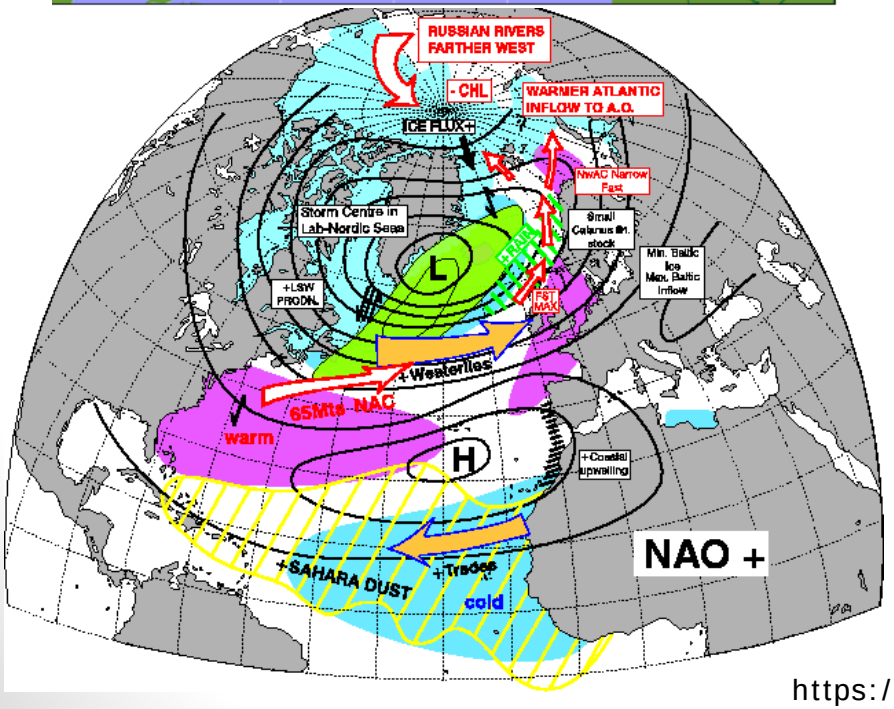


# NAO – positive phase

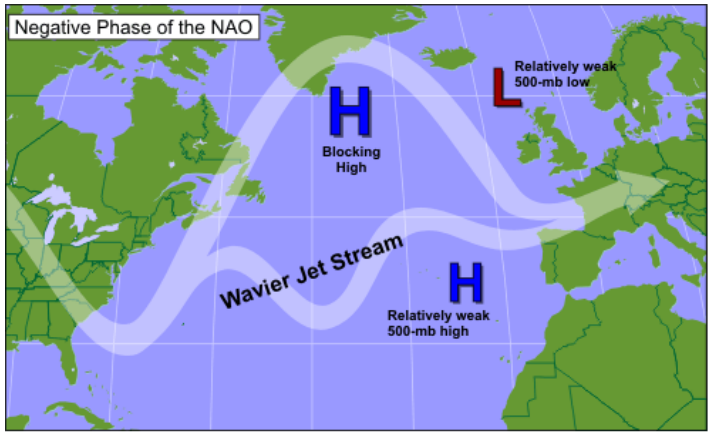


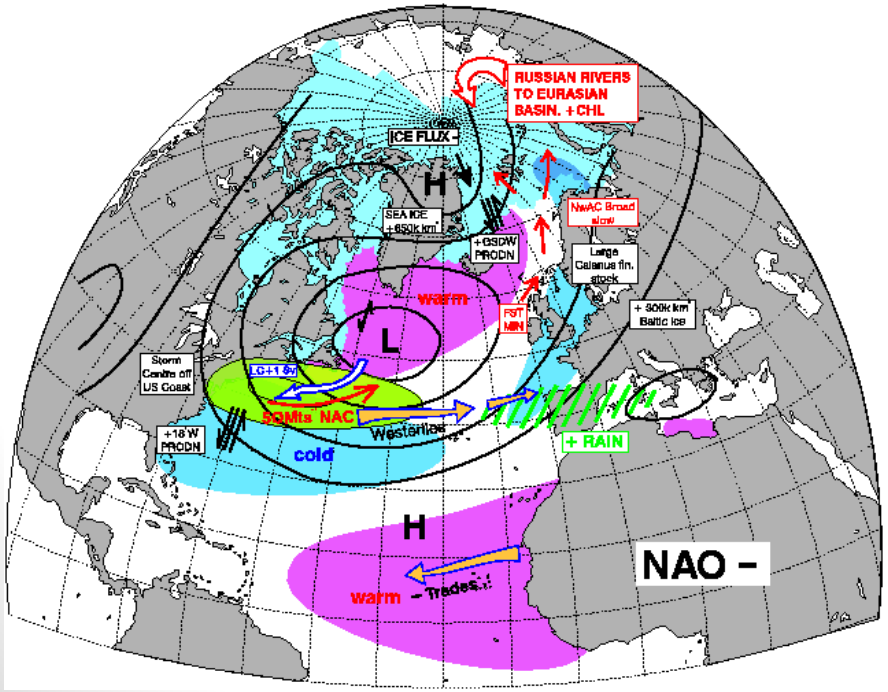




- very strong B-A high & deep Icelandic low
- high frequency of strong winter storms
- northerly track
- warm, wet Europe
- mild, wet eastern US

https://www.e-education.psu.edu/worldofweather/s15.html

# NAO – negative phase

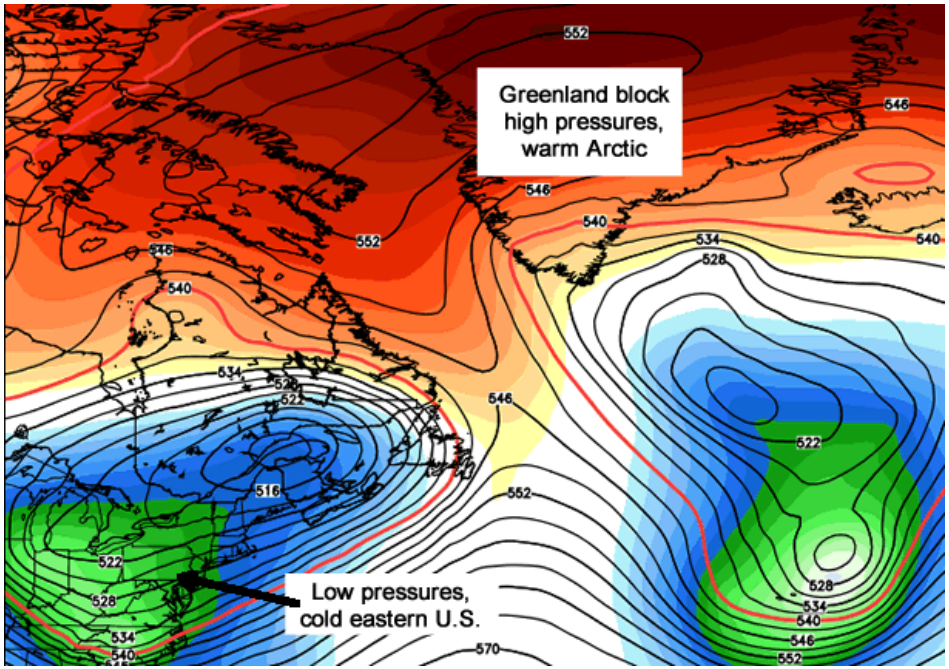


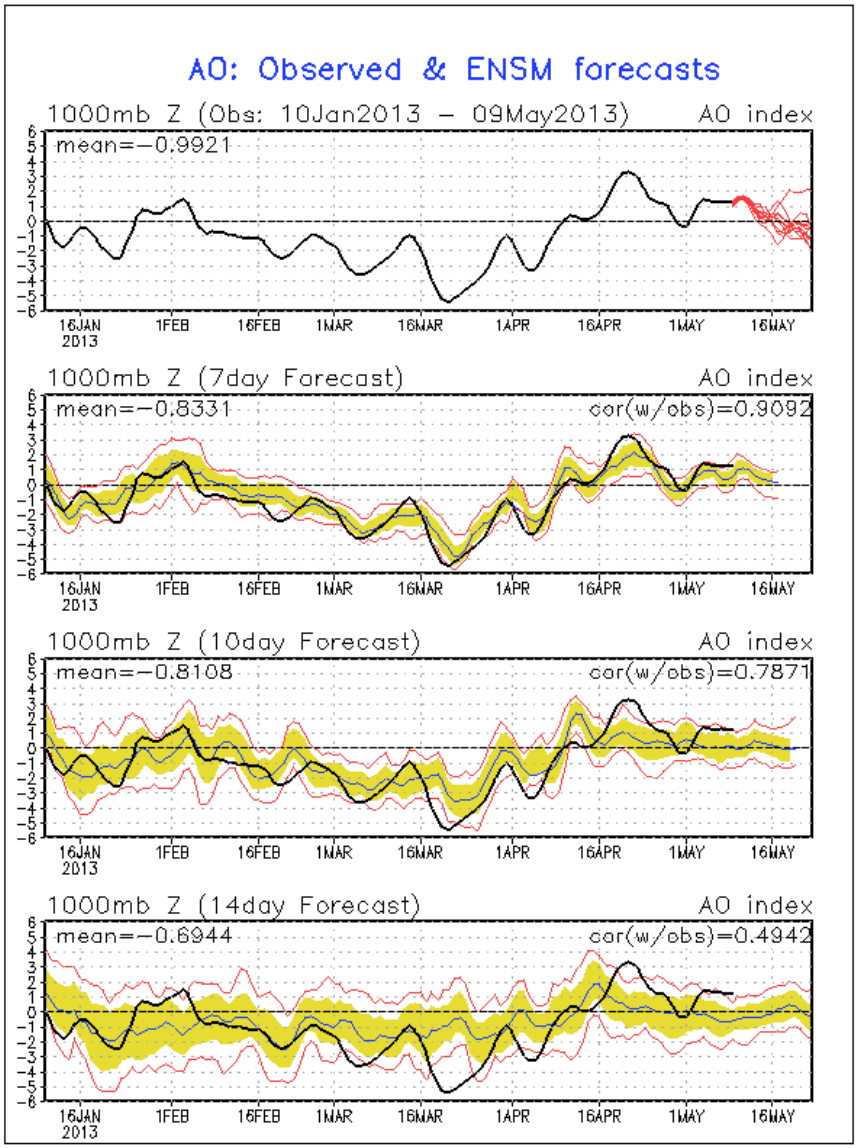

- weak high & low
- fewer, weak winter storms
- cold, snowy east coast
- cold in northern Europe

https://www.e-education.psu.edu/worldofweather/s15.html

# Blocking – March 2013

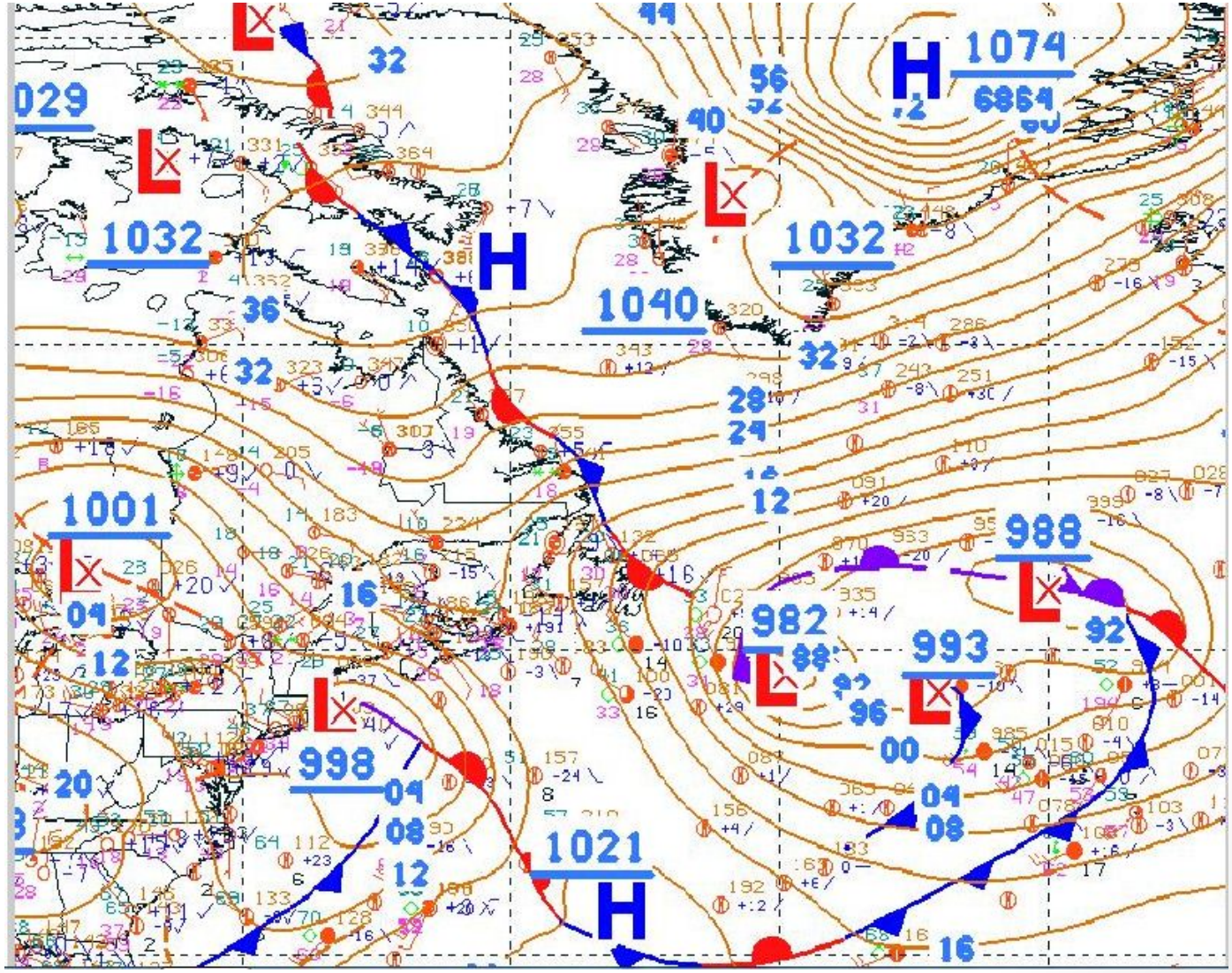



13 March, 2013

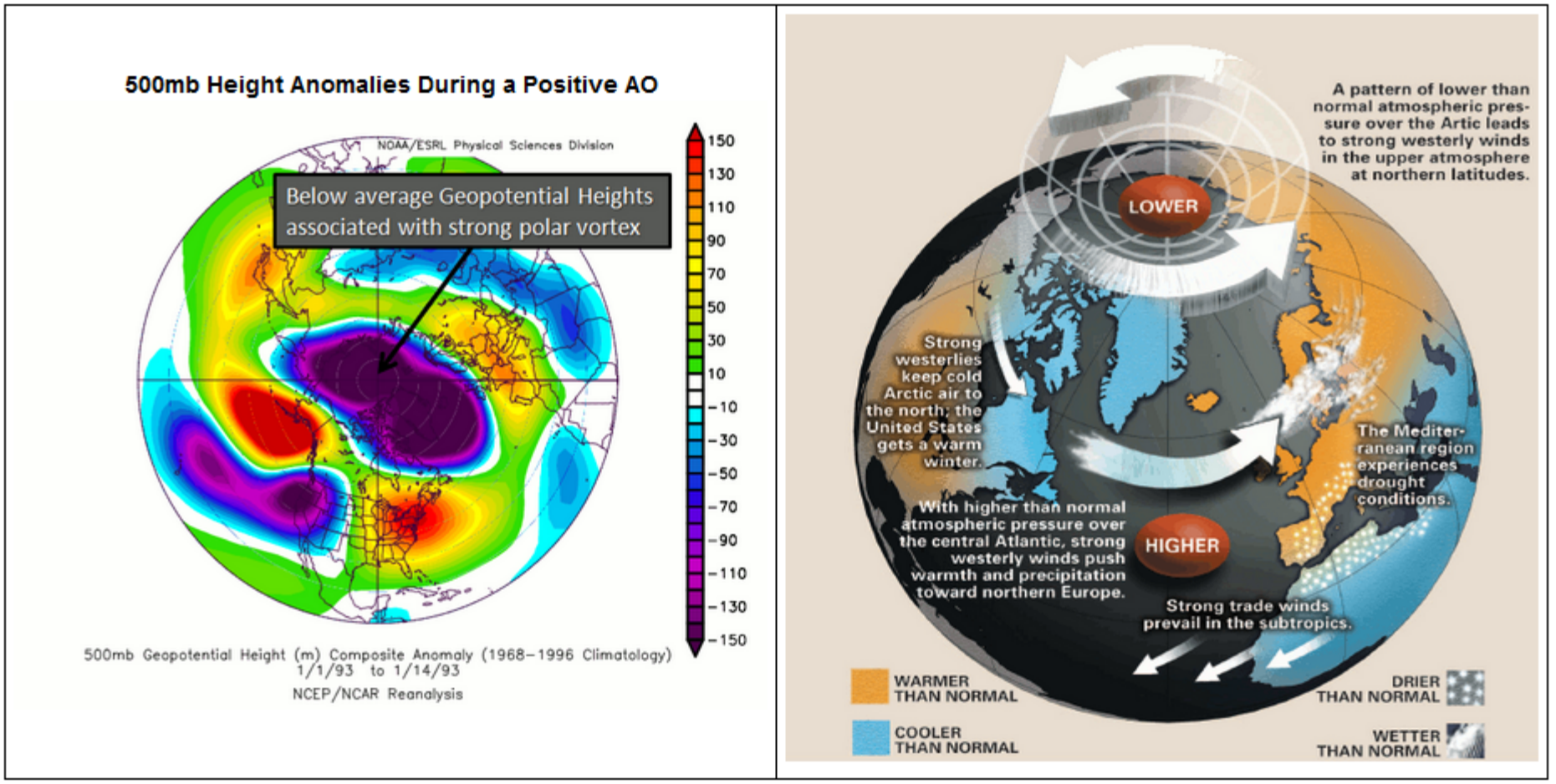



http://www.cpc.ncep.noaa.gov/products/precip/CWlink/daily_ao_index/ao.sprd2.gif

# Greenland block

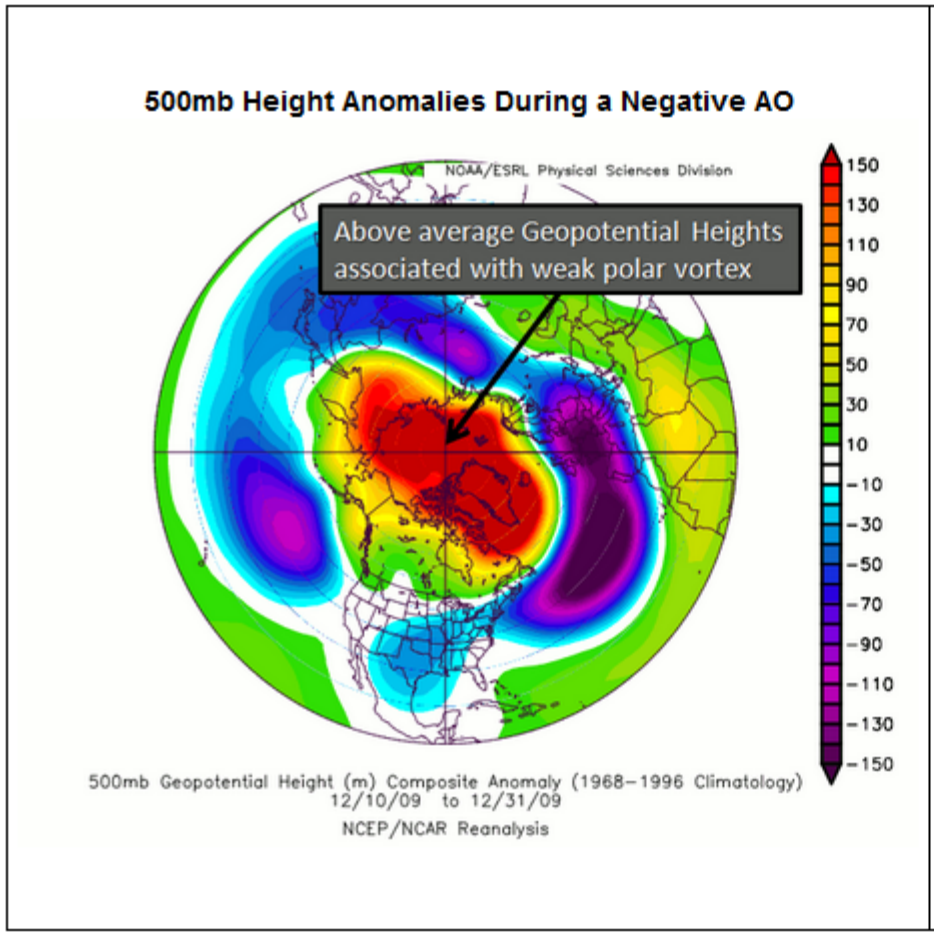


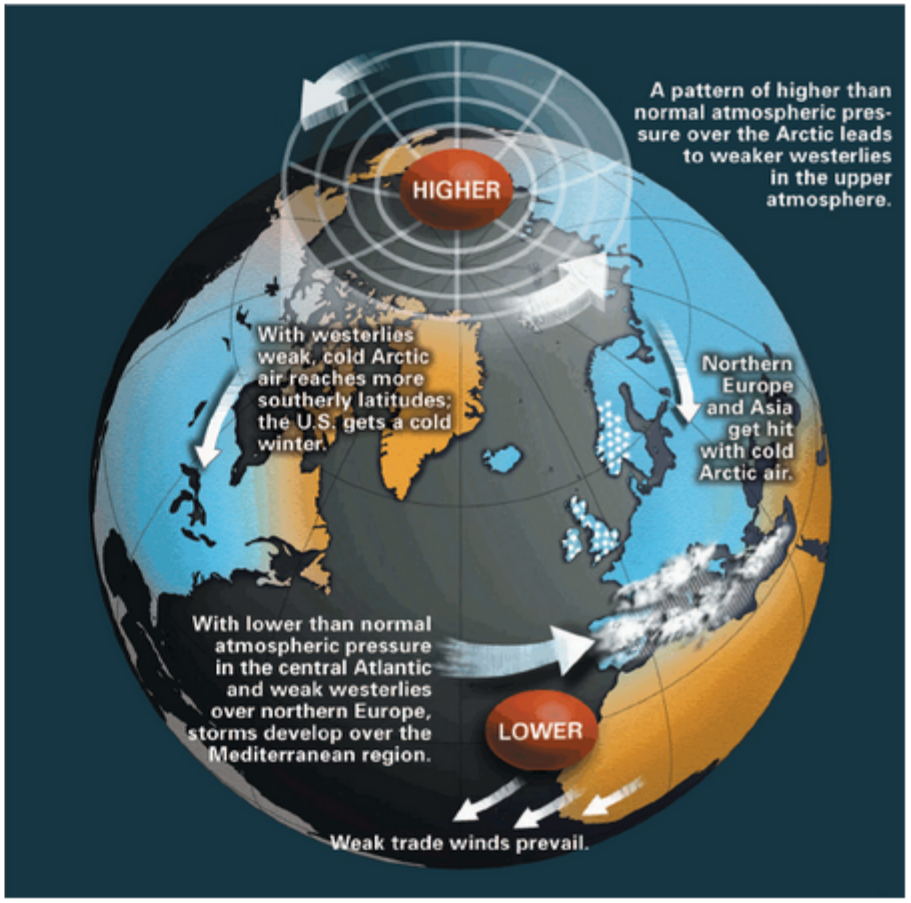
# Arctic Oscillation




http://www.nc-climate.ncsu.edu/climate/patterns/NAO.html

# Arctic Oscillation




Images in right column **From**: National Geographic Magazine, March 2000; **Sources**: Doug Martinson, Wieslaw Maslowski, David Thompson, and John M. Wallace

http://www.nc-climate.ncsu.edu/climate/patterns/NAO.html