Marine Weather Forecasting 101 – a refresher

PRESENTED BY THE AMERICAN SAILING ASSOCIATION AND PETER ISLER – WWW.ISLERSAILING.COM

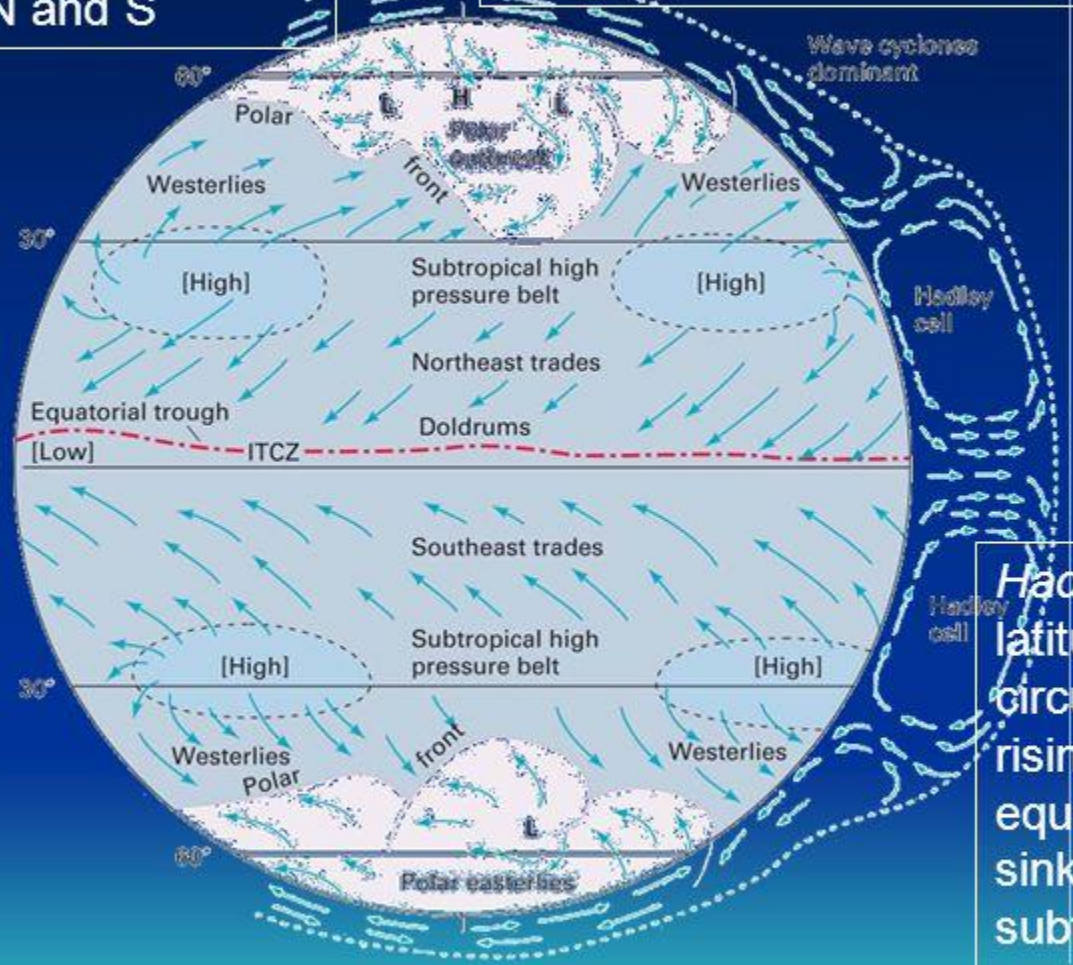
A Sailor's first rule:

Keep a "weather eye" out!

Global Wind and Pressure Patterns

Deserts: belts of persistent high atmospheric pressure centered at about lat. 30° N and S

Polar Front: front lying between cold polar air masses and warm tropical air masses



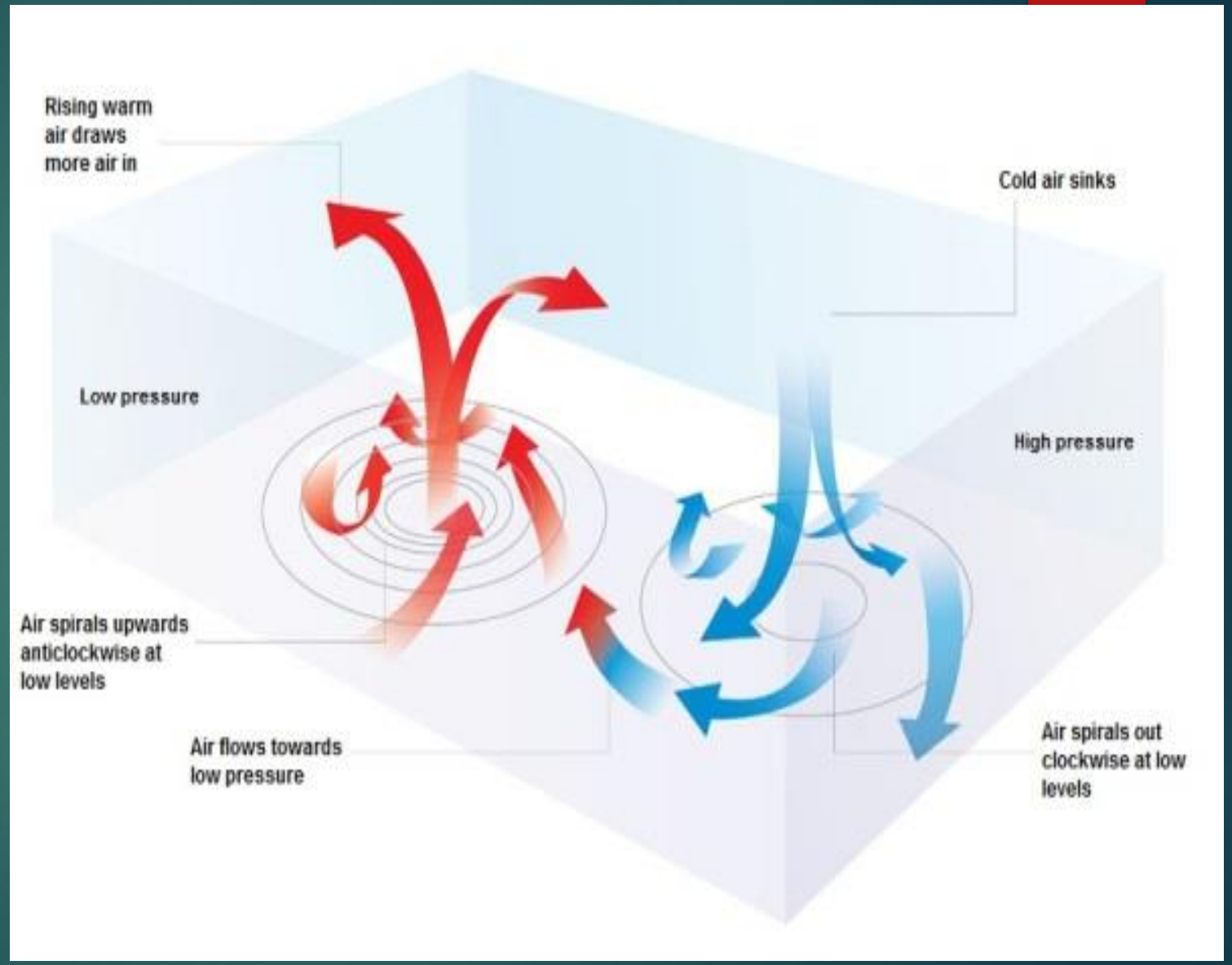
Intertropical Convergence Zone (ITCZ): Where convergence of air masses along the equatorial trough

Hadley Cell: low-latitude atmospheric circulation cell with rising air over the equatorial trough and sinking air over the subtropical high-pressure belts

Highs & Lows

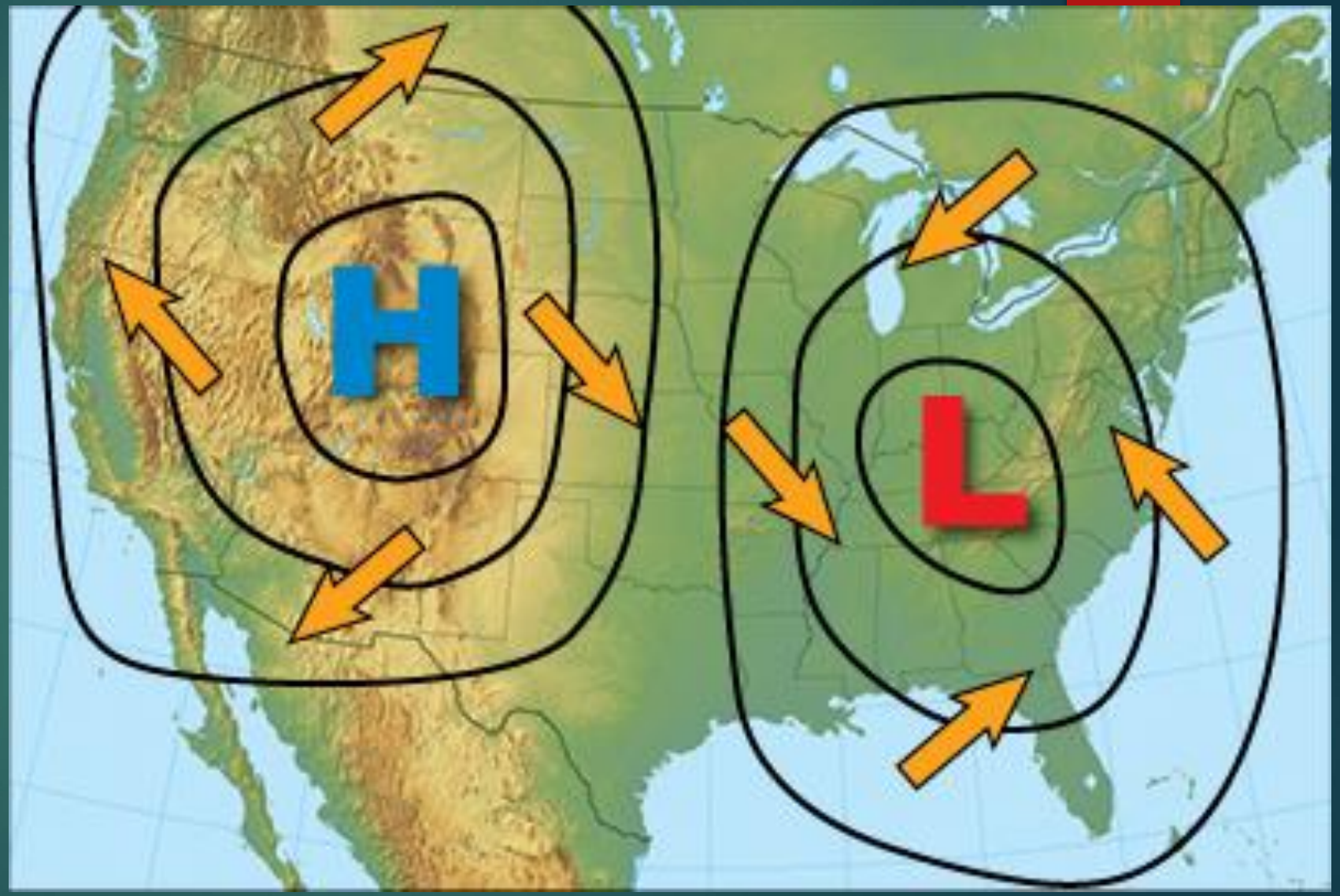
WINDS IN THE NORTHERN HEMISPHERE

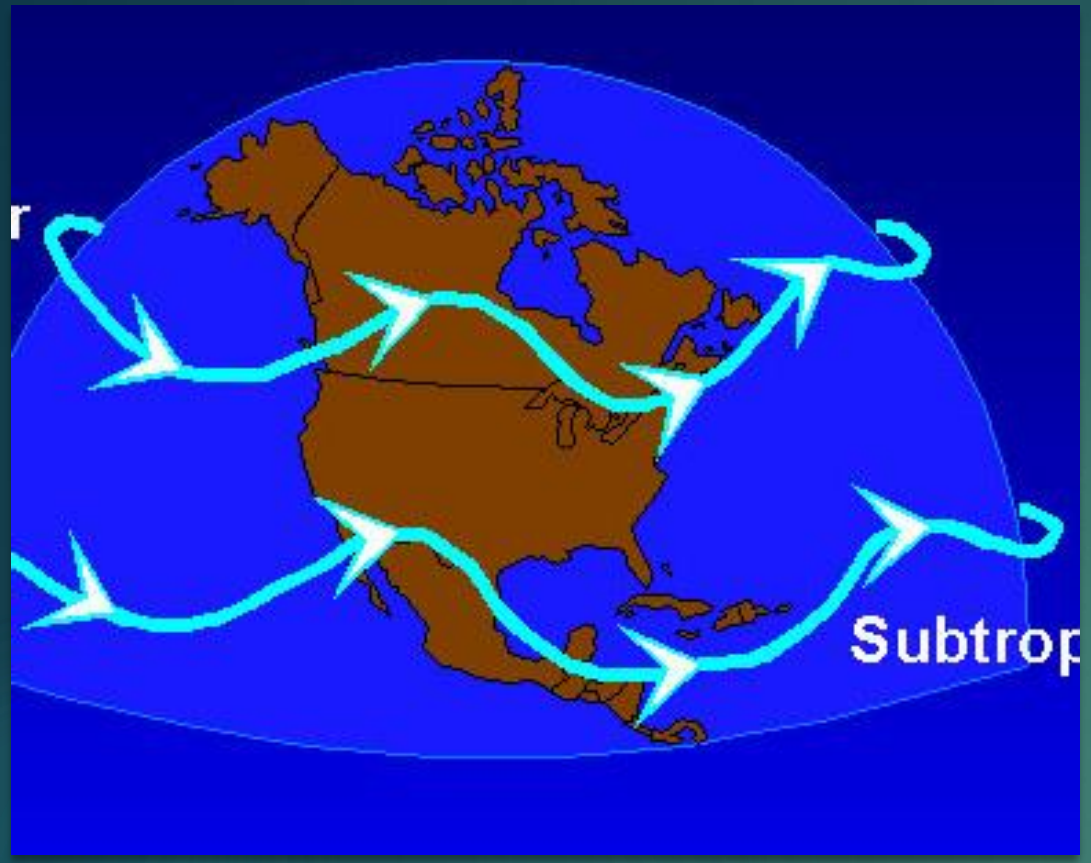
- **Clockwise around Highs**
- **CCW around Lows**

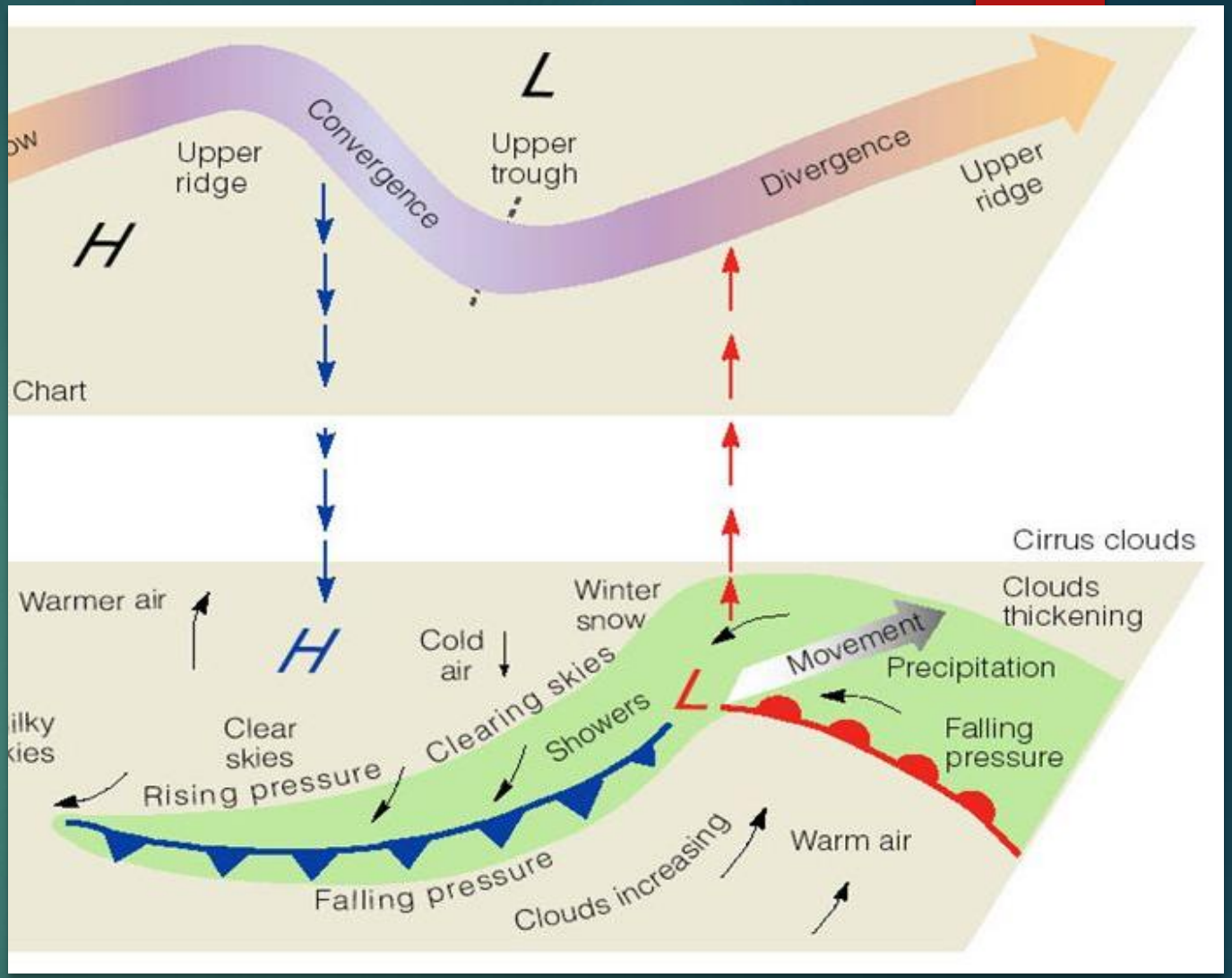


Isobars - lines of constant pressure

- Windspeed is a function of isobar spacing and curvature.



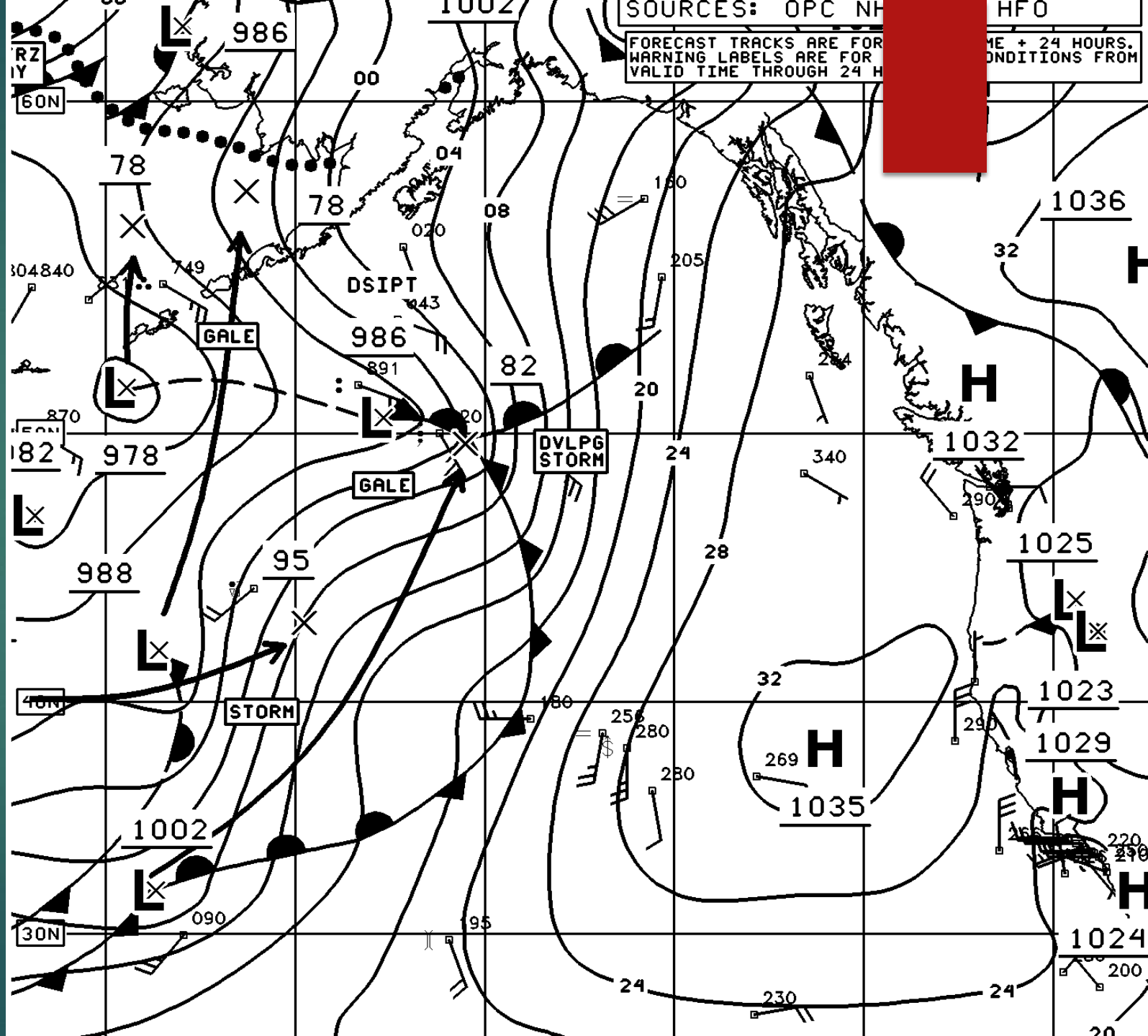




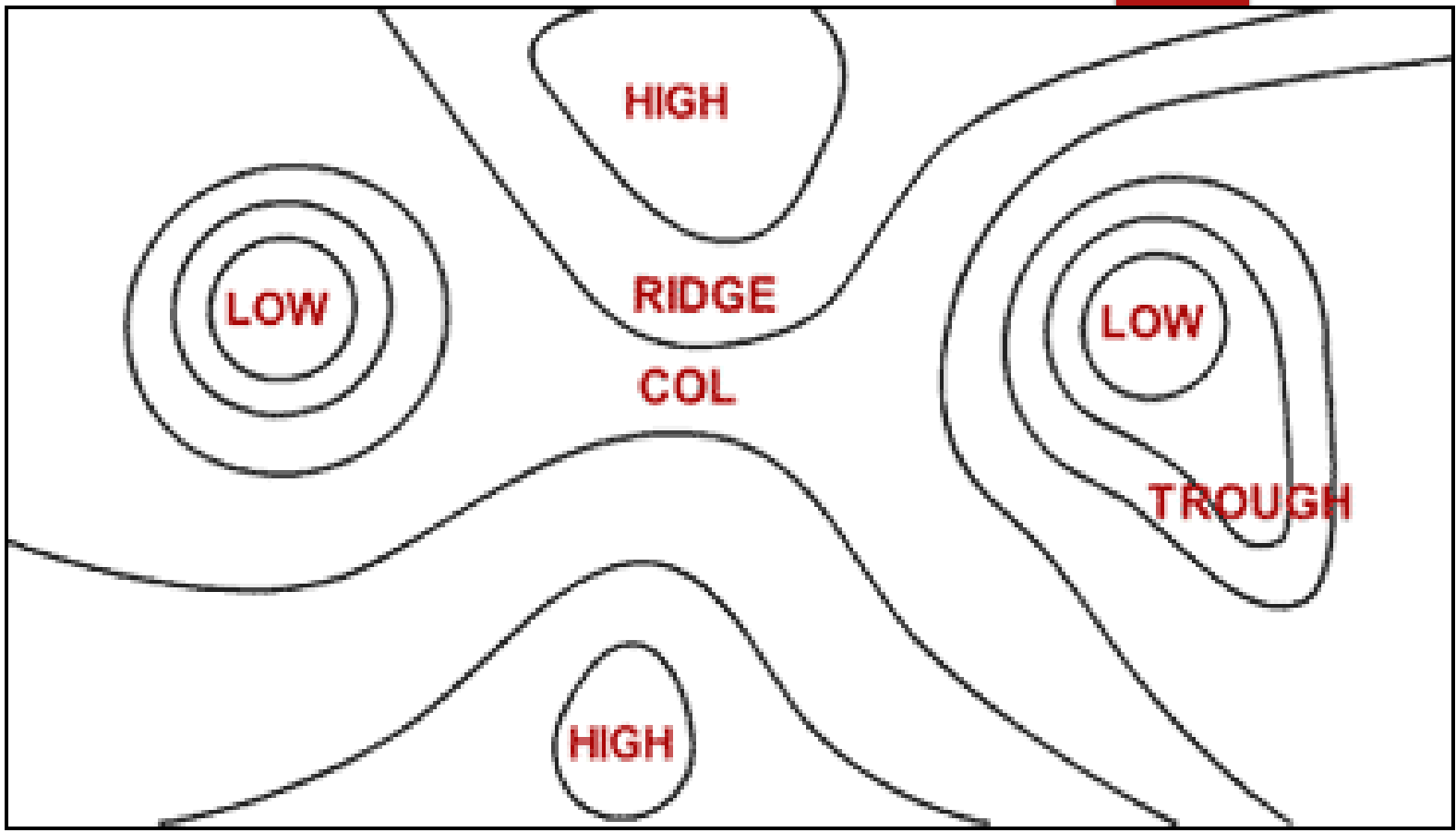
Upper Atmosphere & Jet Streams

Highs & Lows

- Arrows fly with the wind, feathers towards L. Short feather 5k, long 10k, triangle 50k.
- Fronts, cold: triangles, warm: circles
- Windspeed is a function of isobar spacing and curvature.
- X shows Low position 24 hours before/after valid time. Circled X for Highs.



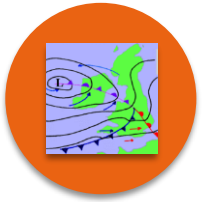
Ridges & Troughs



Low Pressure System

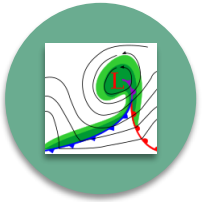
- **Air in a low pressure area rises**
- **As the air rises, it cools, reaches its dew point, and clouds form**
- Low pressure systems often occur near the boundary between warm and cold air masses
- **Causes rainy conditions**
- **Counter-clockwise motion**
- **Remember Low pressure means Lousy weather**

Know your Lows



Mid-Latitude Lows

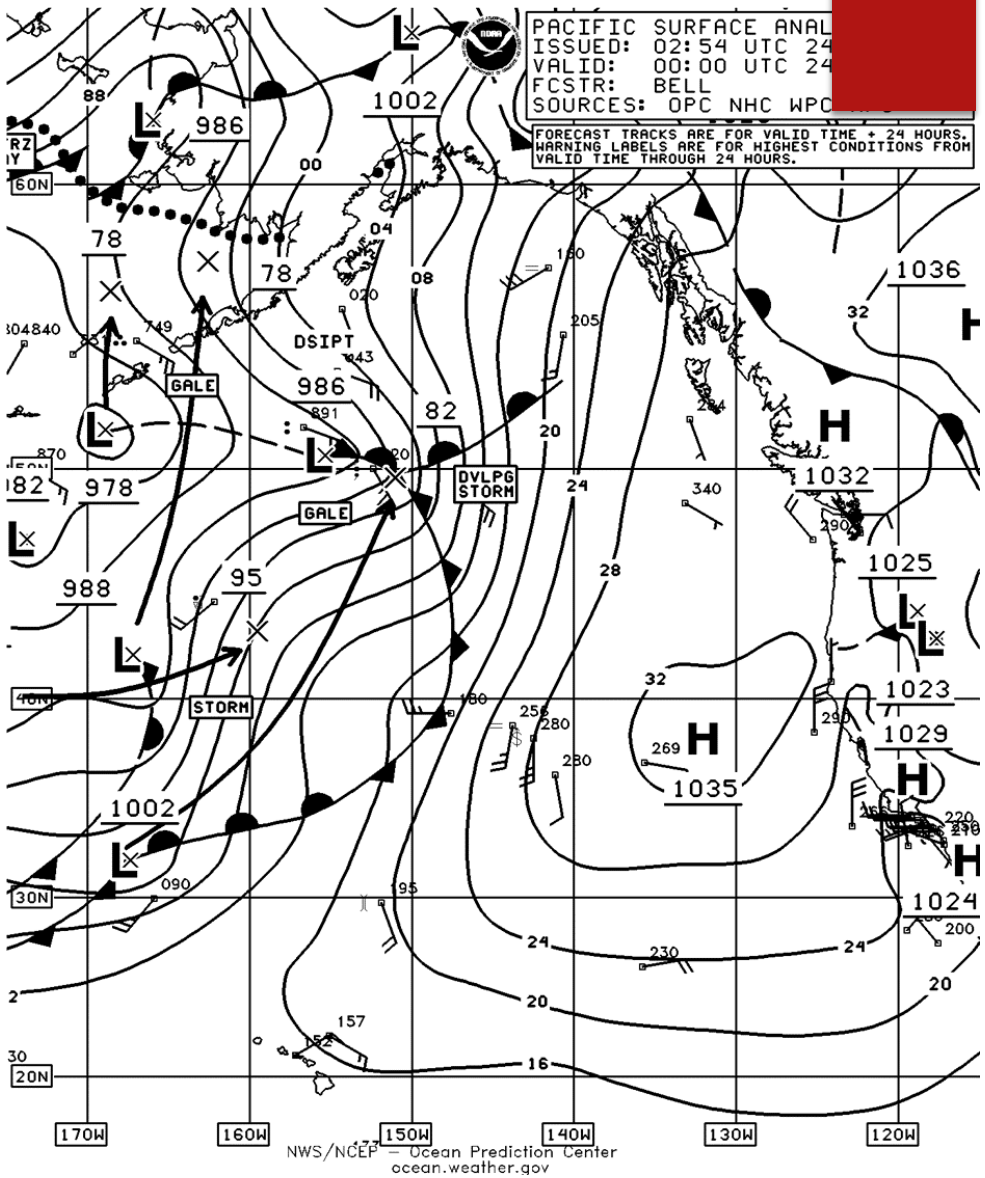
Tropical Lows



“Cutoff” Lows

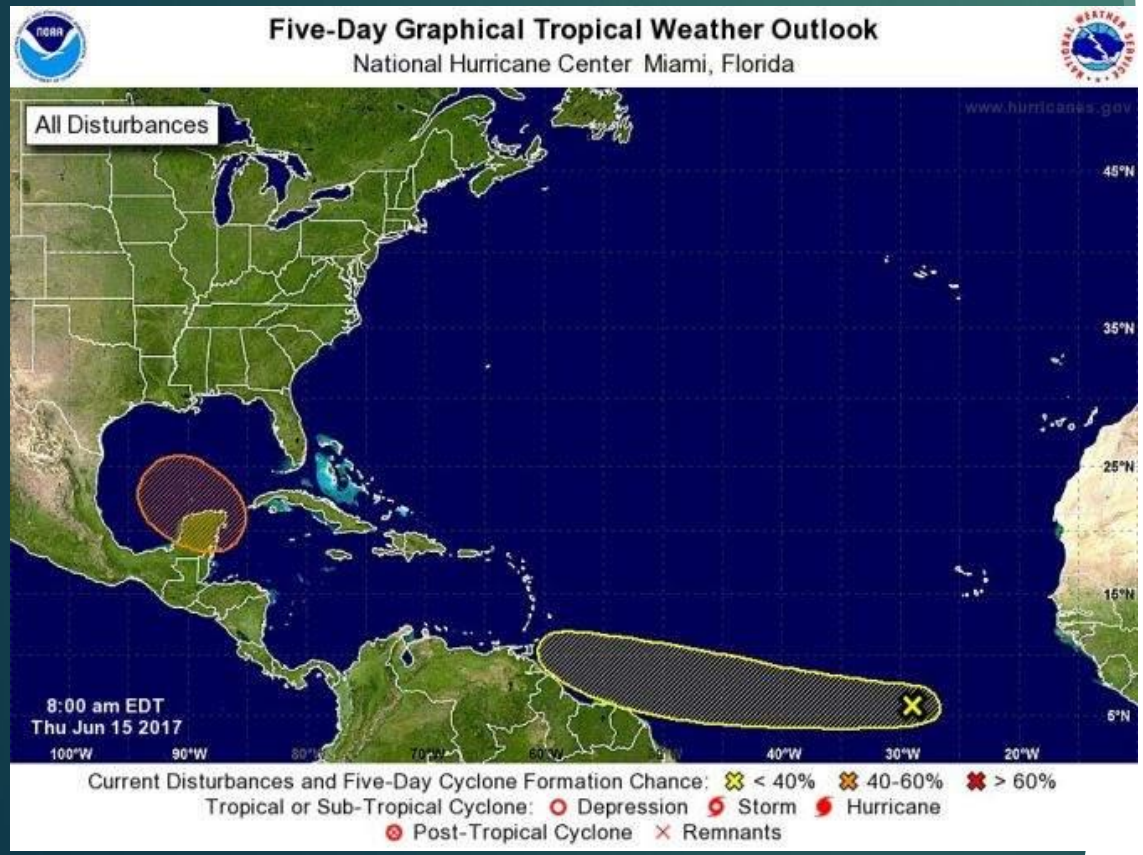
Mid Latitude Lows

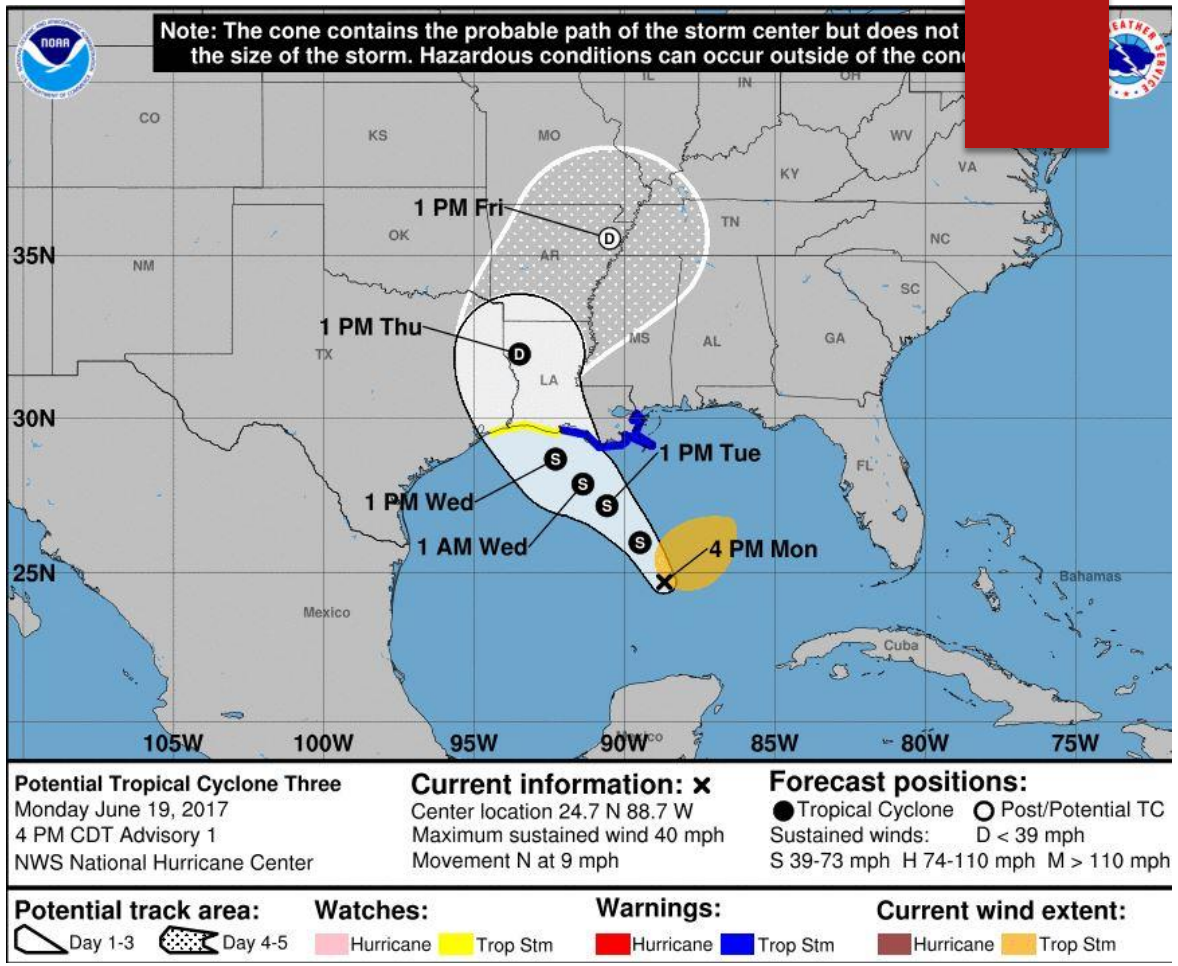
- Our familiar wintertime lows. Move West to East in Westerly flow at half the speed of the 500mb wind. Attached to fronts.



Tropical Lows

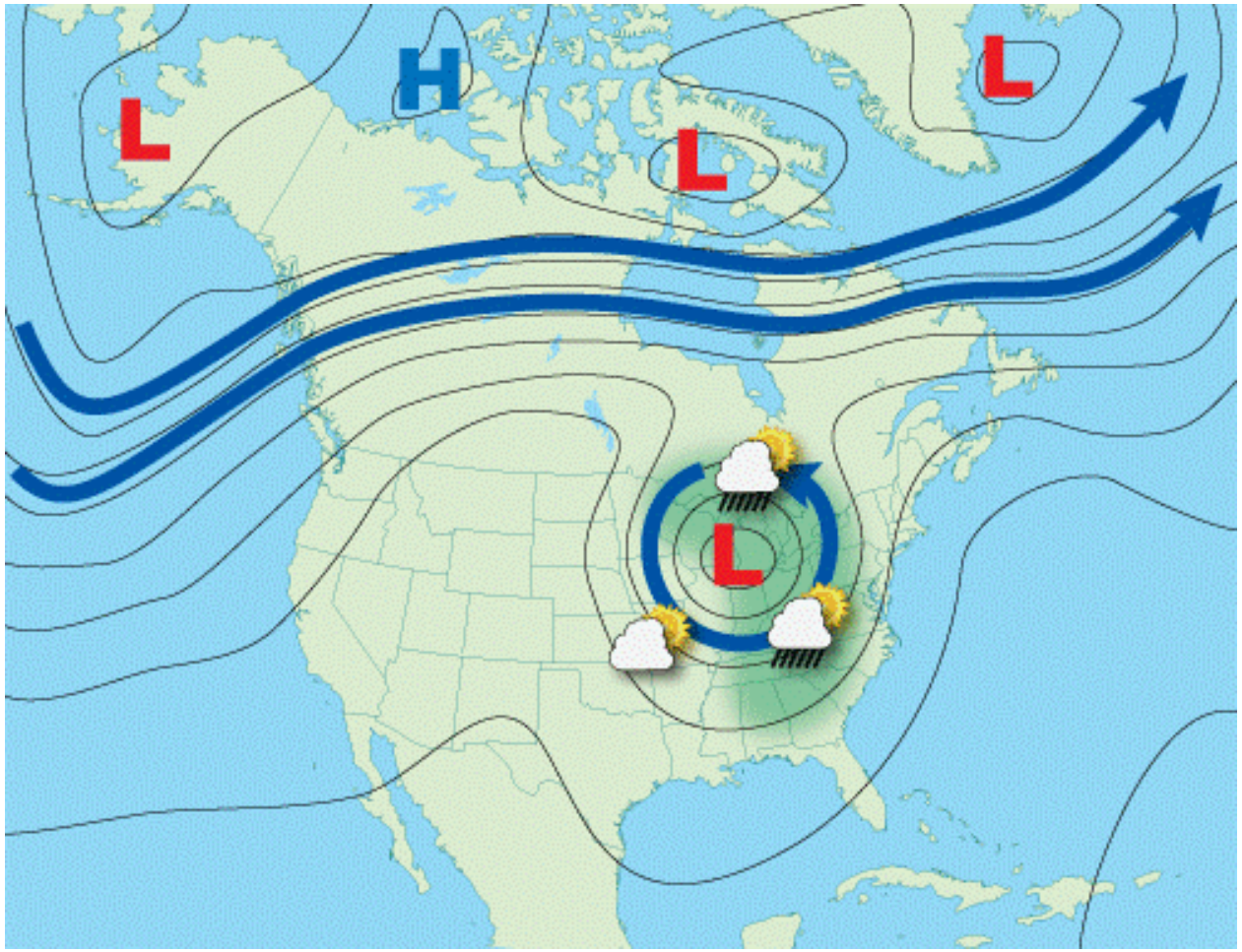
Traditional tropical storms embedded in trade winds. Move broadly with trade wind direction but difficult to predict movement. AKA tropical depression, tropical cyclone, hurricane, or typhoon. If weak sometimes just "inverted troughs".





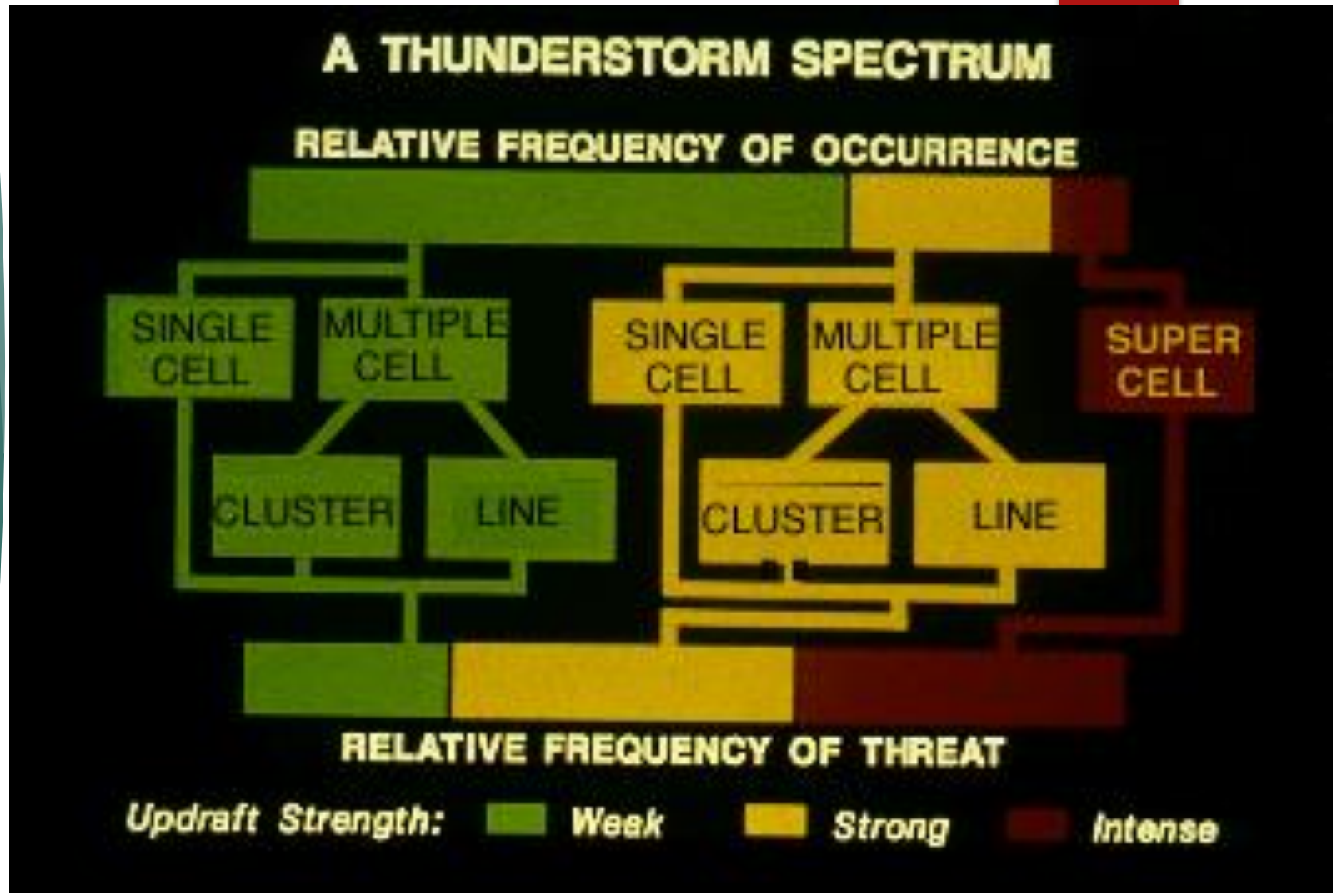
Cutoff Lows

- Cutoff lows are cut off from Westerly (mid-latitude jetstream) and Easterly (tradewind) flow, often nearly stationary, hard to predict movement or longevity. They can sit and spin for days.
- Extremely dangerous in some cases. Halloween Storm '91 (Perfect Storm), Fastnet '79, Hobart '98 were all cutoff lows.
- Danger signs are tight core, rapid pressure drop, significant temperature gradient on polar side, comma shape, fast jet stream over top, nearby tropical energy.



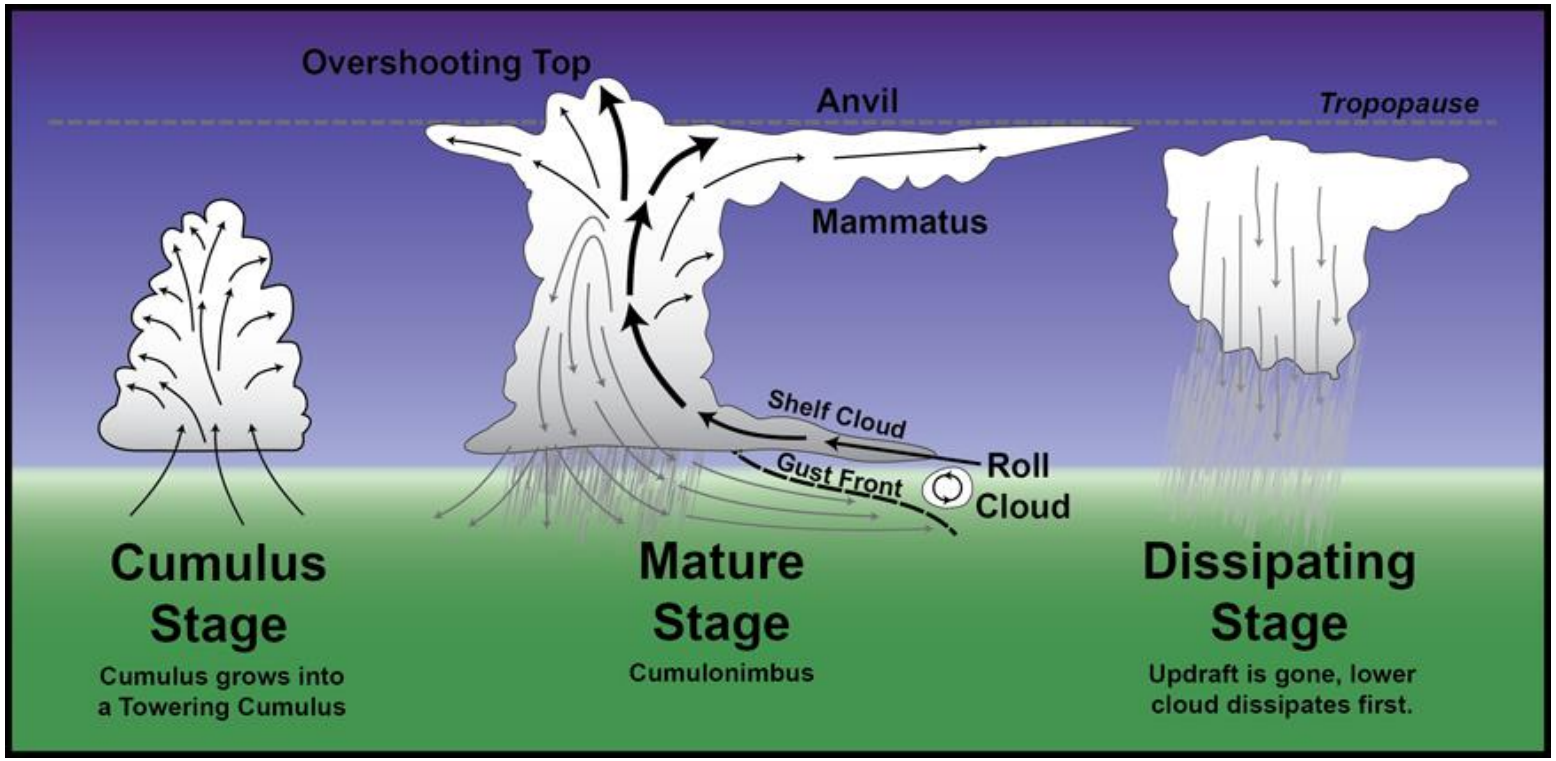
Thunderstorms: four types

- **Single Cell**
- **Multicell**
- **Squall Lines**
- **Supercell**



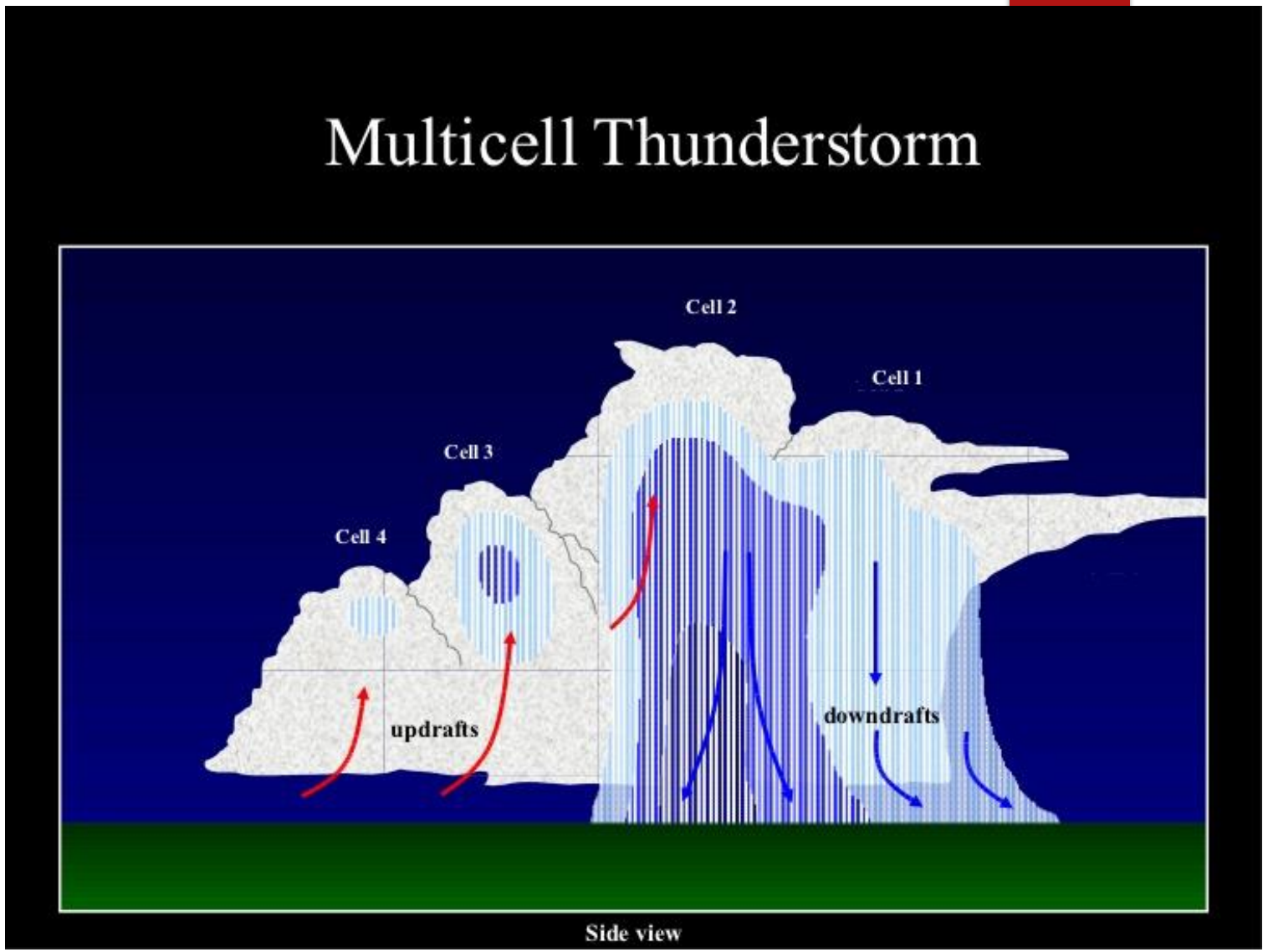
Single Cell Thunderstorm

- ▶Most common
- ▶Small – may not show up on weather chart
- ▶Typically last 20-30 mins
- ▶"Pulse storms" can produce severe weather: hail, downbursts, heavy rainfall & weak twisters



Multicell Cluster and Line Thunderstorms

- A group of cells moving as a single unit, each at a different stage in life cycle
- Can produce moderate hail size, flash floods and weak tornados
- Multicell Line Storms similar, but feature a well developed gust front/leading edge. AKA "squall line"
- "Pulse storms" can produce severe weather: hail, downbursts, heavy rainfall & weak twisters

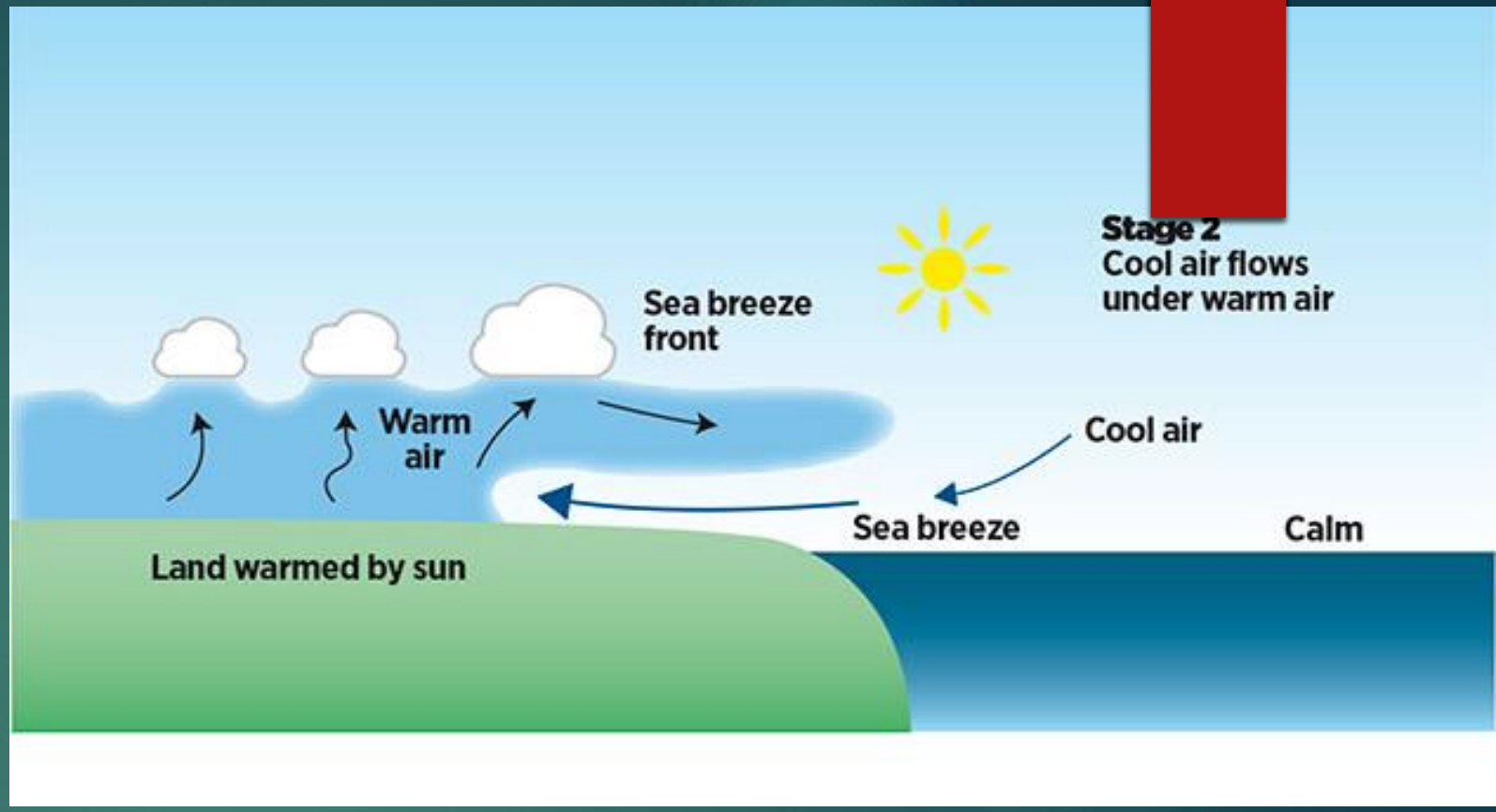


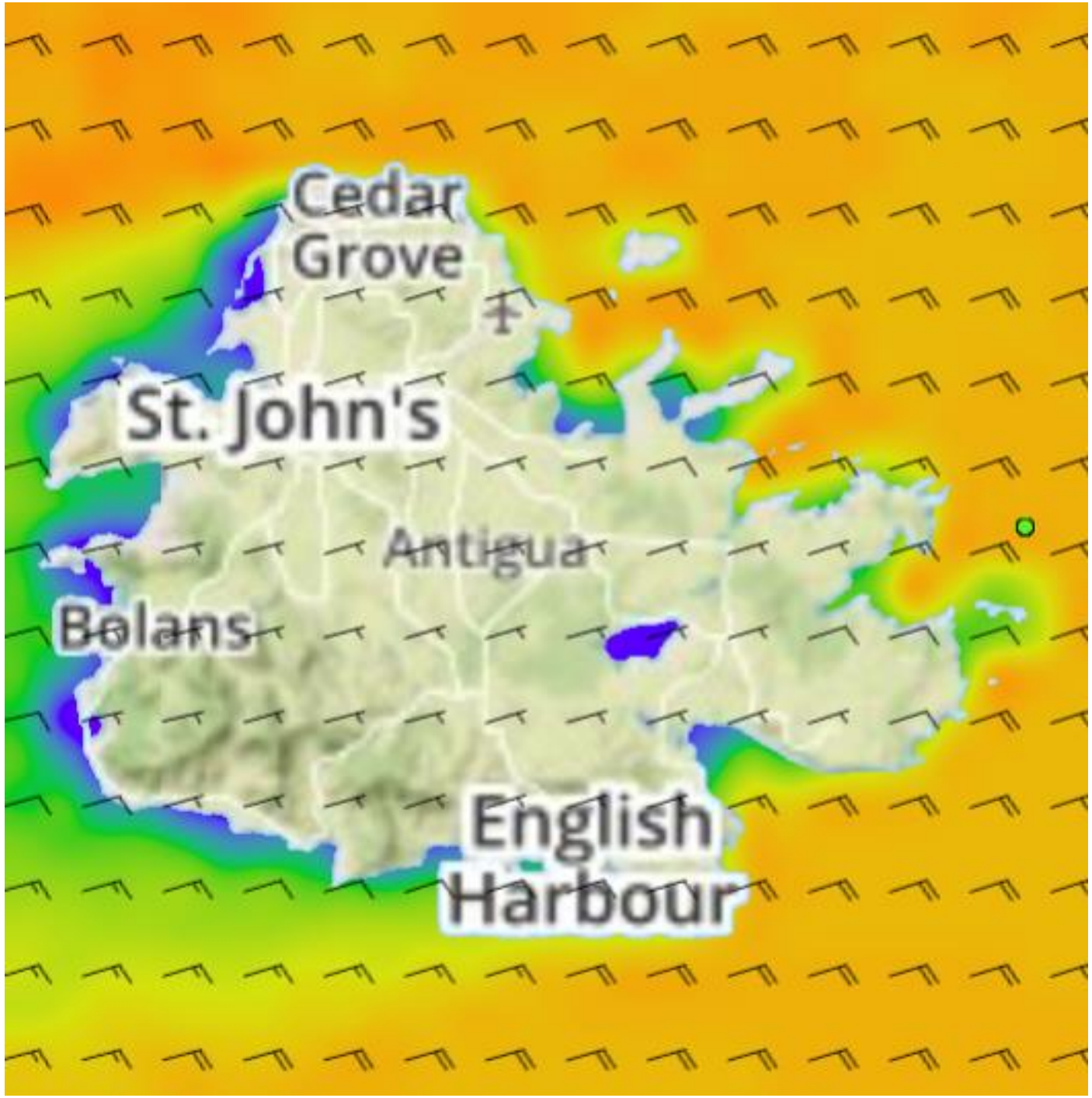
Supercell Thunderstorms

- A thunderstorm with a rotating updraft.
- Can produce strong downbursts, large hail and tornados

Local Thermal Winds

SEABREEZES & LAND BREEZES





Local Geographic Effects to Wind

Warning Signals

	SMALL CRAFT	GALE	STORM	HURRICANE
DAYTIME SIGNALS				
NIGHT LIGHT SIGNALS				
WIND SPEED (KNOTS)	0 - 33	34 - 47	48 - UP	64 - UP

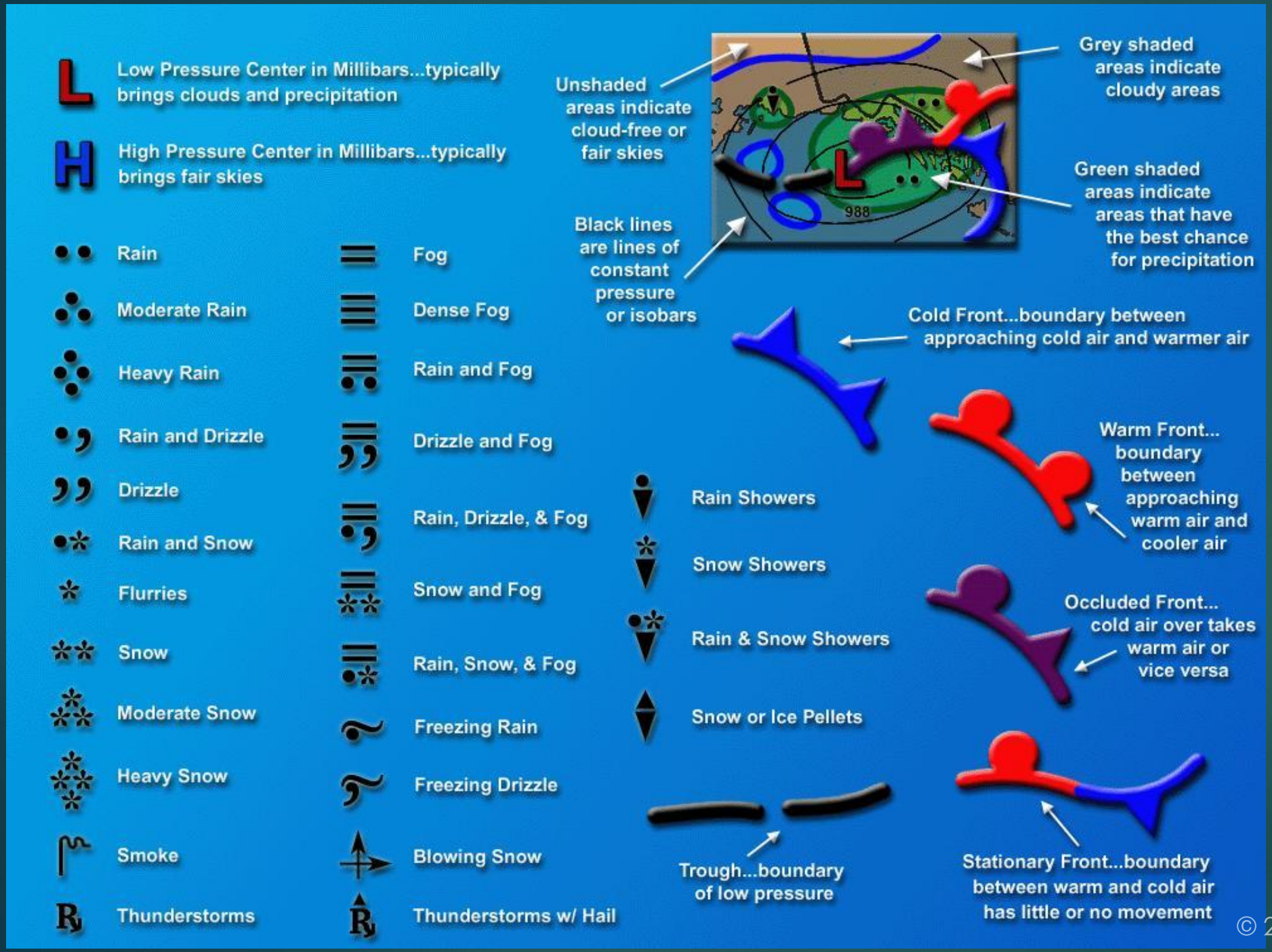
10.2 US terms and definitions and their exact meaning

http://www.weather.gov/om/marine/faq.htm

- **SMALL CRAFT ADVISORY:** Refers to areas within the coastal waters with sustained winds of 18 knots to 33 knots (21-38 mph).
- **GALE WARNING:** A warning of sustained surface winds, or frequent gusts, in the range of 34 knots to 47 knots (39-54 mph) inclusive, either predicted or occurring.
- **STORM WARNING:** A warning of sustained surface winds, or frequent gusts, in the range of 48 knots to 63 knots (55-73 mph) inclusive, either predicted or occurring.
- **HURRICANE FORCE WIND WARNING:** A warning for sustained winds, or frequent gusts, of 64 knots (74 mph) or greater, either predicted or occurring.
- **TROPICAL STORM WARNING:** A warning for sustained surface winds, associated with a tropical cyclone, within the range of 34 to 63 knots (39 to 73 mph), expected in a specified coastal area within 24 hours.
- **HURRICANE WARNING:** A warning for sustained surface winds of 64 knots (74 mph) or higher associated with a hurricane are expected in a specified coastal area within 24 hours or less. A hurricane or typhoon warning can remain in effect when dangerously high water or a combination of dangerously high water and exceptionally high waves continue even though winds may be less than hurricane force.

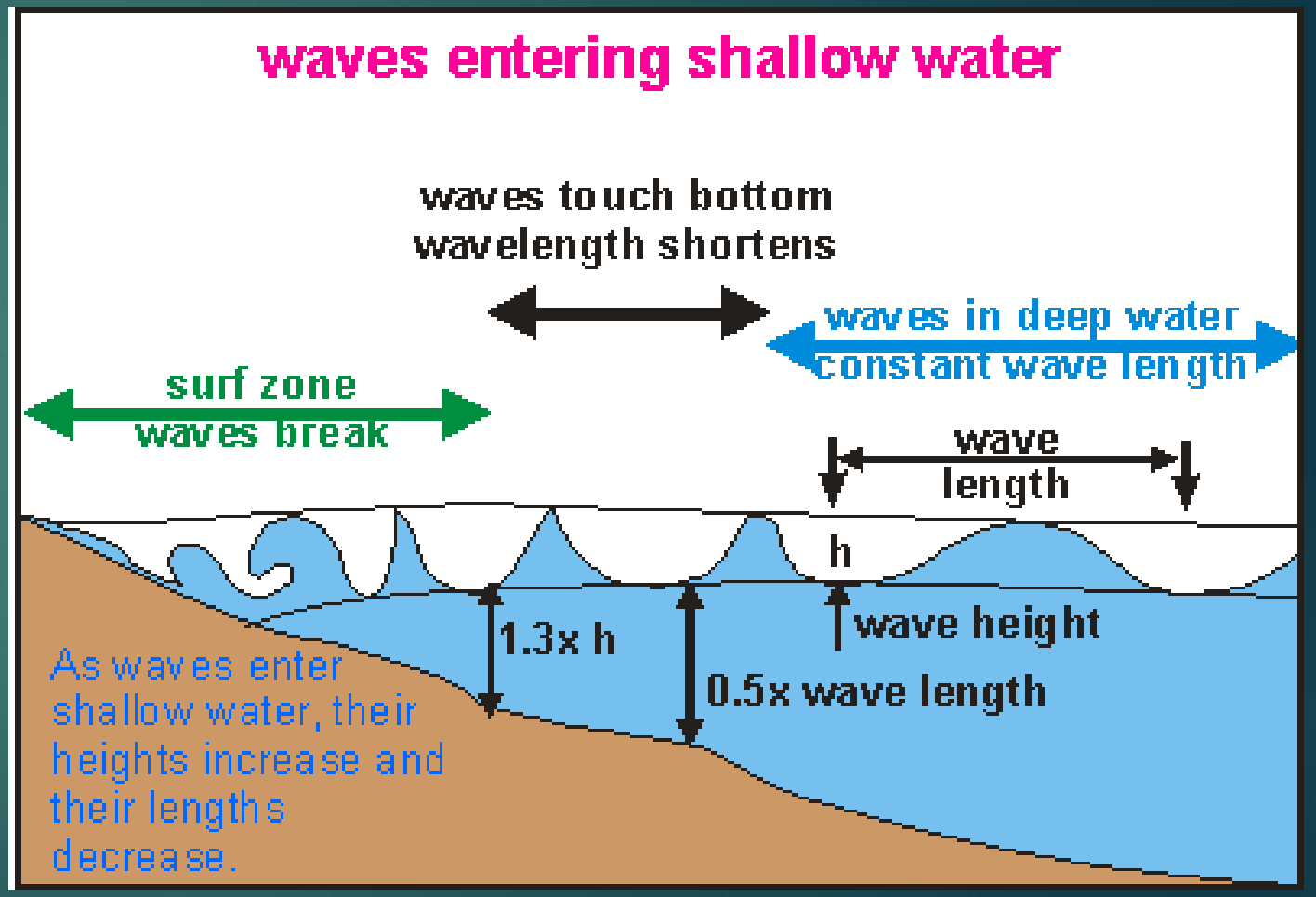
http://www.opc.ncep.noaa.gov/product_description/keyterm.shtml

WX Map Symbols



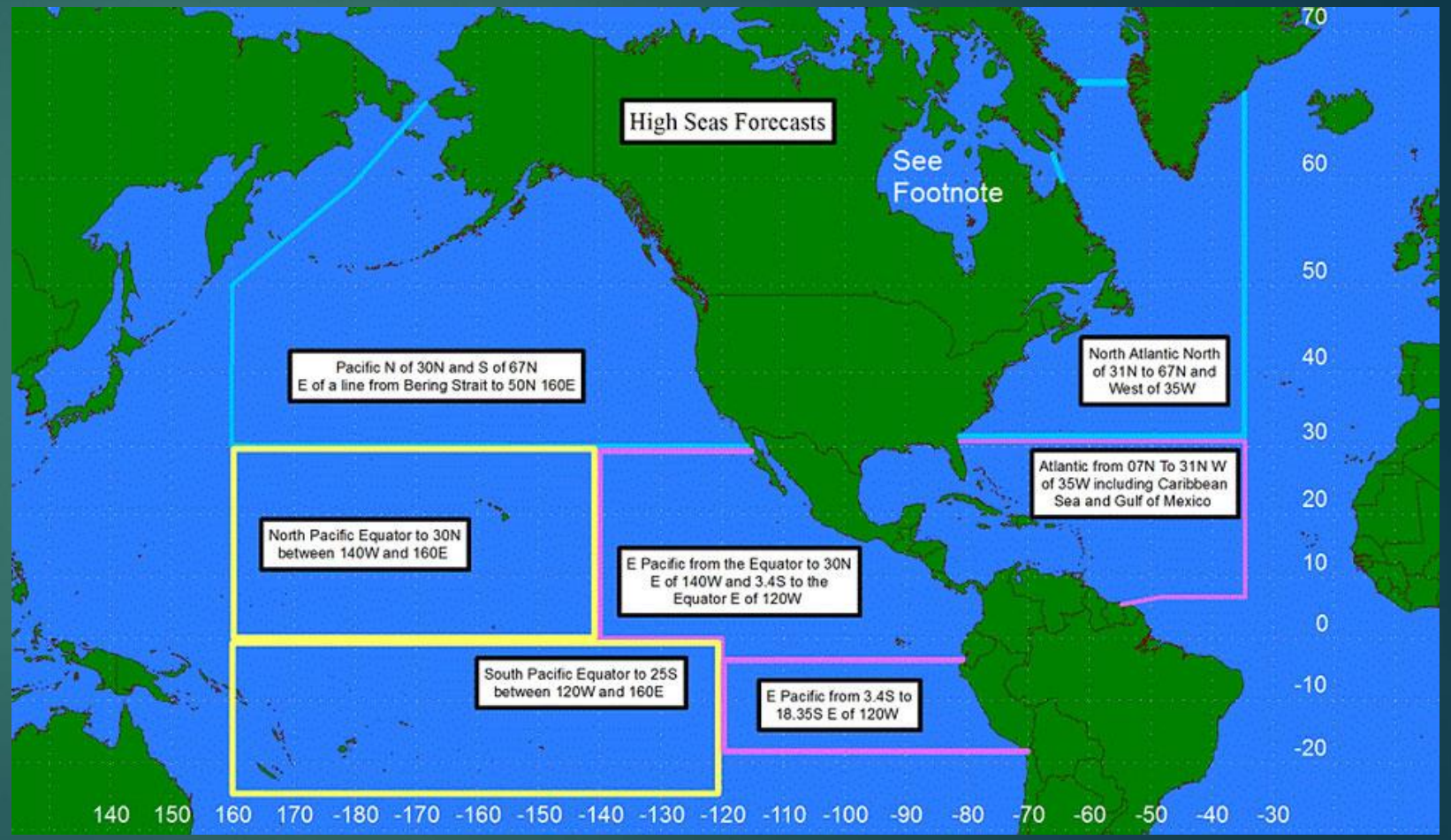
Waves

- Wave/Swell size & speed a function of Wind Speed, Fetch and Duration water depth, other waves (reflection & refraction), current, bottom contour
- Characteristics: Height, wave length, period and steepness.
- "Significant Wave height" (forecasted): Average of 1/3 the highest waves in wave spectrum.
- Deep water waves break when height > 1/7 wavelength
- Safe depth for 15' swell & 7 foot wind wave = 2.5 x (Swell + wind wave) > 55'



Sources for Wx Information:

- **NOAA**
  - High Seas
  - Offshore
  - Coastal
- US Navy
- Academic & Private Sources
- Other national (and Euro) wx services
- Other boaters
- Your own eyes & barometer



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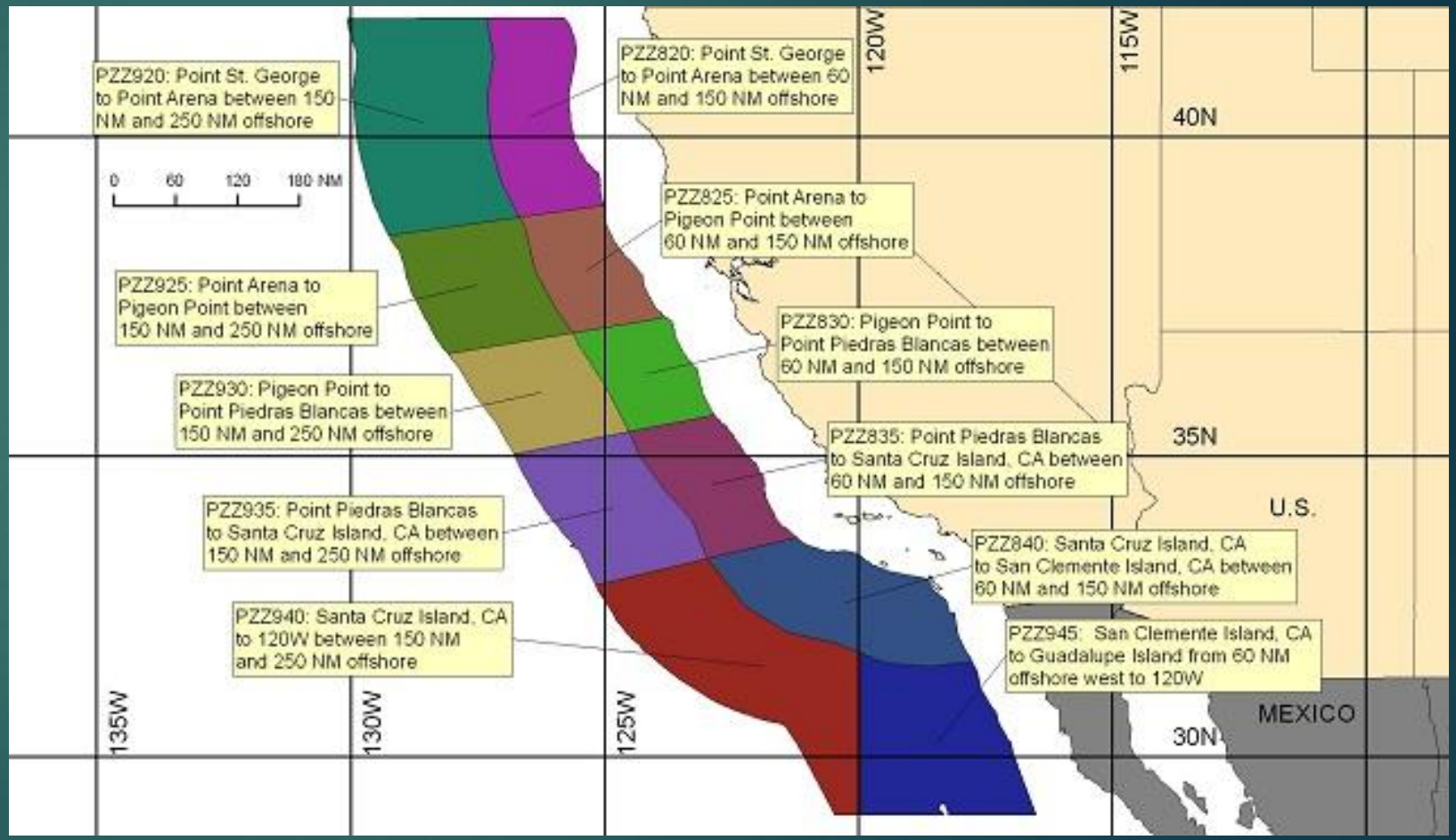

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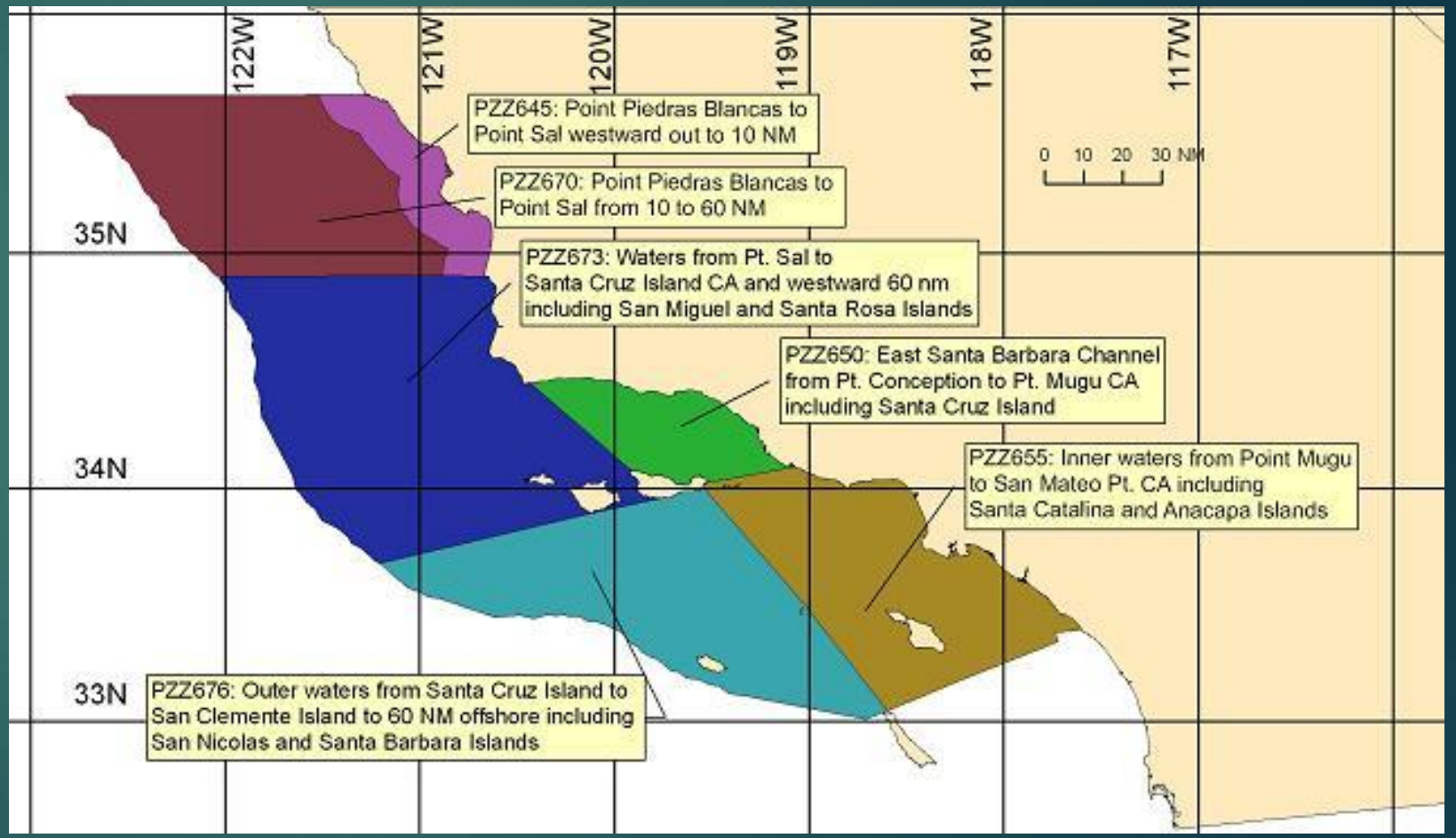

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Marine Weather Endorsement

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ASA 119, Marine Weather Endorsement

Able to observe and forecast weather conditions using traditional maritime skills and
Knowledge of weather information for planning and adapting navigation during short
extended voyages.

KNOWLEDGE

Basic Concepts

1. Describe the role of marine weather in boating plans, particularly wind forecasting.
2. Describe the relationship of temperature, precipitation, visibility, wind, and waves and their impact on forecasting.
3. Describe wind terminology and units used in speed, distances, temperatures and pressures.
4. Utilize data from the Ocean Prediction Center, National Data Buoy Center, and Marine National Weather Service (NWS) Charts.

Marine Weather in the Smartphone Era

Sponsored by SailFlow - Weather Where You Sail

An overview of marine weather and how important it is for sailors to learn the basics. Plus, the tools (smartphone apps, online weather sources, etc.) and techniques that any sailor can use in preparation and during the sail to stay abreast of any changes.

TO SIGN UP FOR THIS WEBINAR OR OTHERS GO TO: asa.com/webinars

This 1-hour webinar is suitable for all levels of sailors wishing to gain a better understanding of the weather's effect on sailing conditions, basic weather forecasting, and becoming a safer sailor through having a deeper knowledge of weather conditions.

What we'll cover in this webinar...

Preparing For Your Sail

– Smartphone app & online sources of weather information.

– Steps to understanding the weather for the day/passage.

Staying Up To Date During Your Sail

– Tools for staying current as the weather changes.

Presented by Peter Isler

with special guest David Burch

Peter Isler is 2x America's Cup winner, and a best selling author. His world class sailing experiences around the world have made him an expert on many topics including weather.

THANK YOU!

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- SAILFLOW

The End