NATIONAL COACHING SYMPOSIUM 2018

US SAILING

Delete Your Weather Apps

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- Chief Meteorologist -

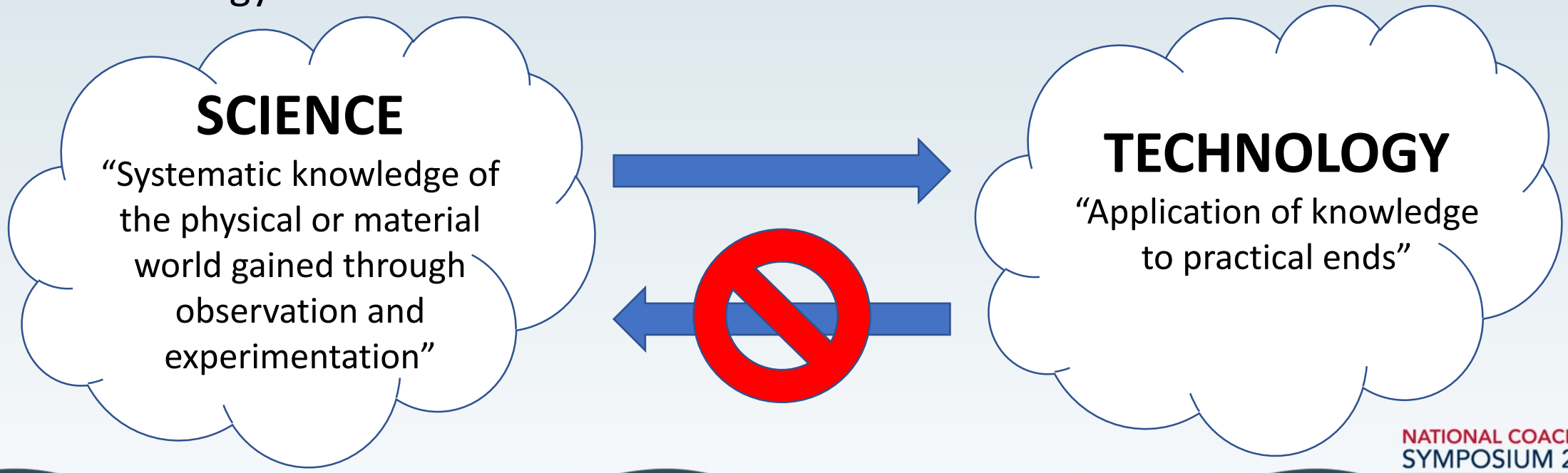
Sailing Weather Service

Overview

- Thesis – Meteorological Atrophy
- A brief history – Before weather apps
- What is a weather app?
- What weather apps can do
- What weather apps can NOT do
- Adding value - Beyond the weather app

Thesis – Meteorological Atrophy

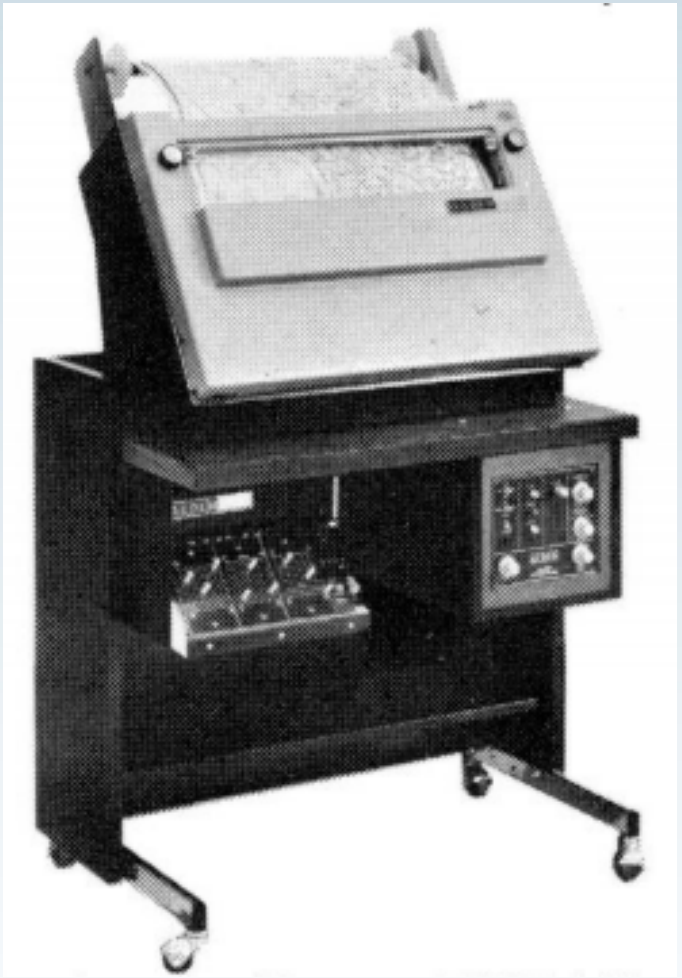
- Meteorological Atrophy: Poor strategic decisions on the race course, in part, result from reliance on weather apps without (or with minimal) analysis of actual conditions and application of basic meteorological knowledge.
- Sole reliance on weather apps and models without an understanding of the meteorology is insufficient

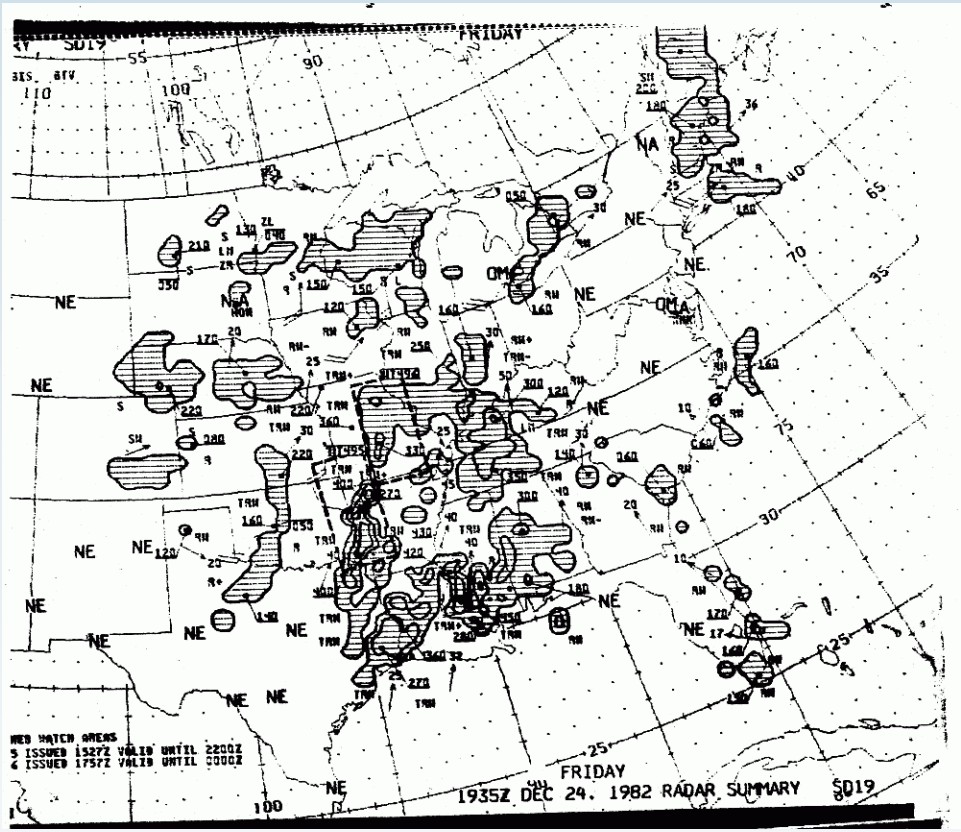


A brief history – Before weather apps

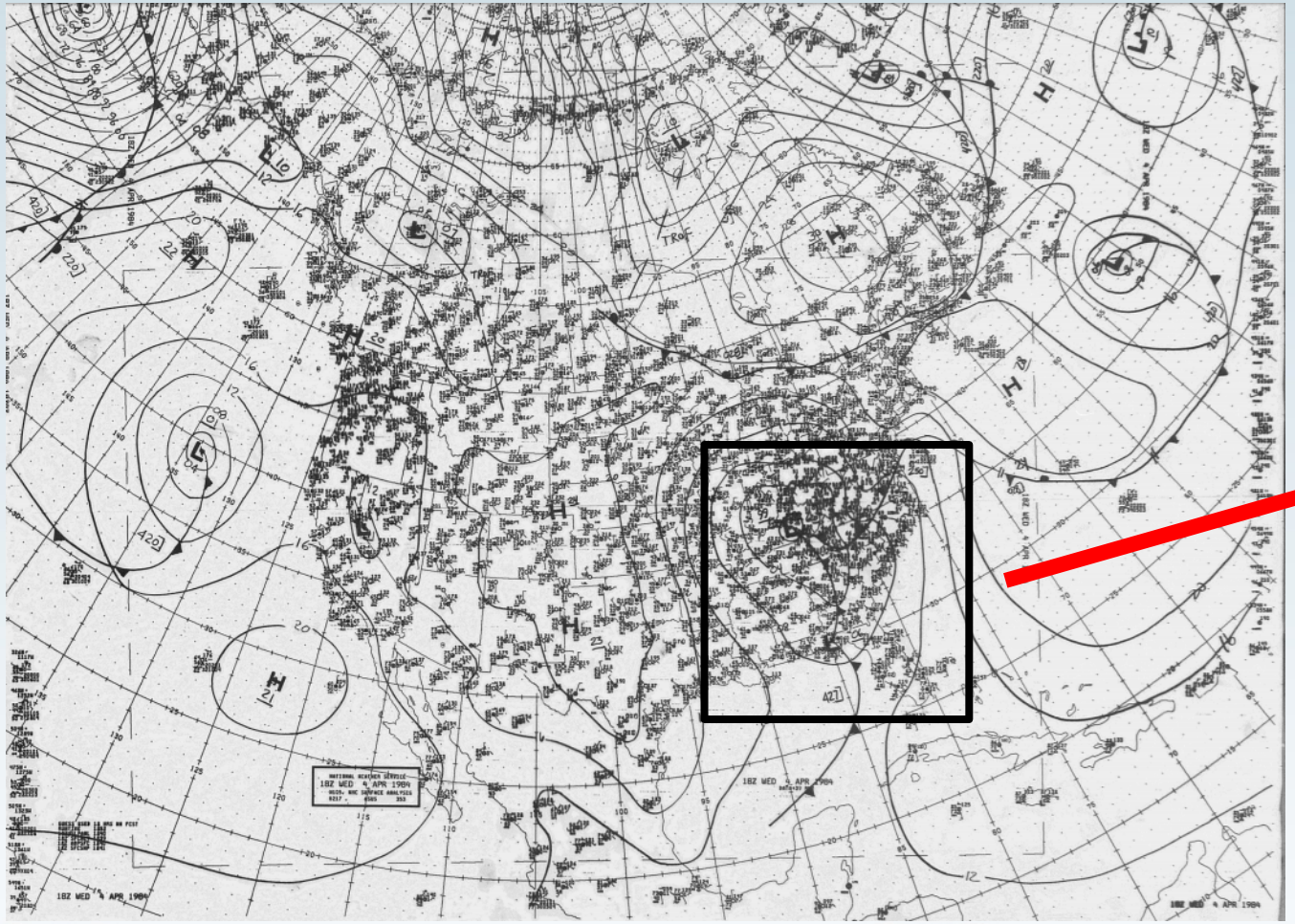
"When I started forecasting, I had to *walk*
5 miles to and from The Weather Office.
And it was UPHILL BOTH WAYS!!!"

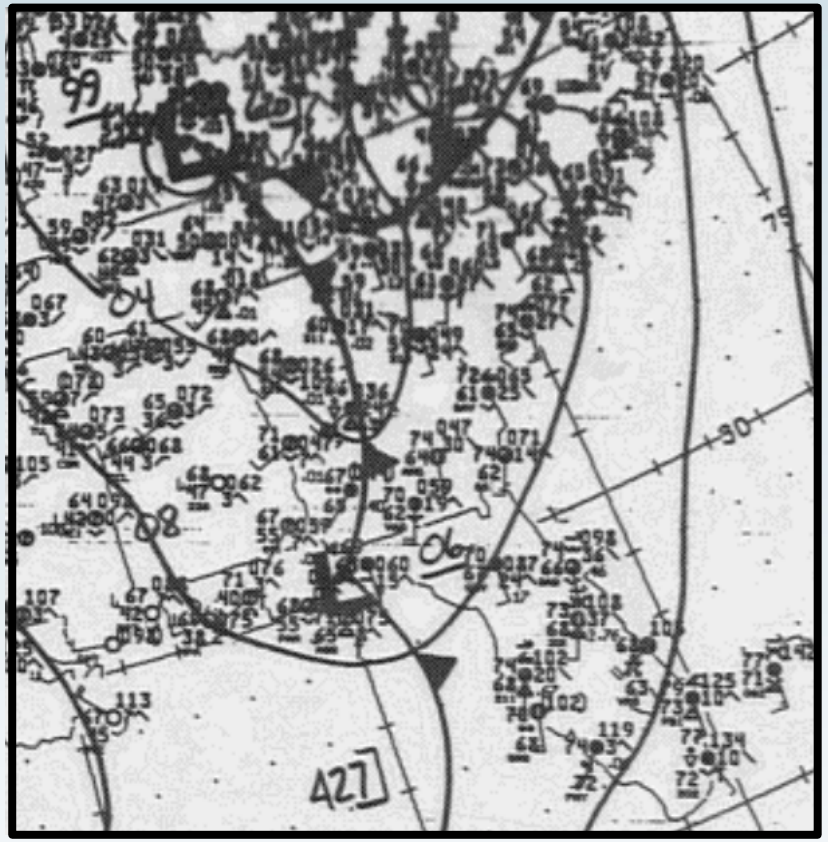
A brief history – Before weather apps





A brief history – Before weather apps





A brief history – Before weather apps

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ILG SA 1350   16   SCT              5H 216/85/75/2604/017
ILG SA 1450   25   SCT              5H 218/87/75/2507/018/ 500 1500
ILG SP 1524             M21 BKN    5H           1605/018/TCU OVHD
ILG SA 1550   21   SCT M28 BKN      5H 218/87/75/1707/018/TCU W
ILG SP 1626   25   SCT E70 BKN      6H           1908/018
ILG SA 1650   45   SCT               7 218/88/76/1707/018
ILG SA 1750   30   SCT               7 211/88/76/1710/016/ 807 1200
ILG SA 1850   40   SCT              10 210/91/72/1912/015
ILG SA 1954   41   SCT              10 208/92/73/2010/015/MDT CU SE-S
ILG SA 2054   41   SCT              10 205/91/73/1709/014/MDT CU SE-
                                                        S/ 707 1100
ILG SA 2152   55   SCT              12 205/88/77/1709G15/014
ILG SA 2254   55   SCT              12 203/87/76/1610/013
ILG SA 2354  100   SCT 250 -SCT     12 205/86/76/1606/014/ 500 1071
ILG SA 0054  250   SCT              12 208/84/72/2006/015
ILG SA 0154  250   SCT              12 211/83/71/1908/016
ILG SA 0252  250  -SCT              12 211/81/71/2007/016/ 107 1001
ILG SA 0352  250  -SCT              12 211/79/72/2007/016
ILG SA 0452  250  -SCT              12 208/78/72/1905/015
ILG SA 0550  250  -SCT              12 205/77/73/2005/014/ 807 1009
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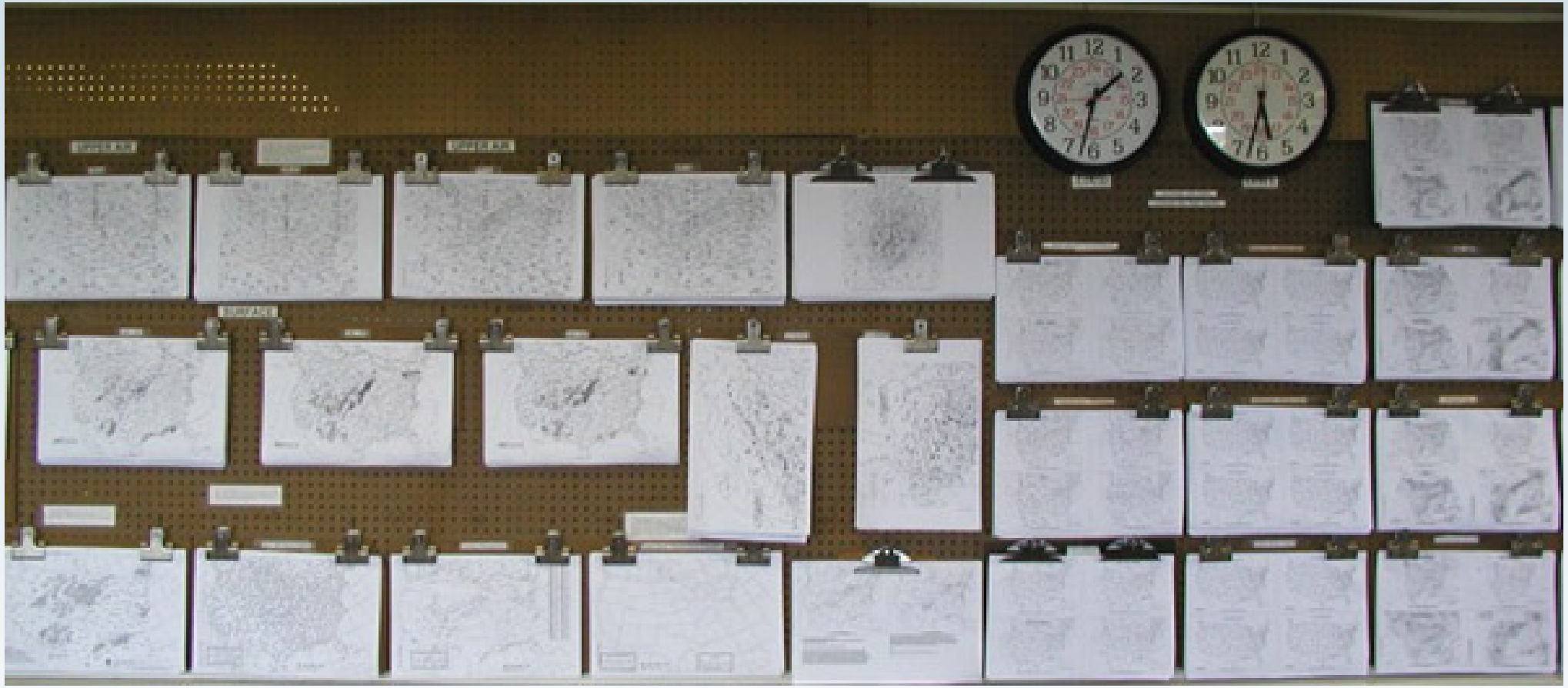
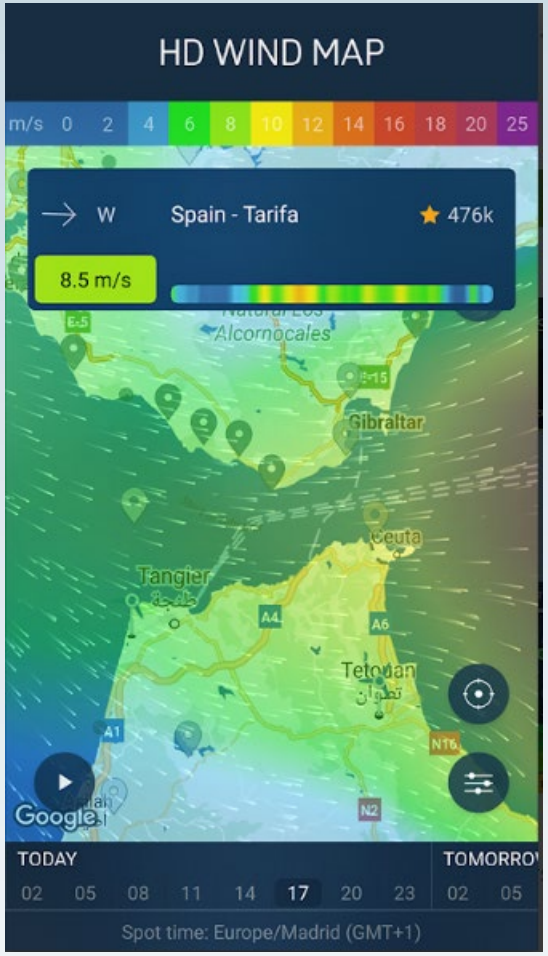
Weather app, circa 1985



What is a weather app*

*No endorsements or recommendations implied

- Software which *aggregates information* and displays it in an interactive and “user friendly” format (PC or mobile device).
  - Sailflow/Predictwind/Windfinder/Wunderground/Windy
- Most apps collect publicly available information (e.g. NOAA, NASA, DOD, Universities, etc) and manipulate it to create displays geared for specific needs and activities.
- Some apps use and display proprietary or custom data
  - Observations – Sailflow, Wunderground
  - Models – Sailflow/Predictwind

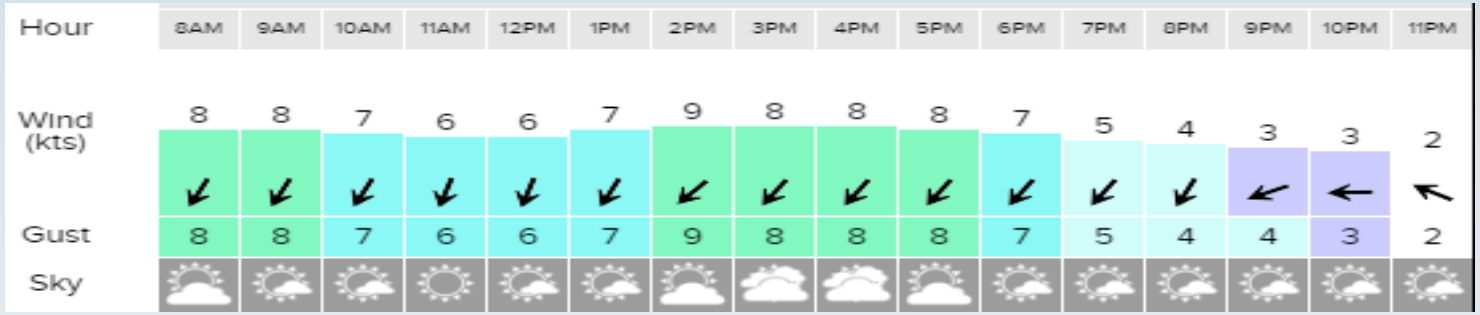


What weather apps can do

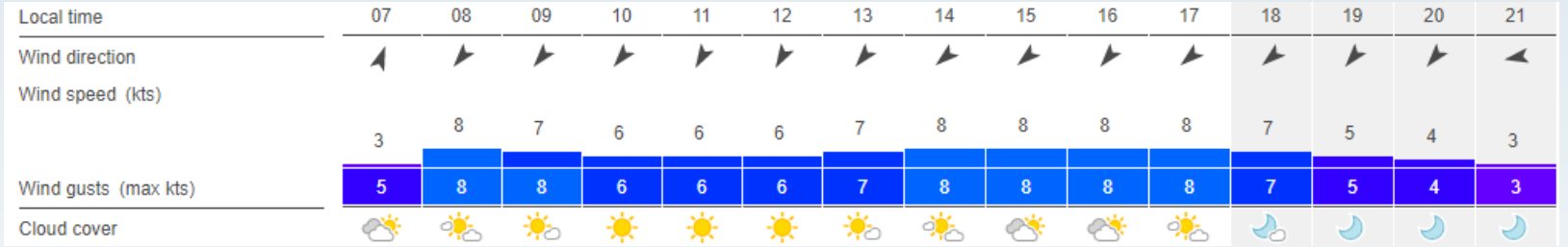
- Provide continuous access to most recent observed and forecast data. *Be careful using raw data!*
- Zoom display to your specific location.
- Create easily understood and interpreted tables, charts/graphs.
- Operate “unattended” – ie track location/adjust display accordingly.
- Alert on user-defined thresholds for specific parameters (e.g. observed or forecast >20 kts).
- Overlay multi-parameters on maps and charts.

Weather App Quirks
Different Apps > Same Forecast

Sailflow*



Windfinder*

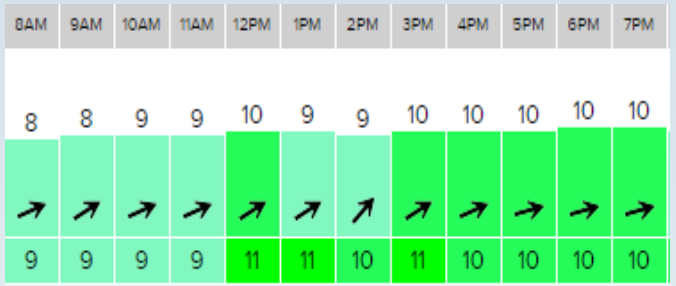


Very small differences can be attributed to differences in apps' rounding methods or interpolation from raw model grid to the forecast point.

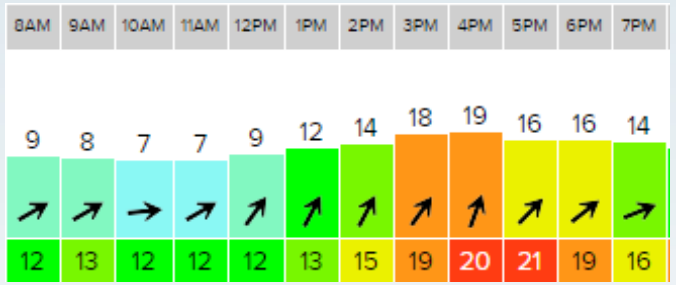
*No endorsements or recommendations implied

Weather App Quirks (or Features)
Same App > Different Forecasts

Sailflow*
NAM3km



Sailflow*
WRF2km



Different models yield different results. This is not necessarily a bad thing, as it gives the user a measure of forecast reliability.

Rule of thumb: If models are similar, confidence is good. If models are different, forecast confidence is lower.

Such information is helpful, but without interpretation or understanding as to why they are different, usefulness is limited.

*No endorsements or recommendations implied

What weather apps can NOT do

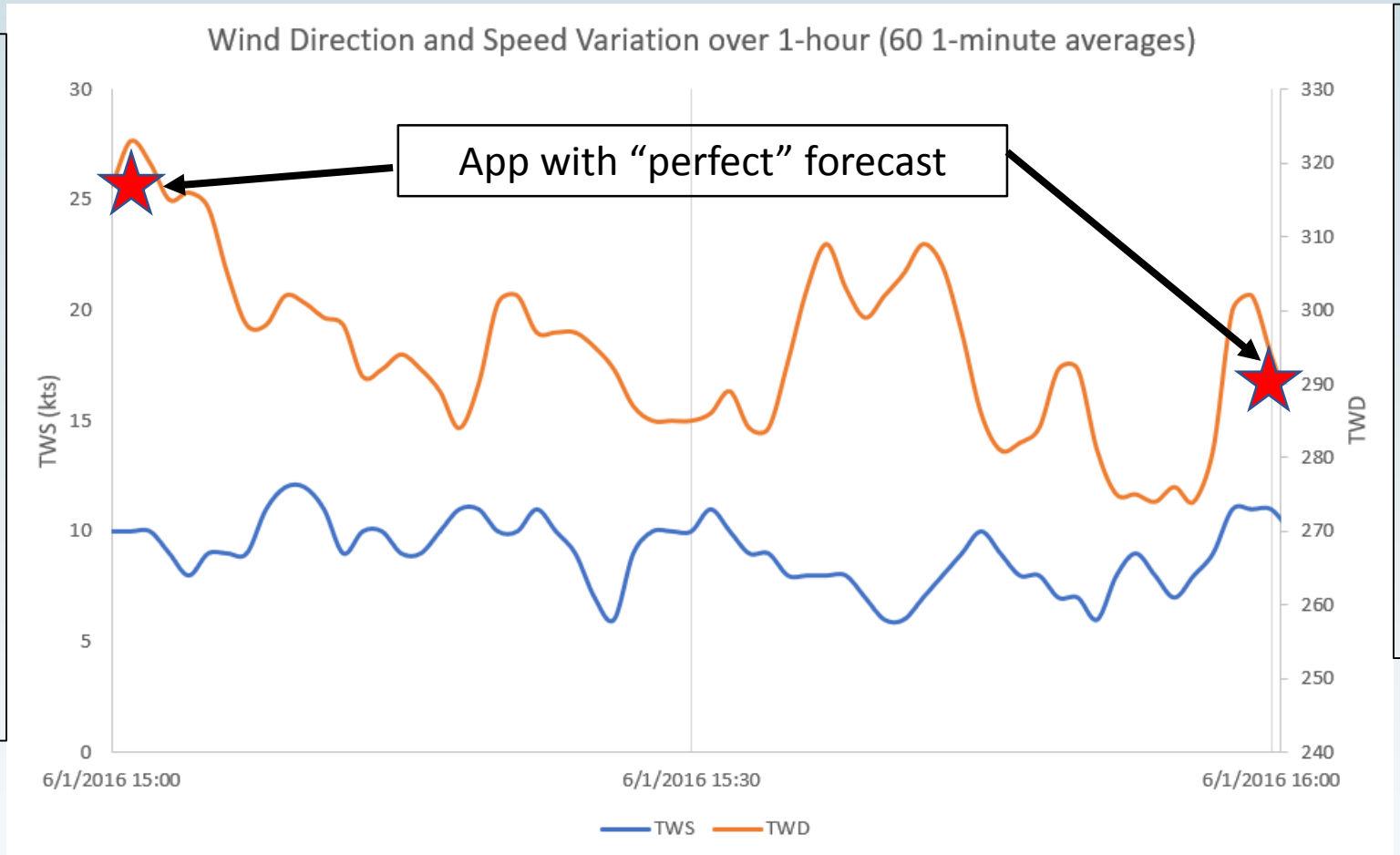
- Some popular sailing weather apps do not show *official* warnings or advisories OR they are relatively difficult to view. Need a separate weather app for that.
- Few sites give information on height of observation. Very important for sailing. Height correction is not accounted for.
- No information regarding the differences between models and why they exist/what to look for/how to interpret.
- Limited or no direct information on the character of the wind, spatial variance, and time dependence (at race/race course scale).
- ***Most racing occurs at time and space scales shorter/smaller than data provided.***

Limitations of Time – Resolution

Most apps provide data at 1 hour increments (stars at right).

But wind often varies substantially in time.

Example at right shows a 10 knot day with wind direction varying between 275 and 320, with some changes >20 deg in < 10 mins.



Best we can hope for from an app is the longer term trend.

Often this is on a scale less than the duration of a race.

App (model output) says nothing about what happens between time stamps.

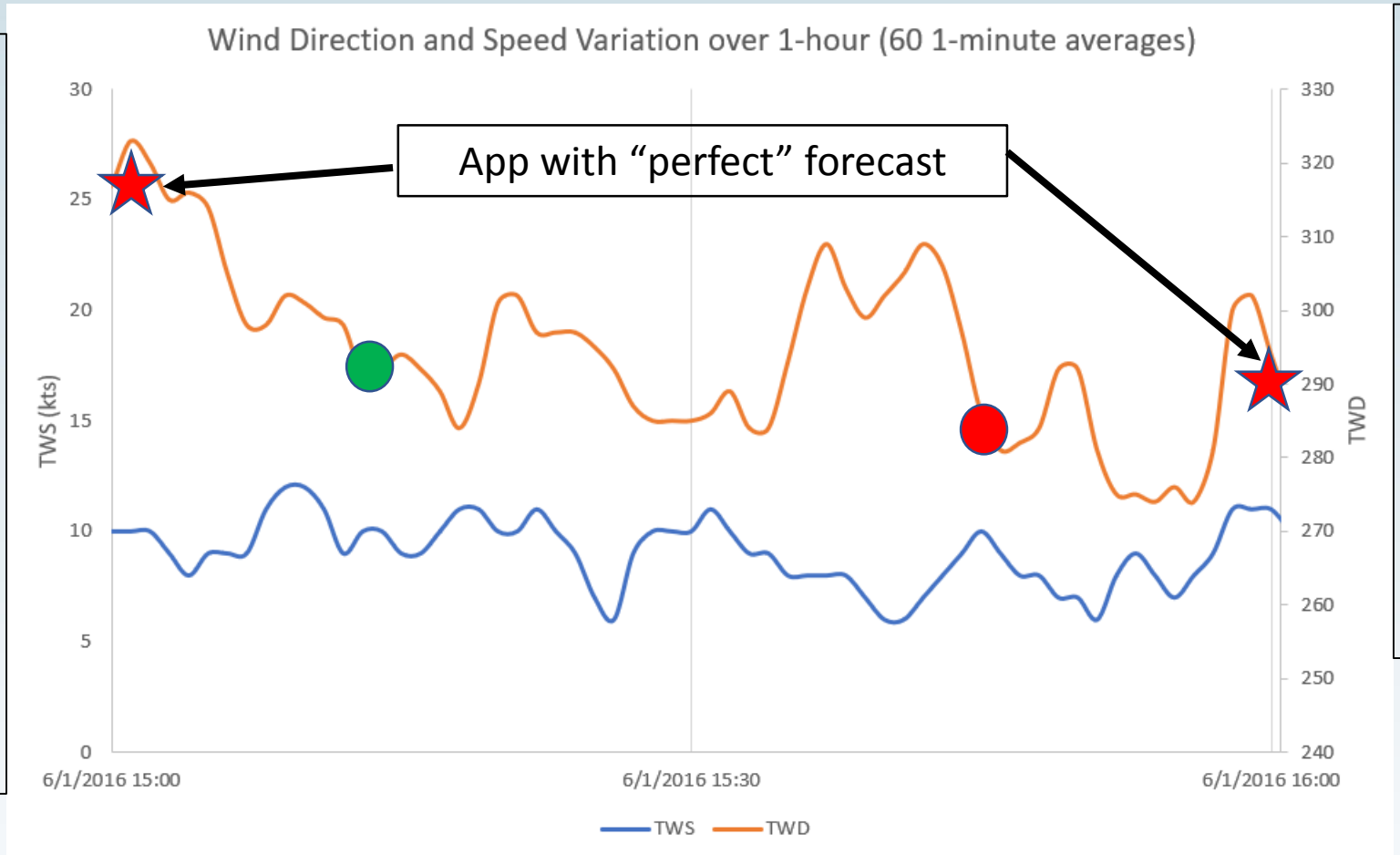
Limitations of Time – Perception

A matter of perspective.

App provides forecast at an instance in time.

Let's assume you sail a 30 min race from 1515 (green circle) until 1545 (red circle).

How do you perceive the character of the wind over that race?



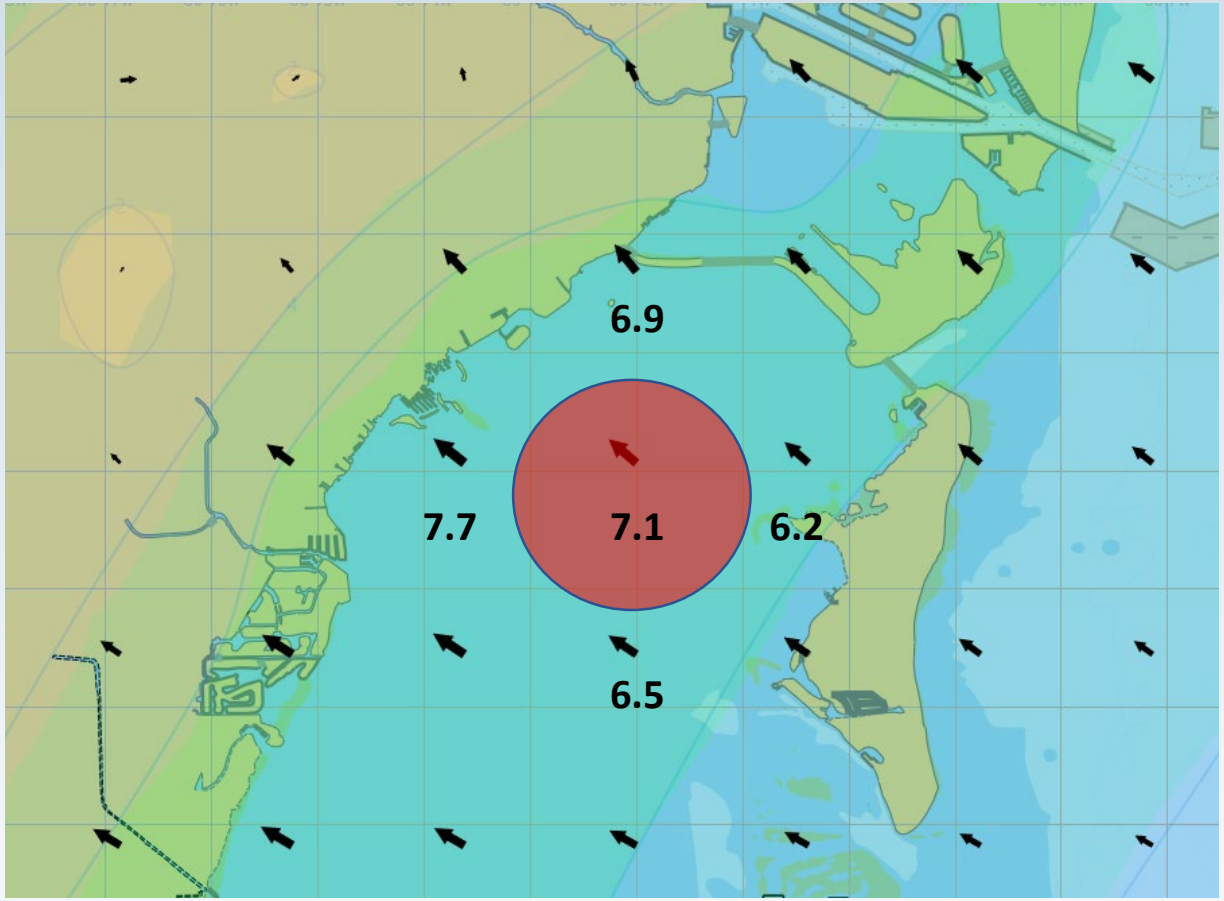
From start to finish, the wind went left 5 deg. However twice during the race it oscillated right 10-15 degrees.

Would you say that the wind went left during the race? No, you'd probably say it was oscillating favoring right-shifts.

Limitations of Space

Most apps provide spatial information. The granularity varies (typically from 1 to 13km depending on location and model used).

Example at right shows wind direction and speed from a widely used NOAA model (3km resolution) with typical Biscayne Bay race area shown.

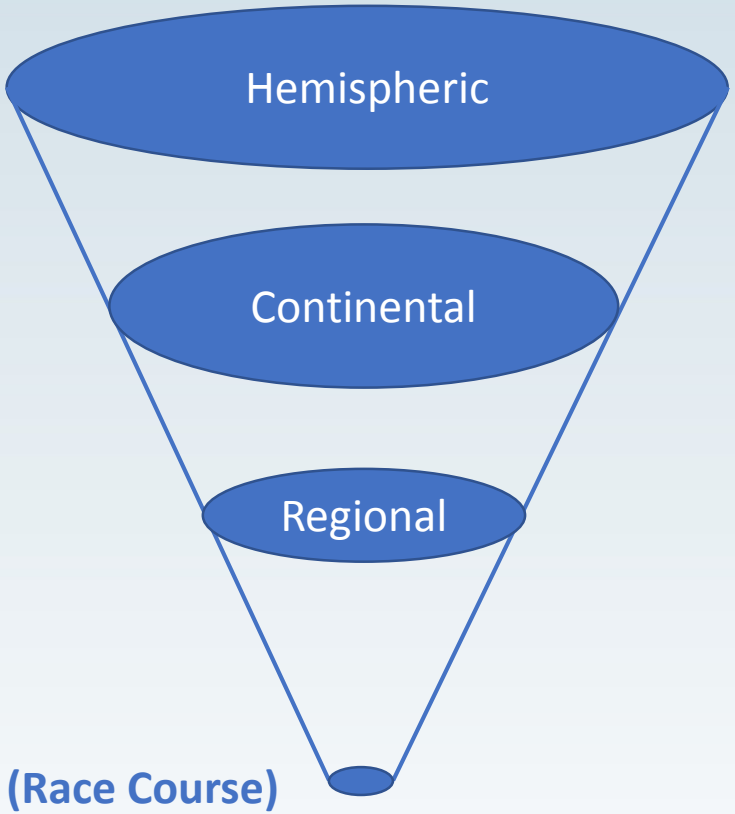


Best we can hope for from an app is some general “suggestion” of static wind features and spatial trends.

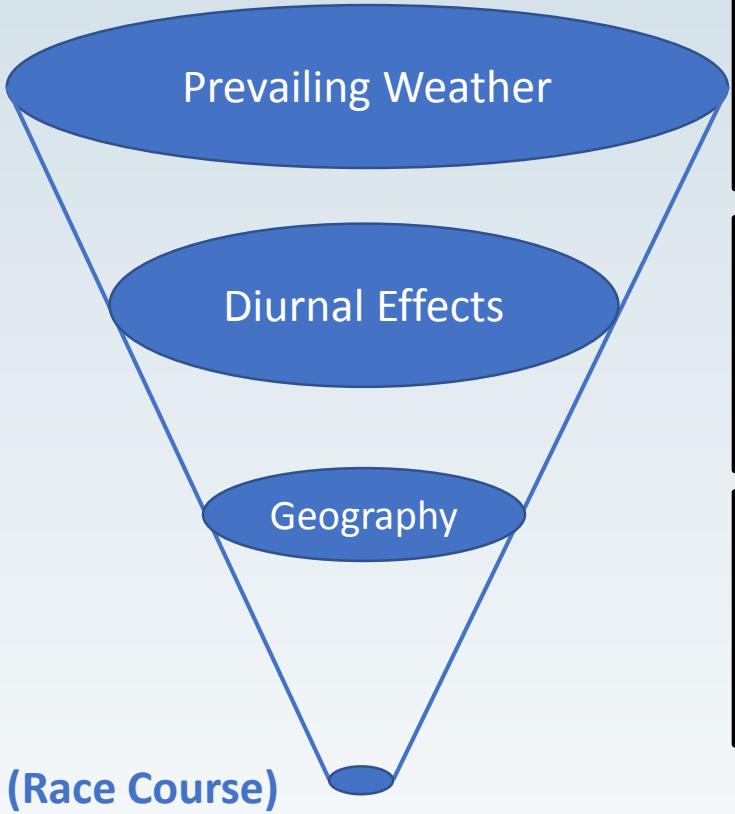
Often information is limited to 1 grid point in the course area.

The process of adding value – Forecast funnel

Meteorologist's View – Global to Local



Local (Race Course)



Local (Race Course)

Onshore/offshore?
Stable/unstable?
Frontal?
Gradient?
High / low pressure?

Drainage flow?
Sea breeze conditions?
Mixing?

Terrain/buildings?
Bays/Rivers?
Islands?
Points/Peninsulas?

Adding value – Beyond the weather app

Character of the Wind Direction

- Steady
- Oscillating
- Persistent shift
- Unstable
- Random
- Abrupt

Character of the Wind Speed

- Steady
- Building
- Easing
- Pumping/Oscillating
- Gusting
- Puffy

Adding value – Beyond the weather app

Stability of the flow

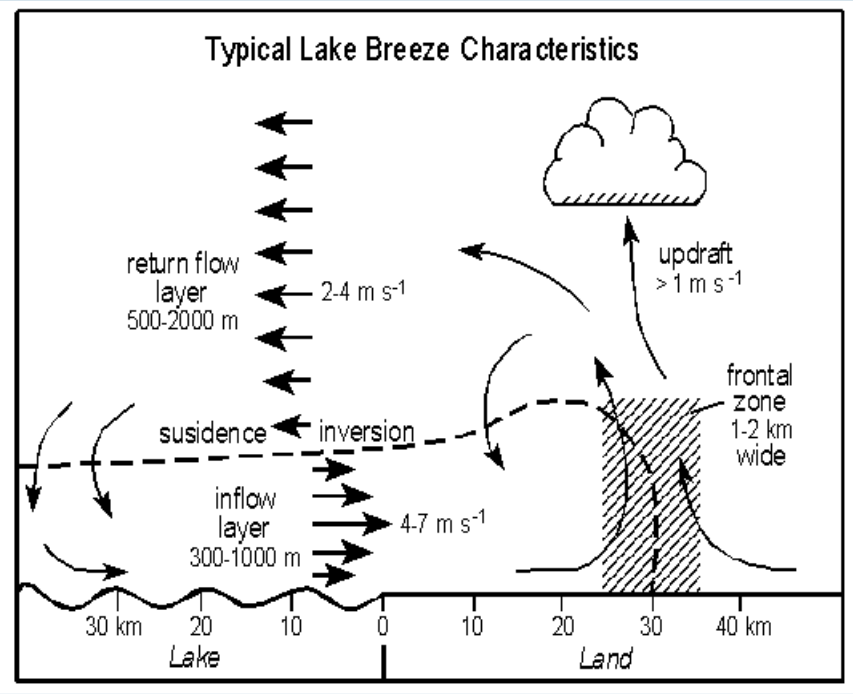
- Onshore vs offshore
- Cold vs warm
- Cloudy vs clear
- Time of day
- Gradient vs thermal
- Air temp. vs Water temp.

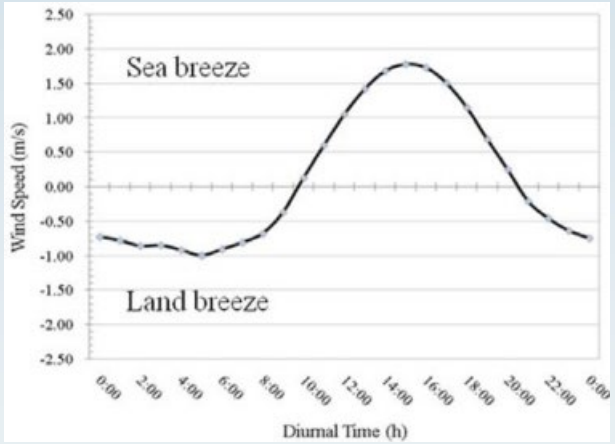
Spatial variation of the flow

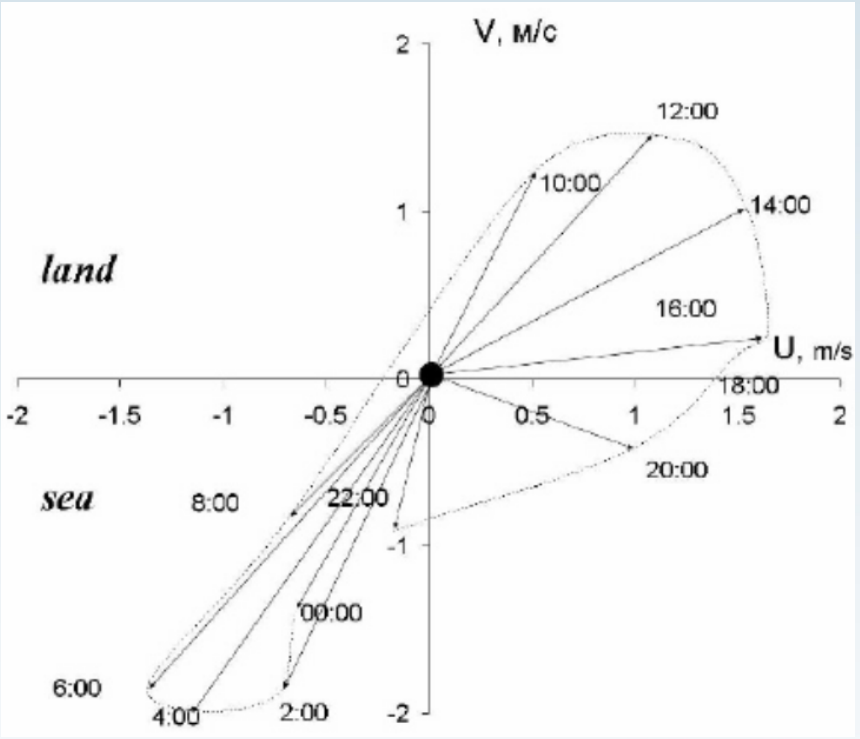
- Static pattern
- Progressive pattern
- Convergent
- Divergent
- Bend
- Acceleration
- Shadow

The process of adding value – Conceptual Models

- Conceptual models simplify complex weather patterns.

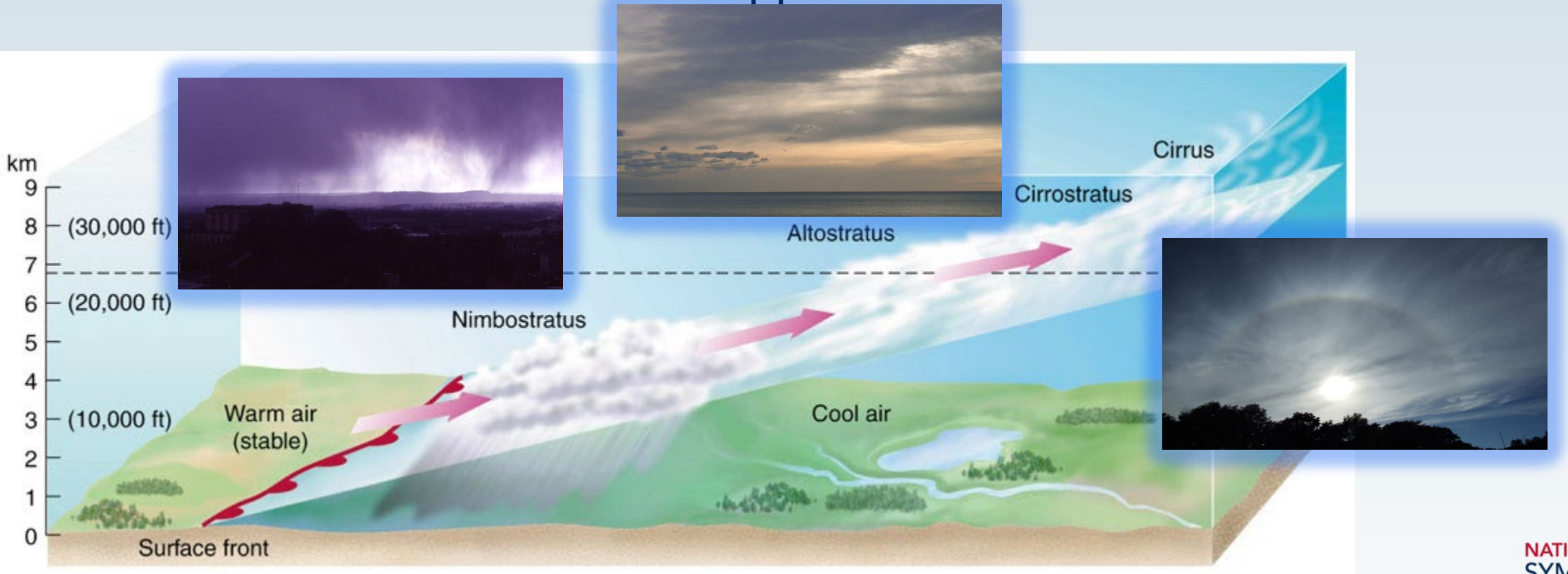






The process of adding value – Conceptual Models

- Based in observation and application of the science.



The process of adding value – Conceptual Models

- Conceptual models can form the solid basis of a “first guess” forecast.
- While incomplete (relative to actual weather), conceptual models help fill in the gaps in weather app data, and provide an idea of what is “most likely to occur”.
- Conceptual models can be very simple (rules of thumb) to more complex with a series of checklists or decision trees resulting in a more detailed, nuanced prediction.

Resources


HIGHER PERFORMANCE SAILING
Faster Handling Techniques
Frank Bethwaite


THE SAILOR'S WIND
Stuart H. Walker


INSTANT WEATHER FORECASTING
5TH EDITION
ALAN WATTS
You can predict the weather


WIND STRATEGY
David Houghton & Fiona Campbell
SAIL TO WIN