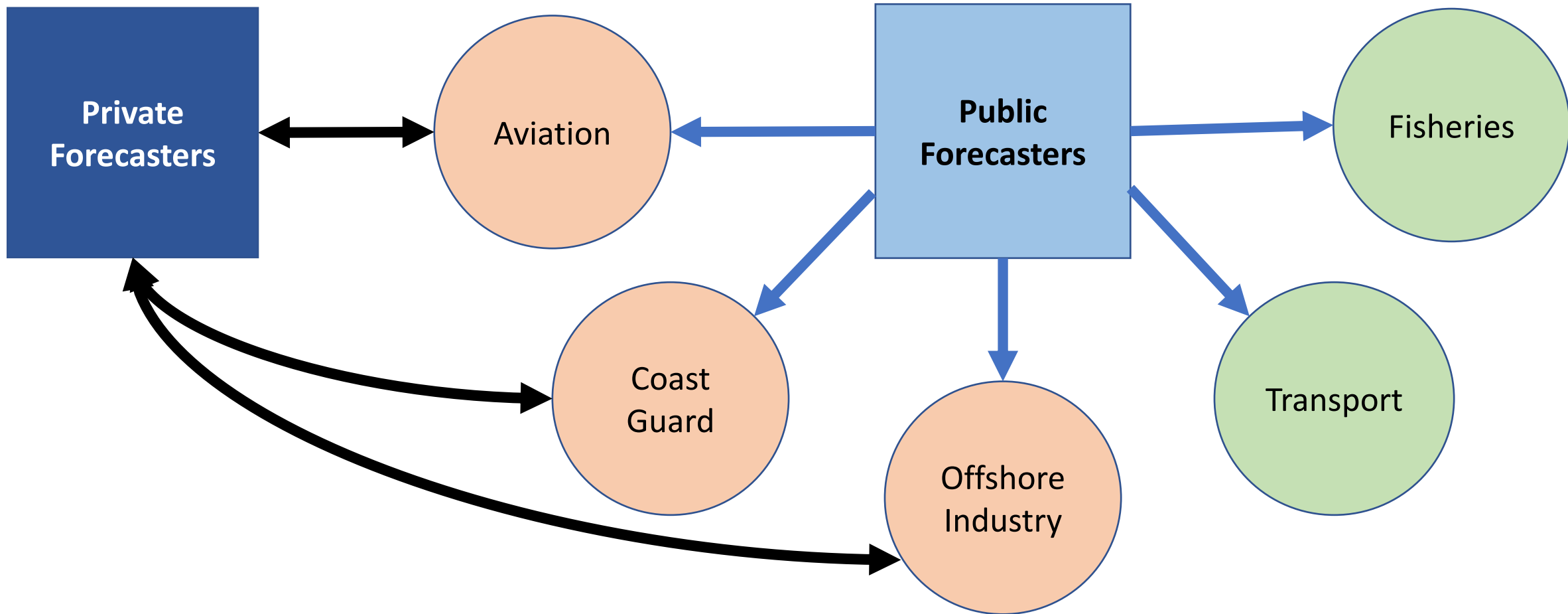


Marine Forecast Production & Application in Newfoundland Fisheries

Joel Finnis,
Barb Neis, Marilyn Koitnurm, Olivia Vila, Mihai Sarbau
Memorial University of Newfoundland





In-house forecasting employees or outside contractors, providing new/targeted info to meet user needs

Attempt to meet critical needs of all potential stakeholders

Comparison Points

1) Information Synthesis:

... whether for forecast production or user decision-making

2) Measures of Forecast Quality:

What constitutes a 'good' forecast?

How is quality assessed?

Marine Meteorologists:

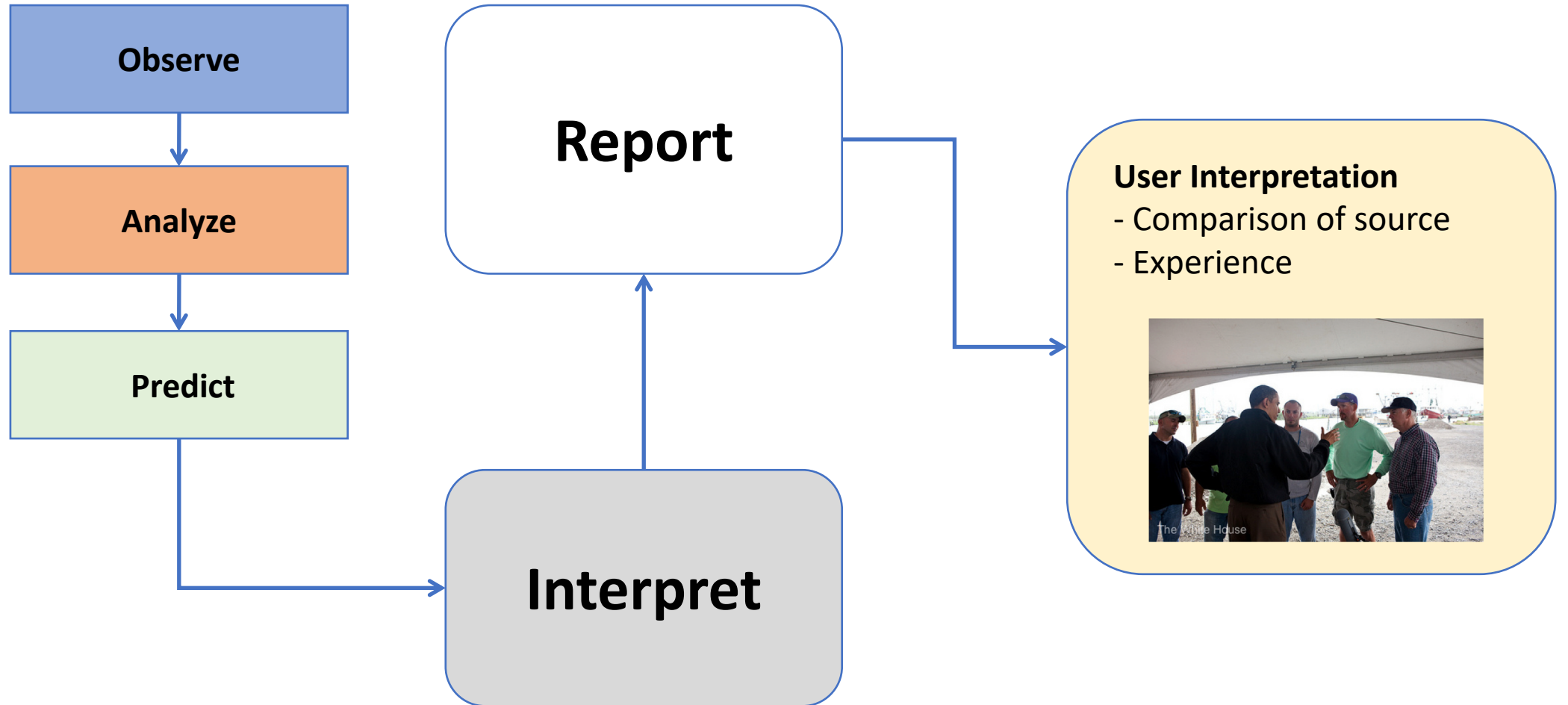
Government:	5
Private:	4
Media:	1

Marine Occupations:

Offshore Aviation:	2
Fish Harvesters:	12
Coast Guard:	1
Transportation:	1
Safety Association:	3

One Roundtable & 12 one-on-one interviews

Forecast Production



“Art” of Forecasting

Problem: Given data, experience with models, and experience with a forecast zone, assess what matters for the coming forecast period

Need to consider:

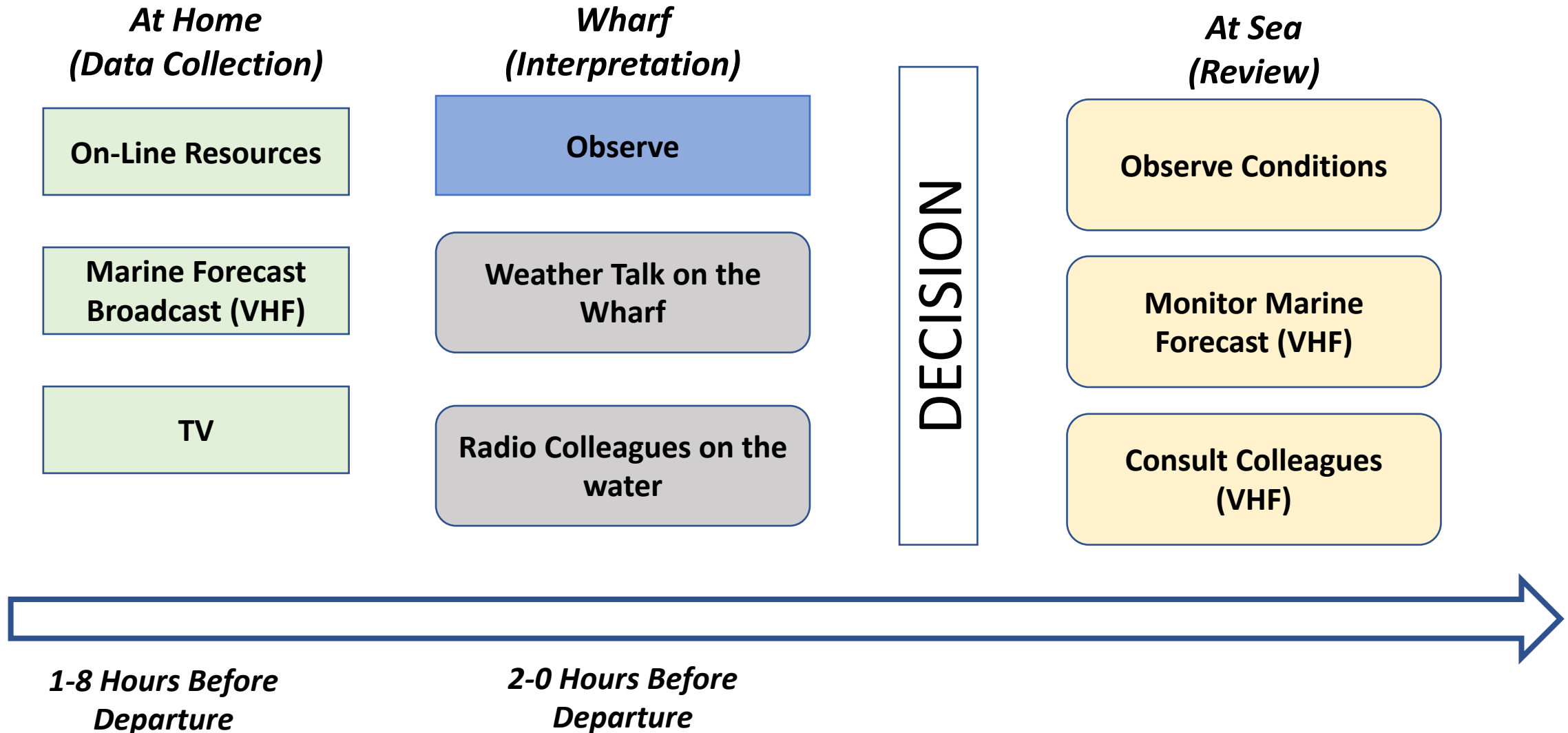
- User needs
- Communicating risk...
- ... without overemphasizing it
- Generalizing for forecast zones

Data review, collegial consultation key part of process. May have 3-4 colleagues plus supervisor to consult with, as well as shift change notes.

Interpret

“...there could be one small swath say of 50-knot winds going right up the center of the region, whereas generally for the whole region the winds are 35 knots. So how do you capture that? “

Harvester Action



"Art" of Forecast Use

Balance multiple (contradictory?) forecasts against current conditions, past experience, and non-weather concerns.

Key Question: "Can I fish when I get there?"

- Fishing gear and its limits,
- Travel time
- Forecast along route (multiple zones)

Consultation and Experience are Critical

Interpret

"I tell some of the people when you be talking about the forecast, you're going to have to make up your own."

“Good” Forecasts: Meteorologist Perspective

- 1) Consistent (no surprises between forecasts)
- 2) Accurate (what’s predicted is what happens)
- 3) Useful

Definitions of useful vary, but broadly suggest something interpretable with info on high impact events:

“...a good forecast is not too technical, but at the same time not too broad.”

“...getting the impactful weather, absolutely is kind of the number one thing.”

“Big thing, they have to have utility. They have to be useful to the user. They have to do what they’re intended to do, I guess. We’re not there to make the decisions for people, but we’re there to help facilitate those decisions.”

“Good” Forecasts: Harvesters

1) Accessible

- Can get to the information you need easily
- Can get it anywhere

2) Timely

- Fresh forecast for the start of the working day
- Currently too early (3AM) or too late (9AM)

3) Detailed

- Smaller forecast zones
- More info

Some appear mutually exclusive (e.g. more detail vs accessibility)

Communicating Uncertainty

Forecasters struggle with communication of uncertainty: the *correct* forecast is buried in the weather model ensemble

- Adds length, complexity
- How well do users understand?

“Like, mathematical chaos is not a commonly understood concept to most people”.

Concerns may be excessive: Harvesters already juggle multiple (contradictory) forecast sources, and understand forecasts are uncertain

“But I mean, if they want to take the four areas and put them together, there’s no way they’re going get the work—to get to work the forecast so it’ll be good for all of them, especially when now you got them split, right?”

Early Lessons:

- Forecaster/harvester processes 'rhyme'
 - Harvesters as skilled risk *interpreters*
- Concern about giving too much information/confusing w/uncertainty is likely unfounded
 - Best delivered online?
- Potential for collaboration between meteorologists & harvesters
 - Sharing information?
 - Observations to meteorologists
 - Enhanced web offerings
 - Redrawing forecast zones

Interested in Marine Weather & Risk?

Coast & Ocean Risk Communication CoP

Online community for practitioners, academics, and stakeholders with shared marine/coastal risk concerns

Sponsored by Marine Environment Observation Prediction & Response (MEOPAR) Network

Contact:

corccom@gmail.com or myself (jfinnis@mun.ca)



Limits of Prediction: Agreement

Large Forecast Zones

Challenges of forecasting large marine zones align with stated challenges using them:

Large areas => too general => less useful

Solutions?

- Review zones
- Review online format/info

Forecast Timing

Harvesters ID release times as a concern ('old' forecasts @ departure).

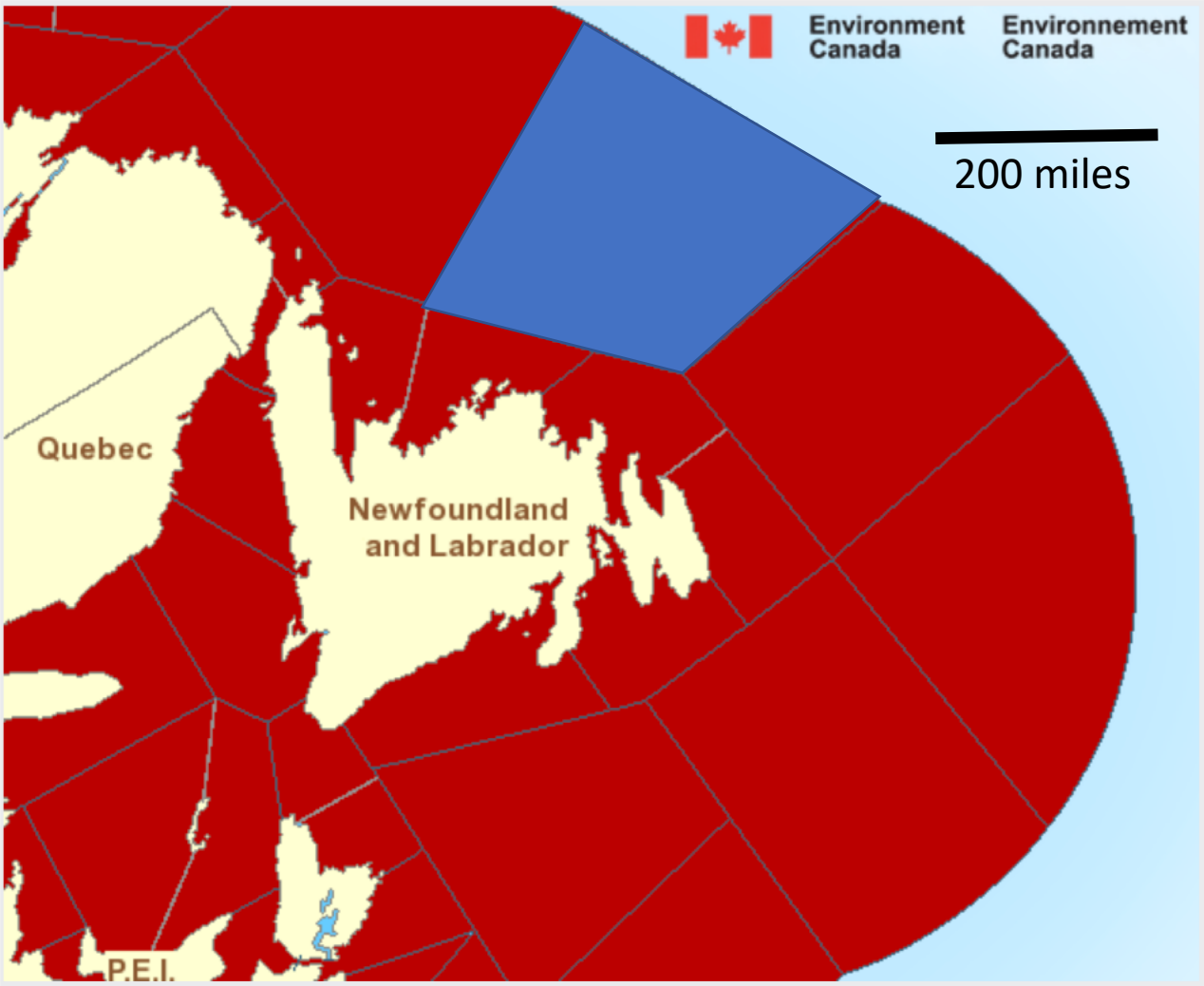
Forecasters tied to synoptic times/WMO schedule

Solutions?

- No simple fixes...

Marine Weather for: Atlantic - Newfoundland

Click on the coloured marine region for which you would like the marine forecast or latest warning



- [Warning](#)
- [Watch](#)
- [Advisory](#)
- [No warning or watch](#)

HURRICANE FORCE WIND WARNING IN EFFECT

Forecast

Weather Conditions

Ice Conditions

Warnings

Synopsis

Winds

Issued 10:00 AM NDT 09 April 2018

Today Tonight and Tuesday.

Hurricane force wind warning in effect.

Wind south 35 to 45 knots increasing to southwest 55 to 65 this afternoon then diminishing to west 45 to 55 late overnight. Wind diminishing to west 35 to 45 Tuesday morning then veering to northwest 25 to 35 Tuesday afternoon.

Waves

Issued 06:00 AM NDT 09 April 2018

Today Tonight and Tuesday.

Outside the ice edge seas 3 to 4 metres building to 5 to 7 this morning and to 9 to 12 this evening. Seas subsiding to 7 to 9 Tuesday morning and to 5 to 7 Tuesday afternoon.

Weather & Visibility

Issued 10:00 AM NDT 09 April 2018

Today Tonight and Tuesday.

Rain and fog patches changing to flurries this afternoon. Visibility 1 mile or less in fog patches and in flurries.

Air temperature

Issued 10:00 AM NDT 09 April 2018

Today Tonight and Tuesday.

Temperatures plus 5 falling to minus 2 this evening.

Extended Forecast

Issued 03:00 AM NDT 09 April 2018

Wednesday

Wind west 20 knots.

Thursday

Wind north 15 to 20 knots.

Friday

Wind south 20 knots.

Ice Forecast

Issued 10:00 AM EDT 8 April 2018

Today Tonight and Monday

Bergy water except 4 tenths first-year ice in the extreme western section.

[[Canadian Ice Service](#)]

Limits to Prediction and Use

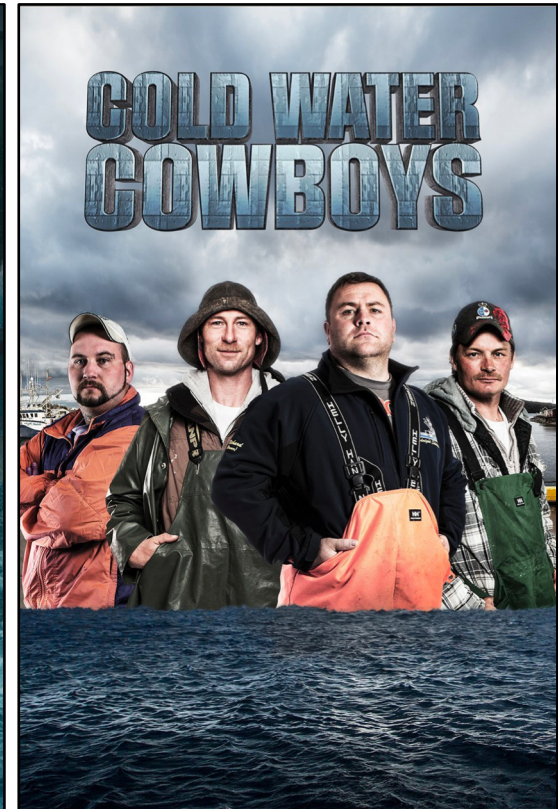
Very little blame attributed to other parties – and very few stereotypes

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"And now the 7-day forecast..."



Limits of Marine Forecasts

Space:

- Generalized forecasts for large, variable areas
- Limited observations = limited verification

Time:

- Time to generate model predictions (6 hrs)
- Time to extract zone forecasts
- Time constraints inherent in format

Uncertainty:

- Errors in observations and physics limit accuracy, especially as lead times increase...
- ...but actual outcome is somewhere in the model ensemble for 1-5 days
- *Bigger question:* how to communicate *uncertainty*, and how much to include

Limits to Forecast Utility

Space:

- Large forecast zones and generalizations

Time:

- Time to generate model predictions (6 hrs)
- Time to extract zone forecasts
- Time constraints inherent in format

Uncertainty:

- Errors in observations and physics limit accuracy, especially as lead times increase...
- ...but actual outcome is somewhere in the model ensemble for 1-5 days
- *Bigger question*: how to communicate *uncertainty*, and how much to include

Marine Weather Statement

Issued 9:54 AM NDT 9 April 2018

An intense low pressure system over Newfoundland will track northeastward to lie northeast of Belle Isle Bank by Tuesday morning. Gale to storm force northeasterlies to southeasterlies ahead of the low will shift to gale to storm force northwesterlies to southwesterlies in the wake of the low. Hurricane force northerlies are forecast for the Strait of Belle Isle today. In addition, hurricane force southwesterlies are expected over Funk Island Bank and southern portions of the Northeast Coast this afternoon into this evening.

Marine interests are advised that hurricane force wind warnings are in effect for the Strait of Belle Isle, Northeast Coast - Cape St. John and south, and Funk Island Bank. Storm warnings are in effect for the Northeast Gulf, Southwest Coast, South Coast, East Coast, Northeast Coast - north of Cape St. John, and Belle Isle Bank. Gale warnings are in effect for all remaining waters.

Marine interests are also advised that freezing spray warnings are in effect for the Strait of Belle Isle, Gulf waters, Northeast Coast, and Belle Isle Bank.

From Observation to Action

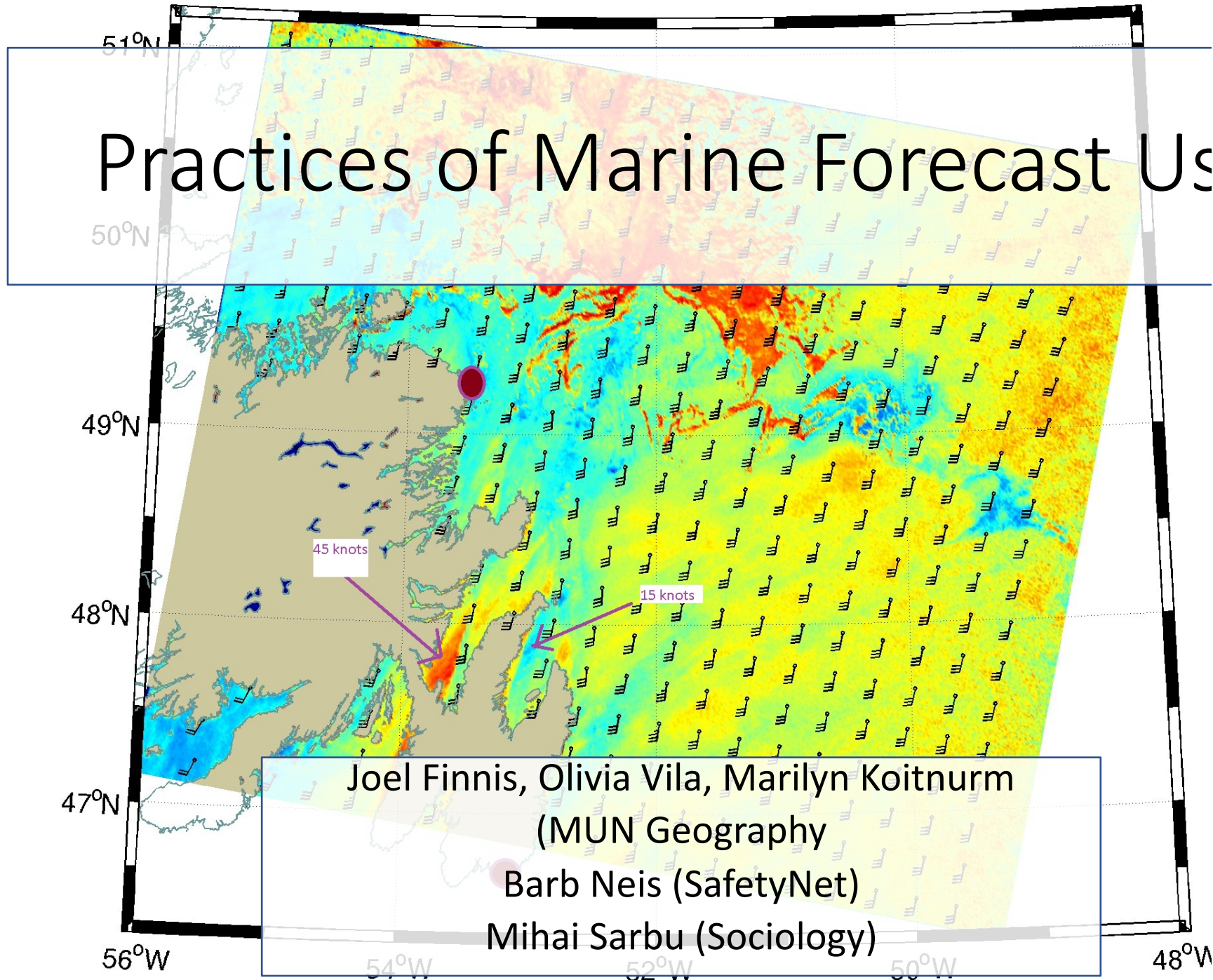
User Re-interpretation

- Discussion between users
- Apply local knowledge, experience



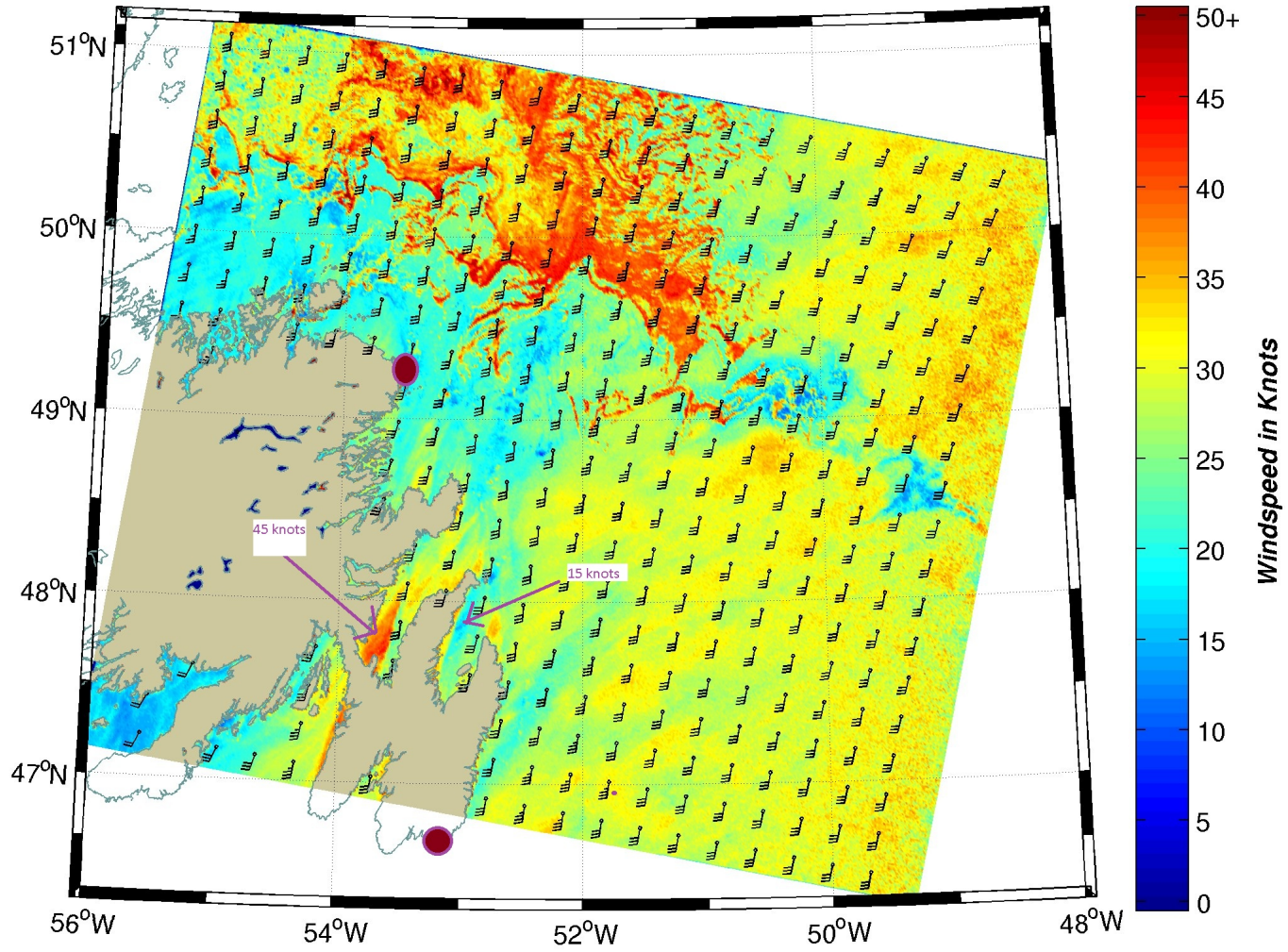
From Observation to Action

Practices of Marine Forecast Us



Joel Finnis, Olivia Vila, Marilyn Koitnurm
(MUN Geography)
Barb Neis (SafetyNet)
Mihai Sarbu (Sociology)

RADARSAT-2 SCWA_HH HV Descending, 26.Feb.2016 09:40:01 UTC
GEM REG NORTH AMERICA with CMOD Winds 26.Feb.2016 06 UTC +04 hr
No buoy wind reports were available for this area.



Comparison Points

Forecast Production & Harvester Interpretation

- How is information a

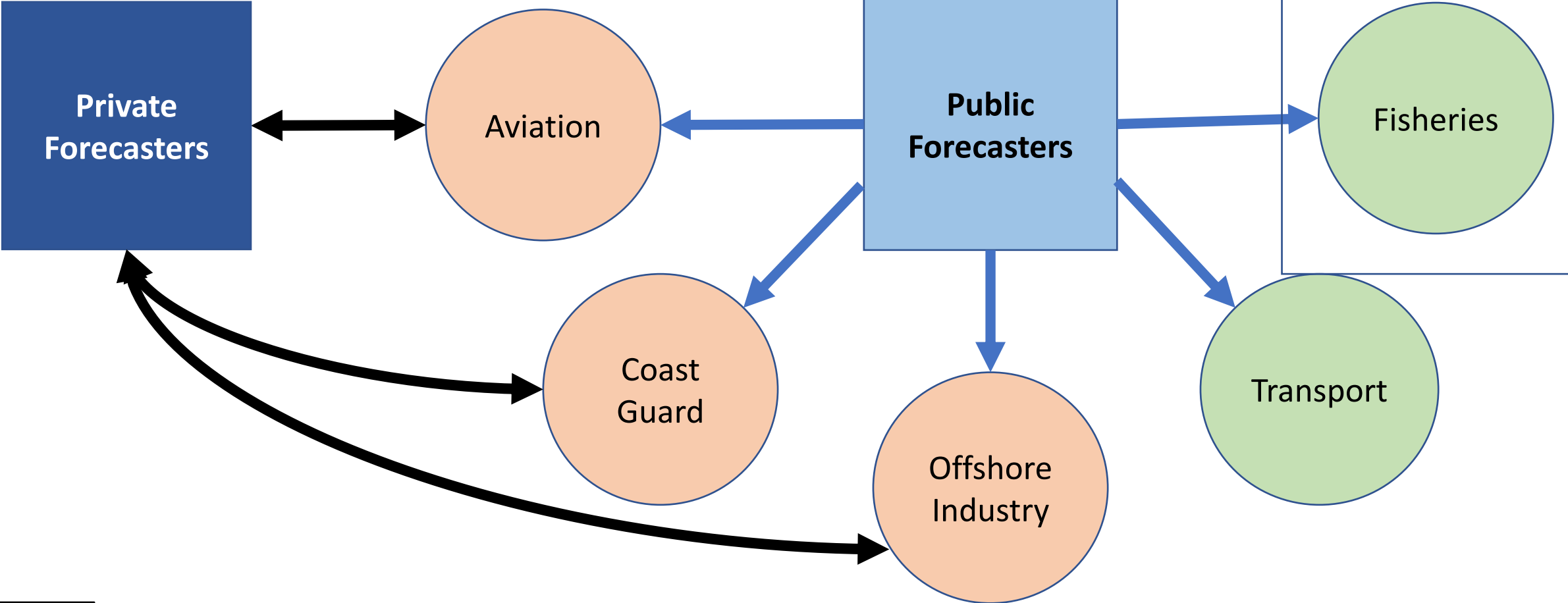
Assessment of Quality

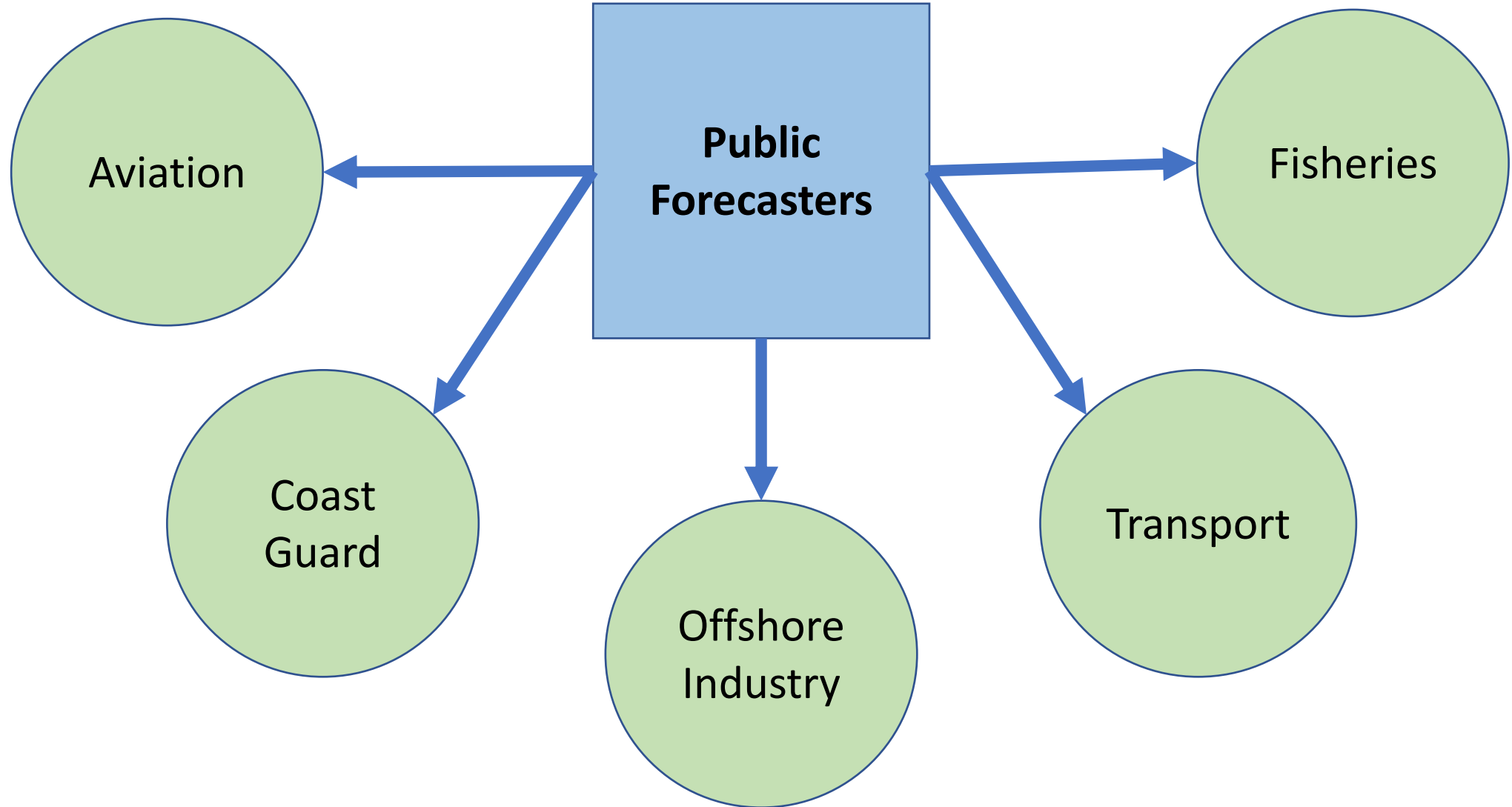
- What makes a 'good' forecast?
- How do current forecasts measure up?
- How is quality assessed?

Limits on Predictability vs. Utility

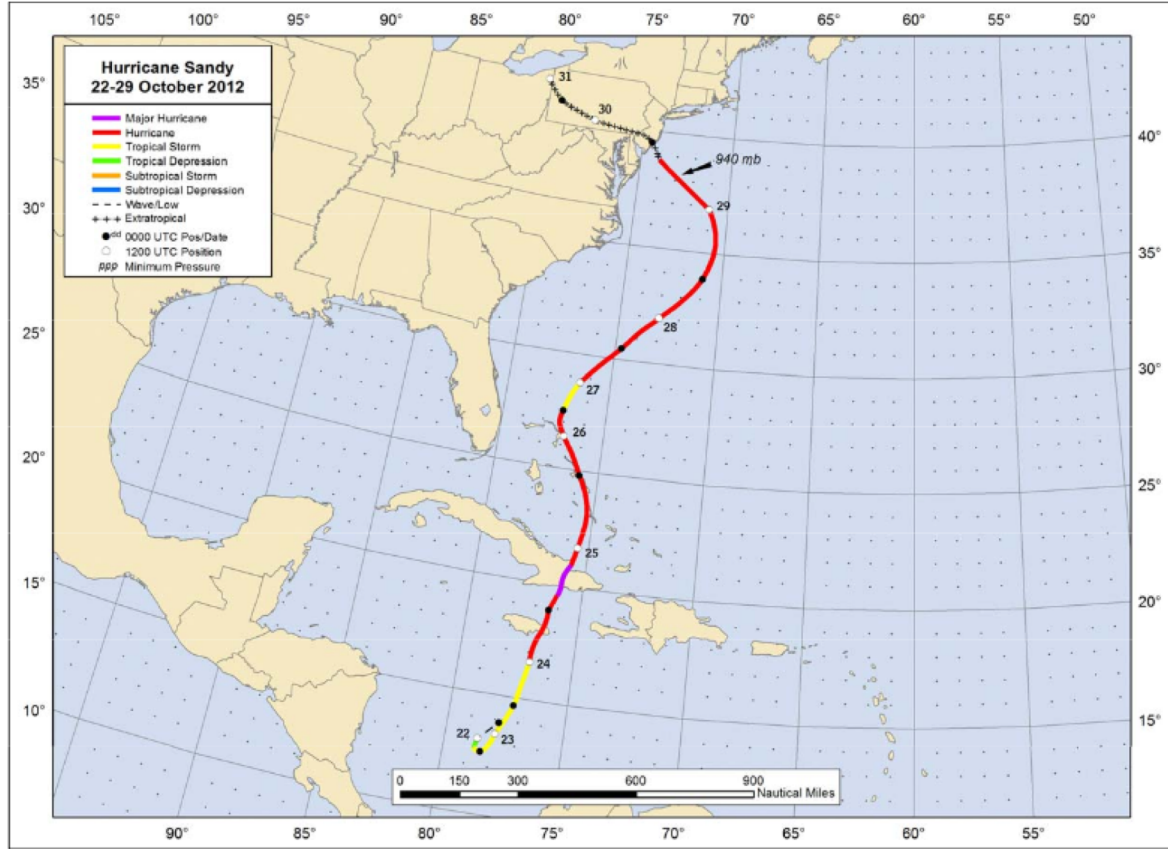
- Current limits on prediction accuracy
- Factors limiting utility for

GOAL: identify factors that limit marine forecast utility – whether in content, communication, interpretation, or implementation.

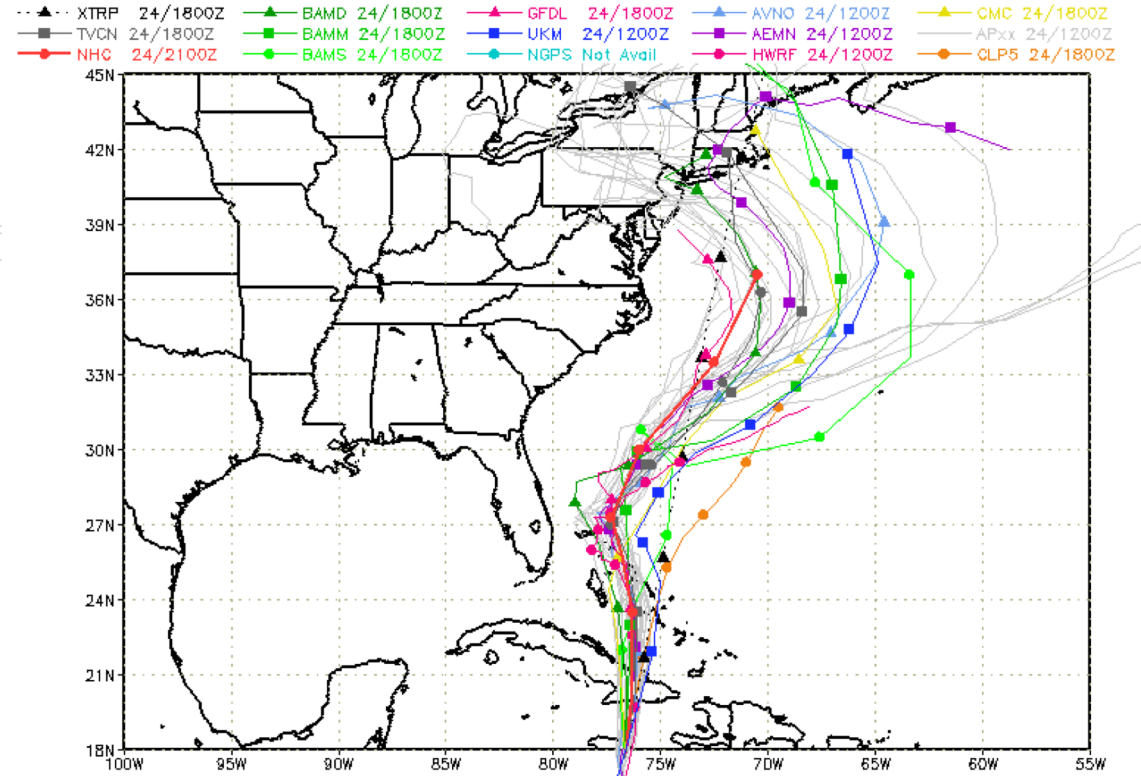




Forecast Use 25 Years Ago



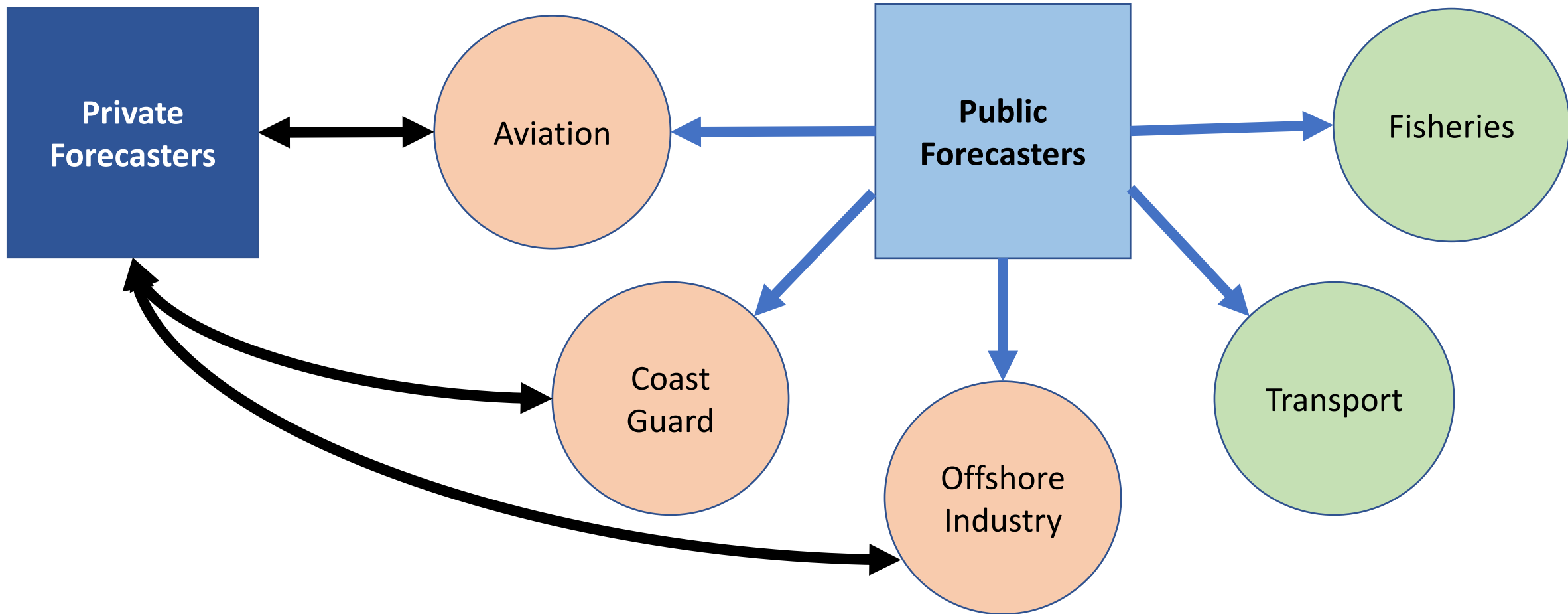
Forecast Use Today



storm_18
sfwmd.gov
weather@sfwmd.gov
24-Oct 19:51EDT

NHC Advisories and County Emergency Management Statements supersede this product. This graphic should complement, not replace, NHC discussions. If anything on this graphic causes confusion, ignore the entire product. For full info, see <http://my.sfwmd.gov/sfwmd/common/images/weather/plots.html>





In-house forecasting employees or outside contractors, providing new/targeted info to meet user needs

Attempt to meet critical needs of all potential stakeholders

Strait of Belle Isle - eastern half

HURRICANE FORCE WIND WARNING IN EFFECT
FREEZING SPRAY WARNING IN EFFECT
ICE PRESSURE WARNING IN EFFECT

Forecast

Weather Conditions

Ice Conditions

Warnings

Synopsis

Warnings (In effect)

Hurricane force wind warning in effect

Strait of Belle Isle - eastern half

Issued 10:00 AM NDT 09 April 2018

'Hurricane' force winds of 64 knots or above are occurring or expected to occur in this marine area. Please refer to the latest [marine forecasts](#) for further details and continue to monitor the situation through Canadian Coast Guard radio or Weatheradio stations.

Freezing spray warning in effect

Strait of Belle Isle - eastern half

Issued 10:00 AM NDT 09 April 2018

Moderate or severe freezing spray is occurring or expected to occur in this marine area. Please refer to the latest [marine forecasts](#) for further details and continue to monitor the situation through Canadian Coast Guard radio or Weatheradio stations.

Ice pressure warning in effect

Strait of Belle Isle - eastern half

Issued 10:00 AM EDT 09 April 2018

Navigators in this marine area should be on the lookout for hazardous ice conditions and take necessary safety precautions. Please refer to the latest [ice forecasts](#) for further details and continue to monitor the situation through Canadian Coast Guard radio stations.