

A satellite-style world map with a network of white lines and dots representing ship routing paths. The lines are most dense in the North Atlantic, the Mediterranean, and the Indian Ocean, showing complex routes around continents and through major shipping lanes. The text 'SHIP ROUTING' is centered over the map in large, bold, black letters.

SHIP ROUTING

- more than just hard weather avoidance



Annika Hjelmsten



Norrköping, Sweden



Annika Hjelmsten
Marine/routing meteorologist

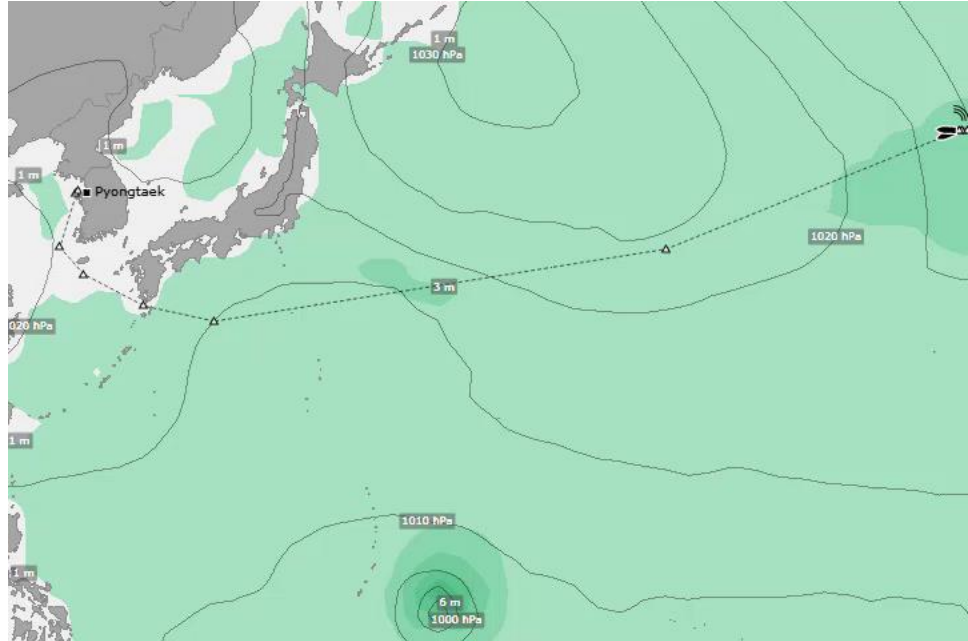


Ship routing

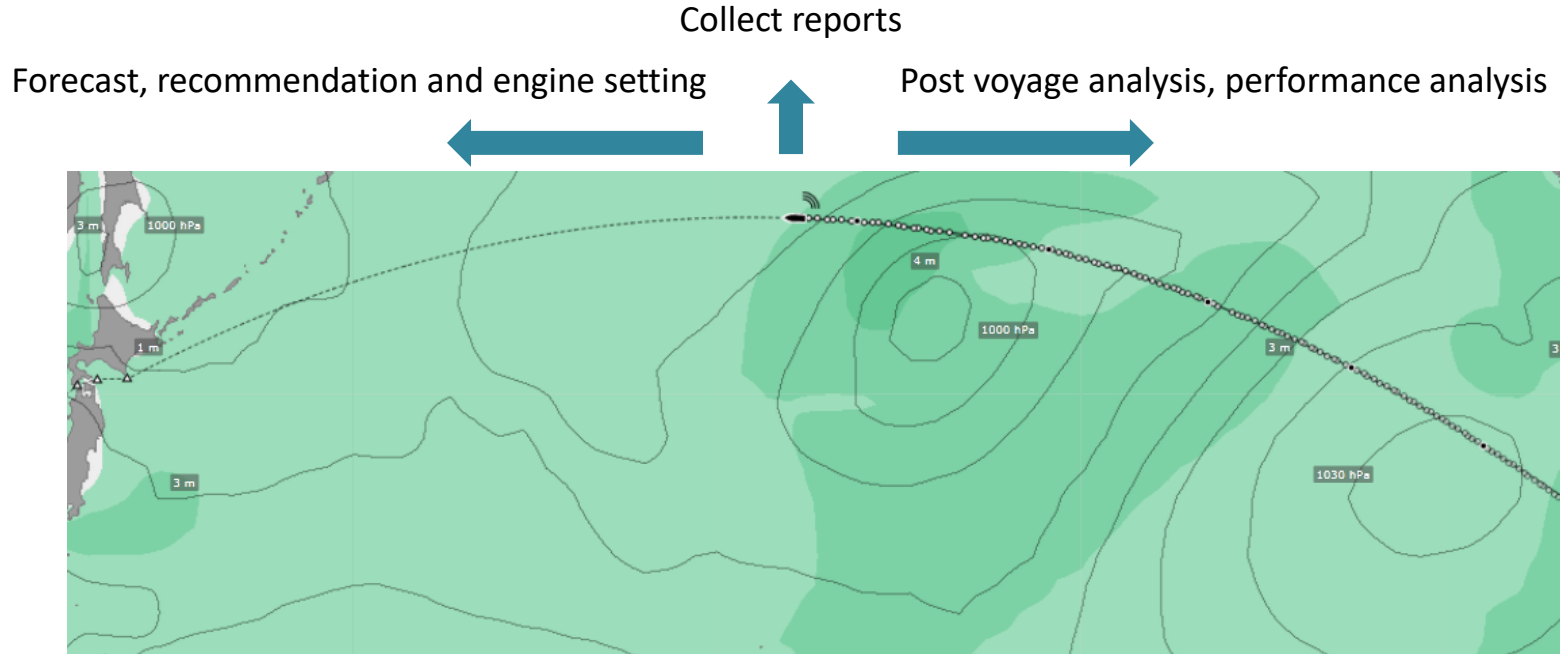
Life
Fuel
Time
Money

- We'll help you save them all

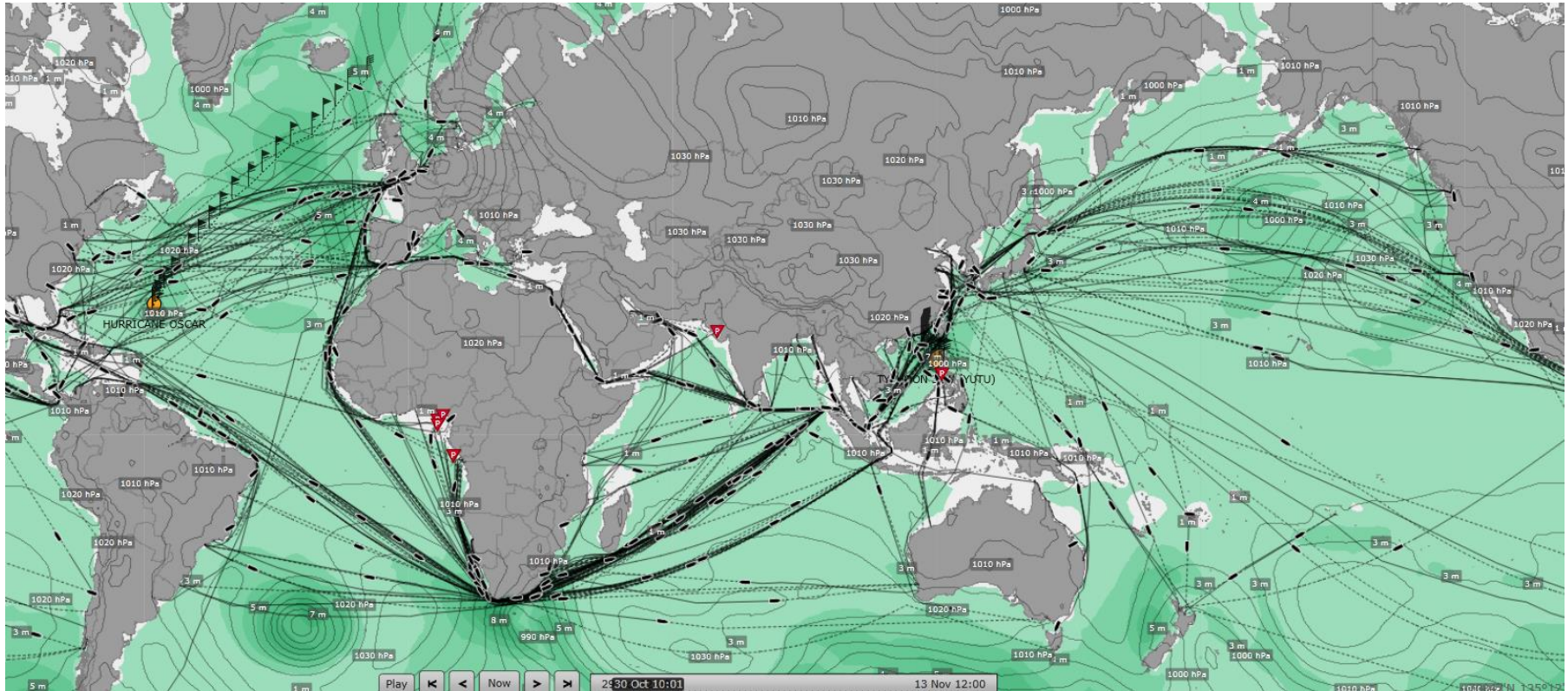
 **SMHI** Weather Solutions™



What do we do?



Forecast products



Vessel characteristics



VLCC loaded 350m



Reefer 170m



Container 350m



Bulk 150m



Car carrier 200m



Tanker 150m



Container 150m



General Cargo 100m

VLCC and Tanker



VLCC

Loaded with oil
No sensitive cargo
When loaded the vessel can handle almost any weather



Tanker

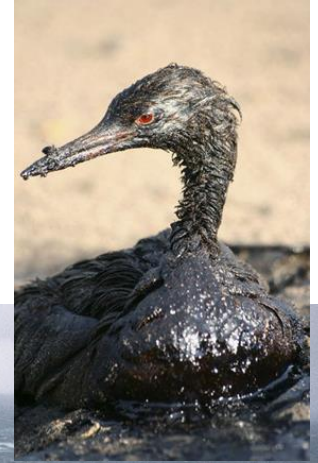
Loaded with oil or chemicals
Generally no sensitive cargo
Vessel may be moderately sensitive to weather



VLCC and Tanker



What can go wrong?



Container



Container



Stacked with containers

Rather stable

Small vessels are more sensitive than large



Container



What can go wrong?



Car Carrier and General Cargo



Car carrier

Loaded with cars or other vehicles
Sensitive cargo
Mostly stable ships



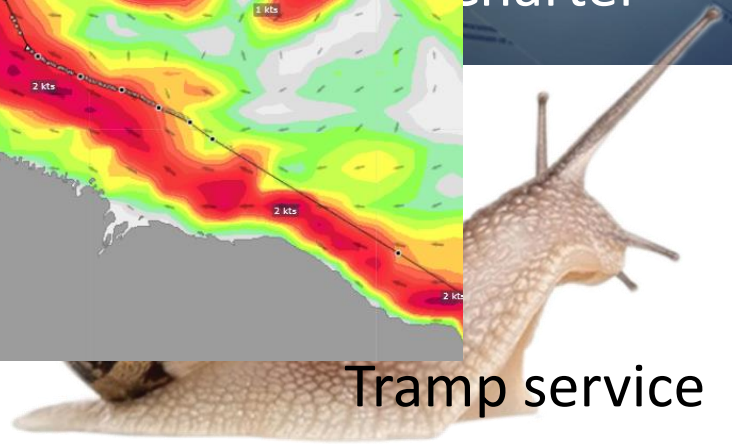
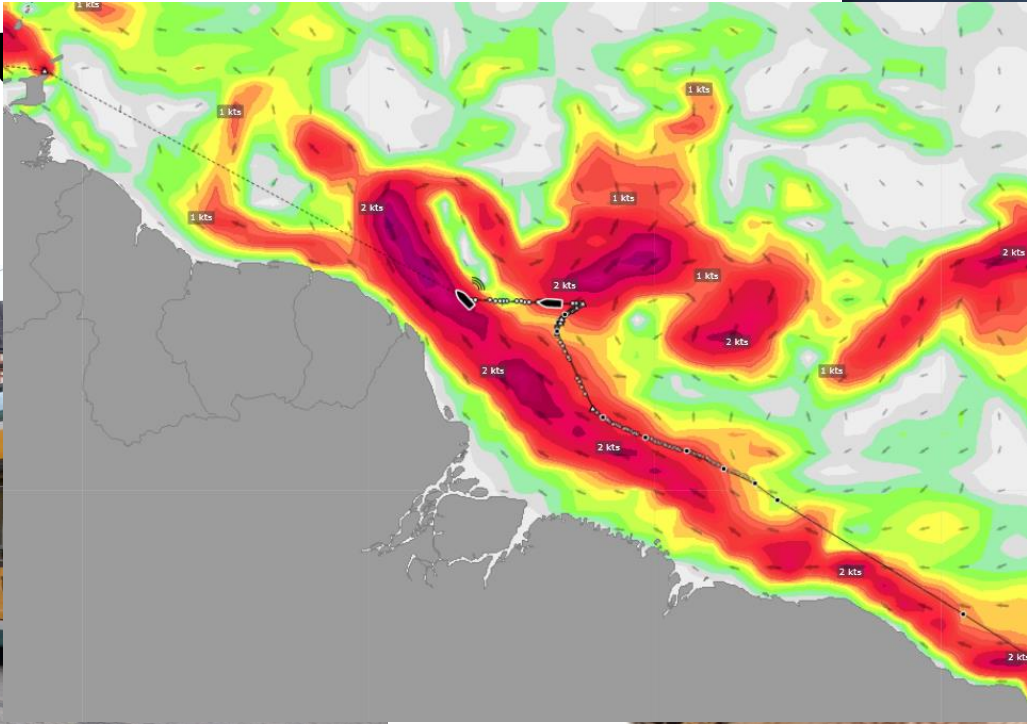
General Cargo

Loaded with anything
May have very sensitive cargo
Vessel is sensitive to rolling



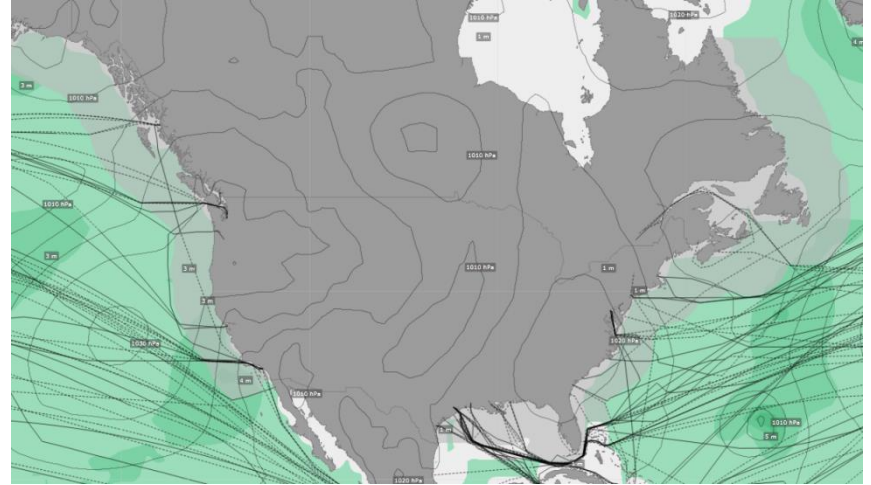
Different kinds of operators

-different

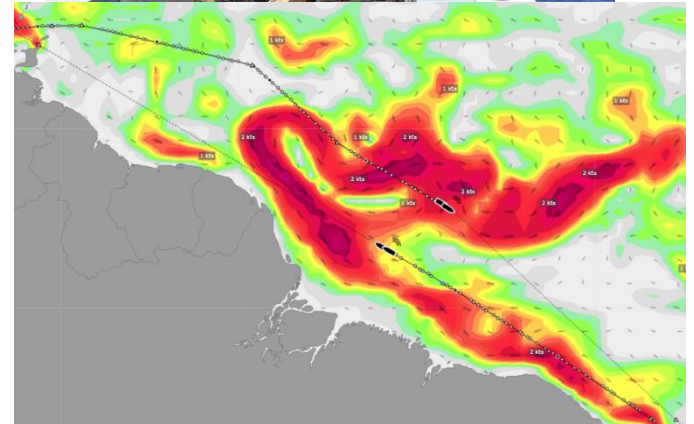
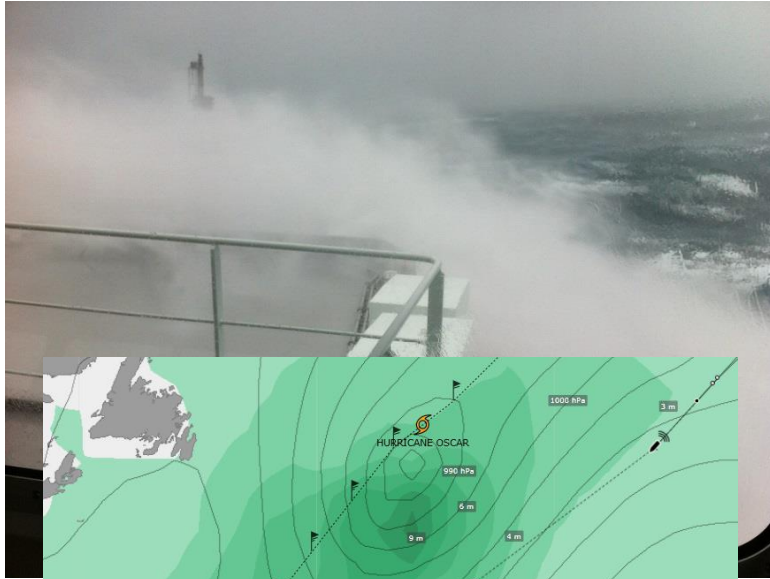


Route planning

- Wind and waves
- Currents
- Sea ice and ice bergs
- Emission Control Area (ECA)
- Pirates



When is routing most needed?



The weather affects a ships speed

Speed over ground (SOG) – reported by the vessel

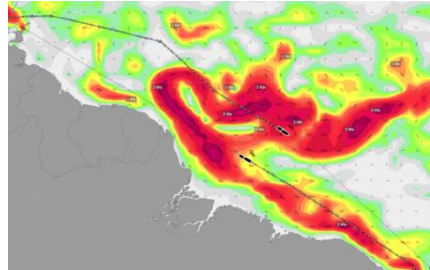
Speed trough water (STW) – actual preformed speed

$$\text{STW} = \text{SOG} - \text{weather factor} - \text{current factor}$$

Calculated SOG for STW 13 kts

Date/Time	Calc SOG kts	Current factor kts	Weather factor kts
29/18UTC	13.3	0.5	-0.1
30/00UTC	14.0	1.1	-0.1
30/06UTC	13.8	0.9	-0.1
30/12UTC	14.5	1.6	-0.1
30/18UTC	14.5	1.6	-0.1

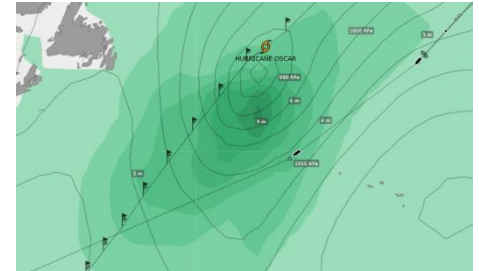
No significant weather
Favourable current



Calculated SOG for STW 10 kts

Date/Time	Calc SOG kts	Current factor kts	Weather factor kts
30/18UTC	7.5	0.2	-3.7
31/00UTC	8.5	0.3	-2.8
31/06UTC	8.9	0.3	-2.4
31/12UTC	9.2	0.1	-1.9
31/18UTC	9.2	-0.1	-1.6

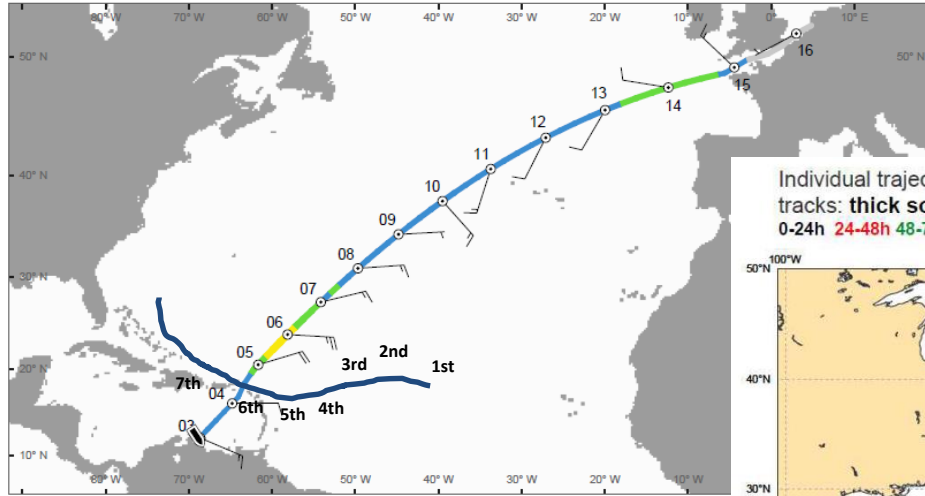
Adverse weather
No significant current



Hard weather avoidance



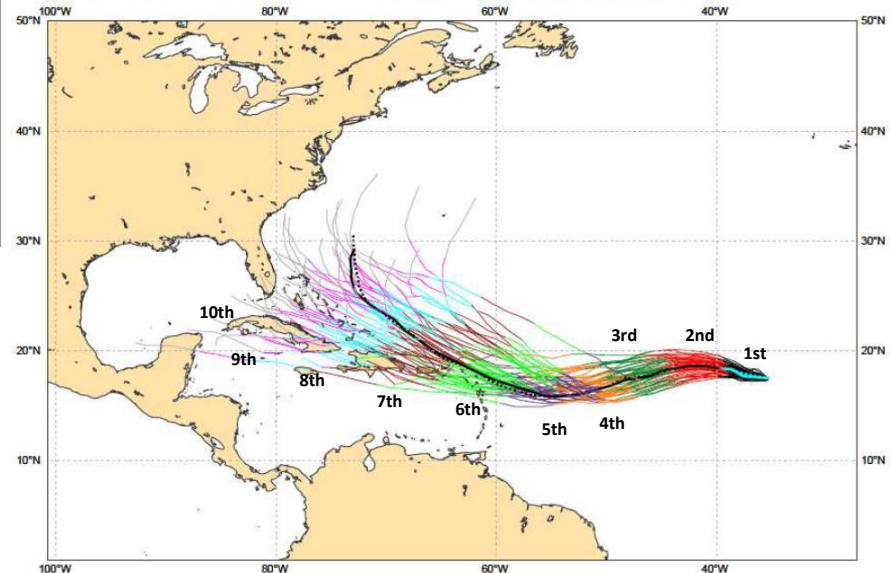
Small tanker vs. Hurricane Irma



RECOMMENDED ROUTE

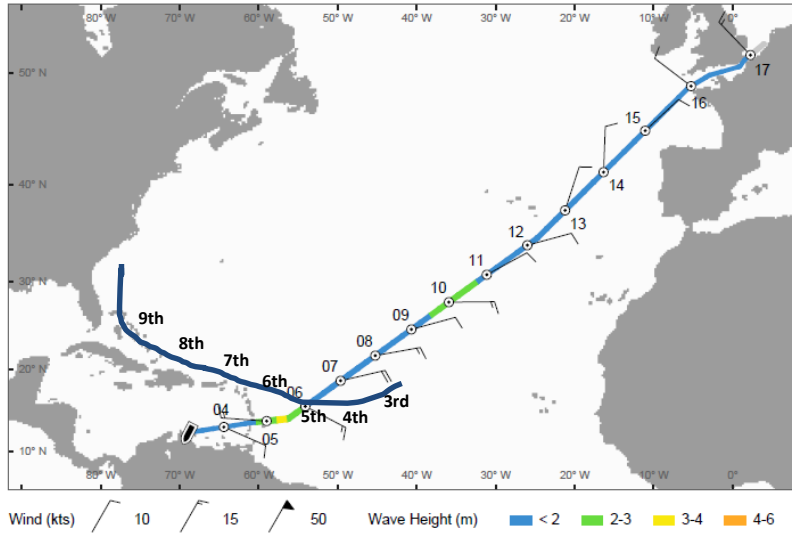
RL via Sombbrero Passage, direct GC to English Channel and RL for Amsterdam.

Individual trajectories for **IRMA** during the next 240 hours
 tracks: **thick solid**=HRES; **thick dot**=CTRL; **thin solid**=EPS members [coloured]
 0-24h 24-48h 48-72h 72-96h 96-120h 120-144h 144-168h 168-192h 192-216h 216-240h



3 days before departure,
 Expected to sail ahead of HR Irma on 5th-6th

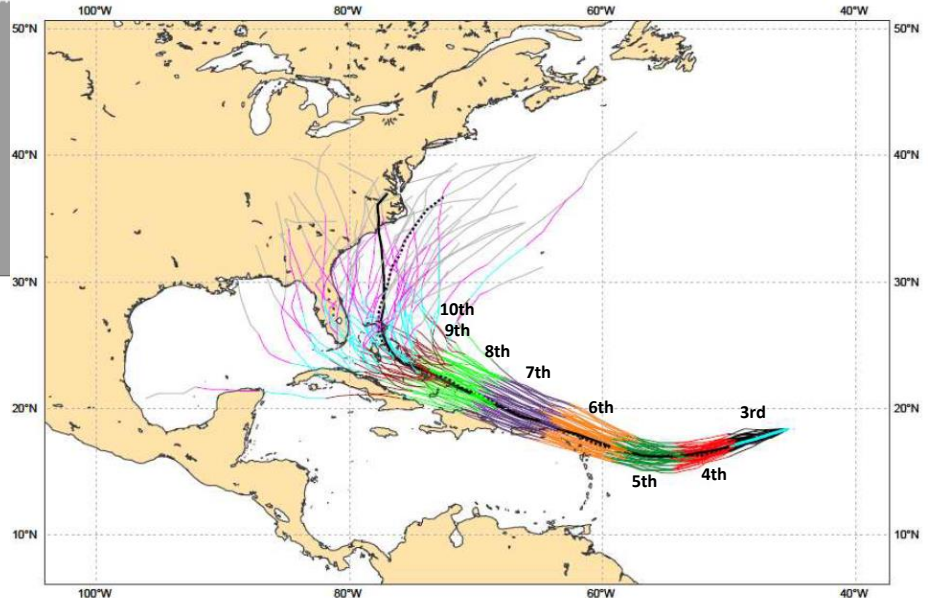
Small tanker vs. Hurricane Irma



RECOMMENDED ROUTE

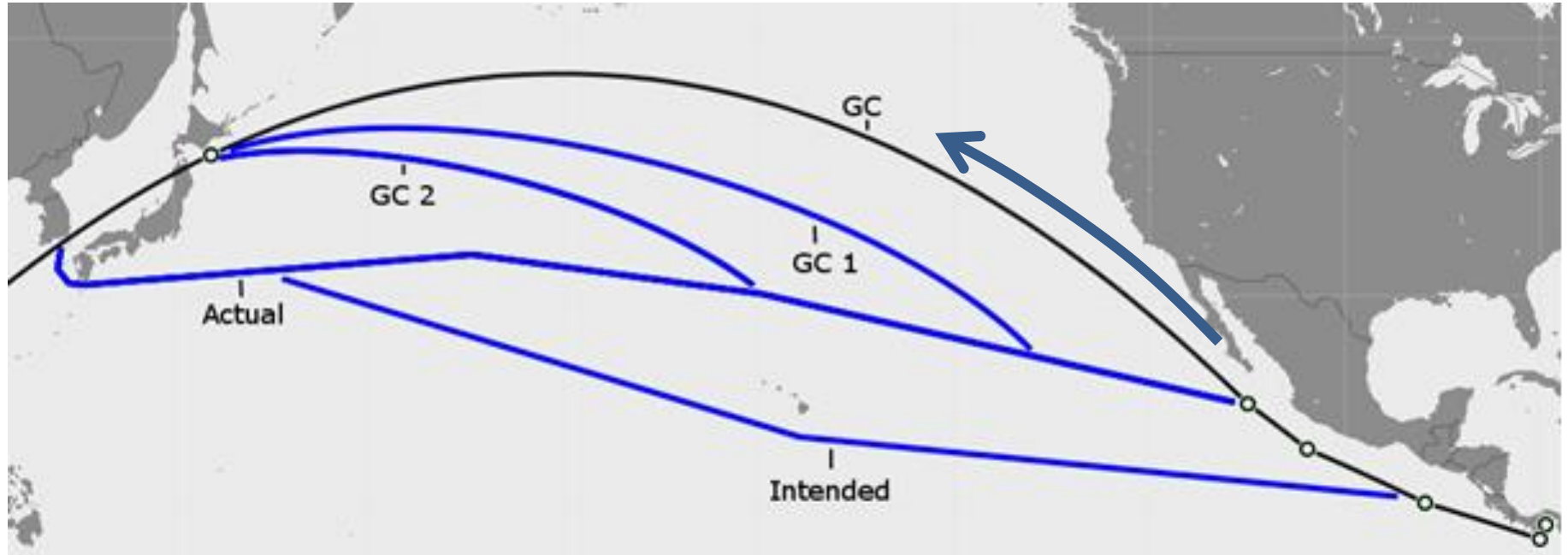
RL via St Vincent Channel, S of the Azores to the English Channel for Amsterdam.

Individual trajectories for **IRMA** during the next 240 hours
 tracks: **thick solid**=HRES; **thick dot**=CTRL; **thin solid**=EPS members [coloured]
 0-24h 24-48h 48-72h 72-96h 96-120h 120-144h 144-168h 168-192h 192-216h 216-240h



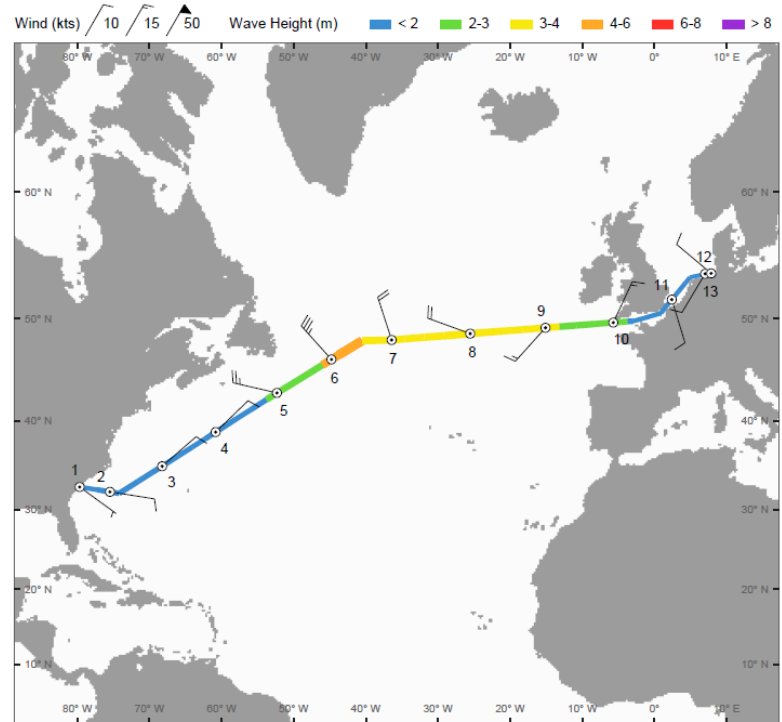
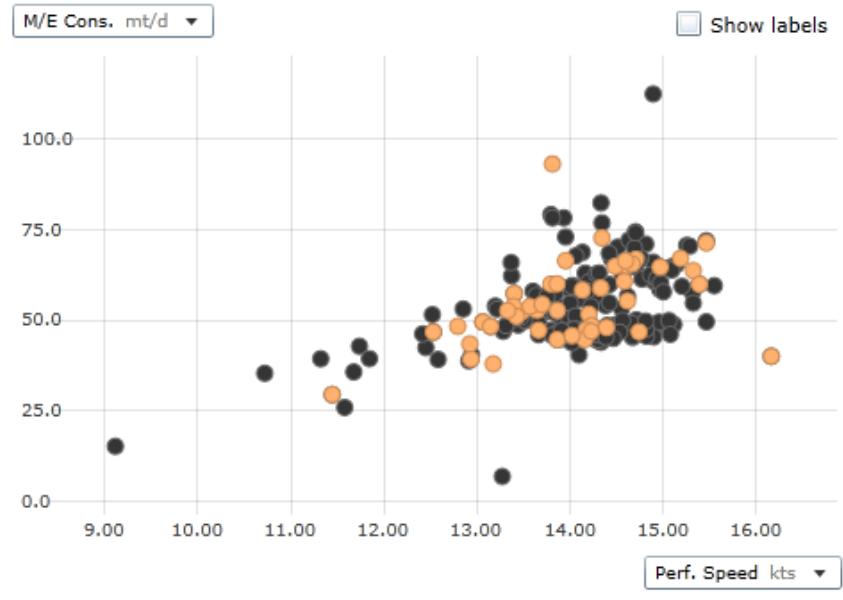
The day of departure, vessel was delayed by 6 hours
 Routed behind Irma

Choosing the optimal route

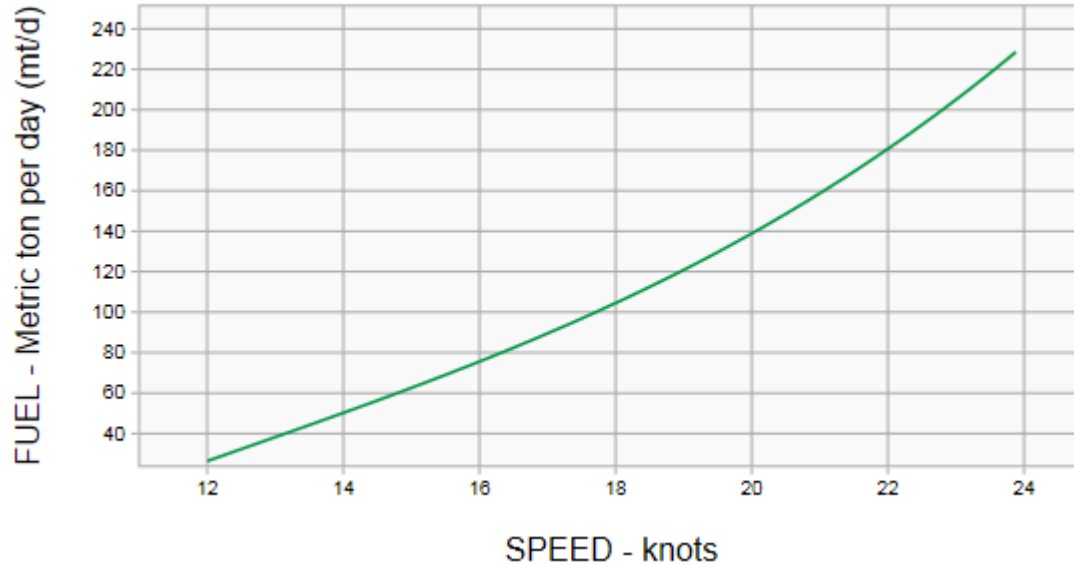


Post Voyage Analysis

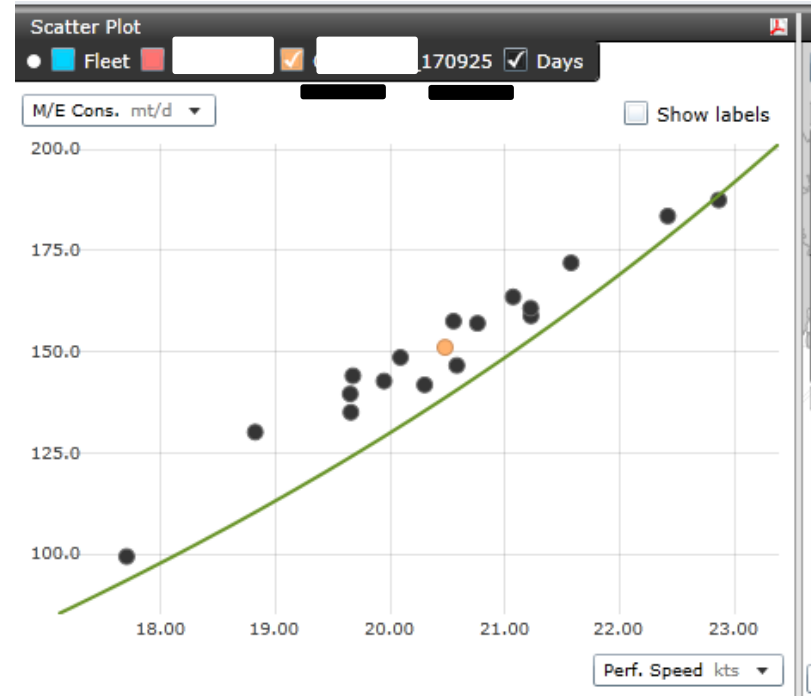
How looking back in time help us predict the future.



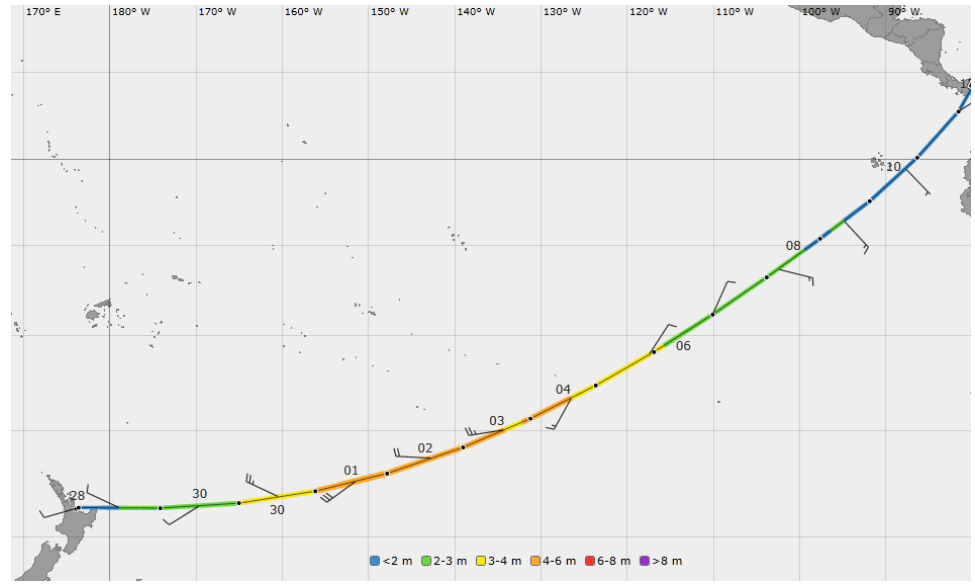
Performance analysis



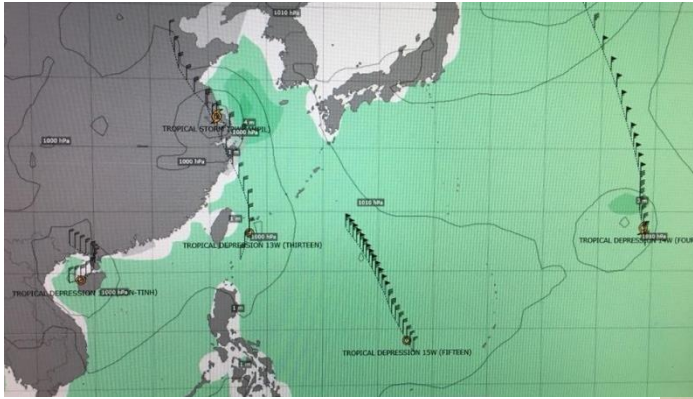
Need a hull cleaning?



Appels and kiwis



There is always a storm somewhere!



Thank you for listening!