

Intercomparison of operational wave forecasting systems against  
in-situ observations: data from BoM, DMI, DWD, ECCO,  
ECMWF, JMA, LOPS, METEOAM, METFR, METNO, NCEP,  
PRTOS, SHNSM, UKMO.

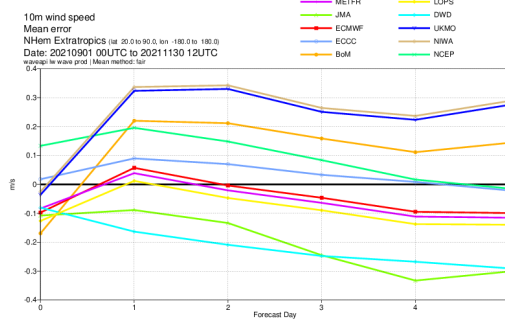
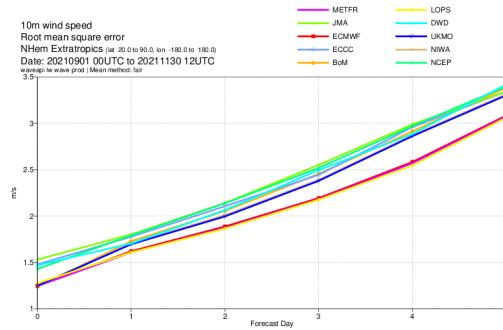
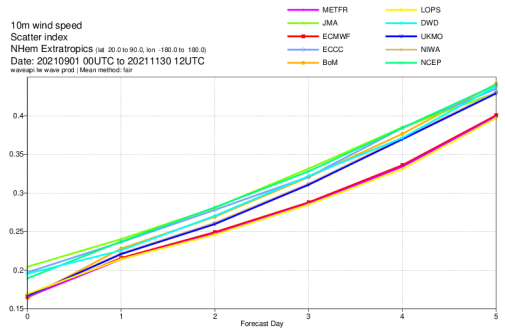
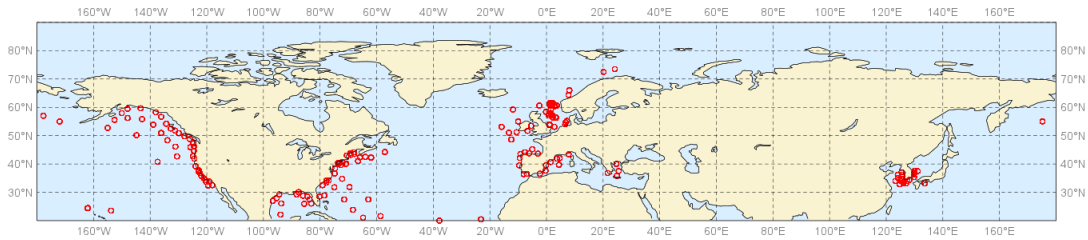
00 and 12 UTC runs

WMO Lead Centre for Wave Forecast Verification LC-WFV,  
European Centre for Medium-Range Weather Forecasts ECMWF

December 13, 2021

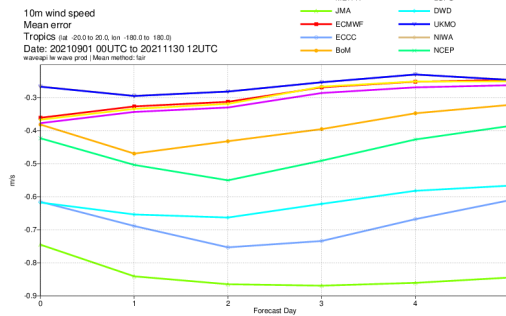
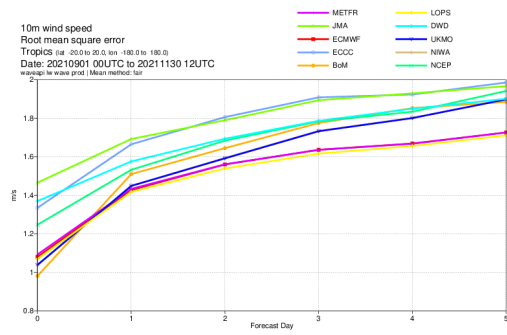
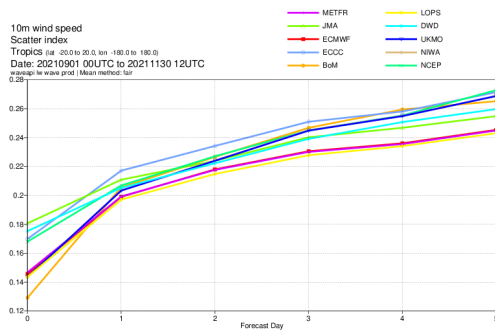
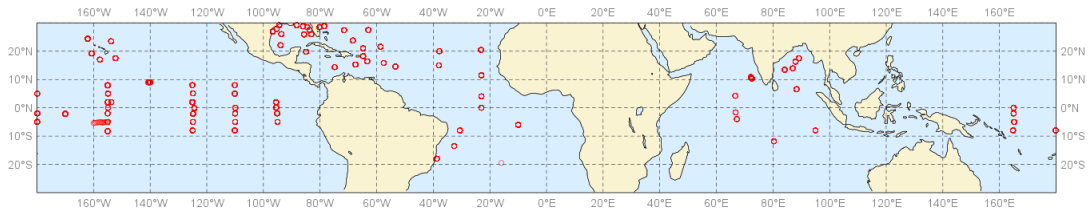
**PART III: 10 meter wind speed (10ff)**

Buoys observations - from 20210901 to 20211130 - (10ff)



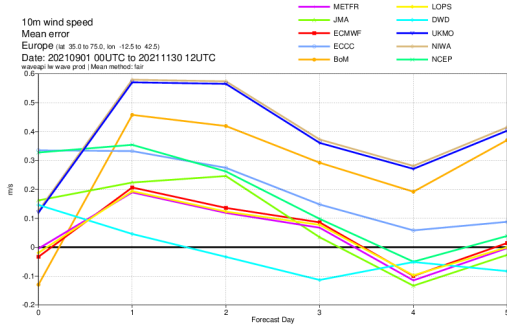
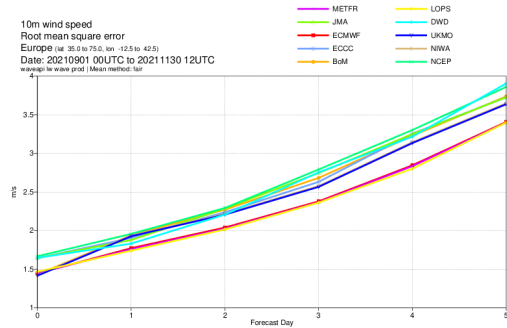
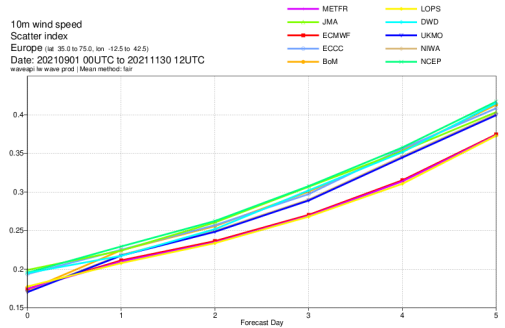
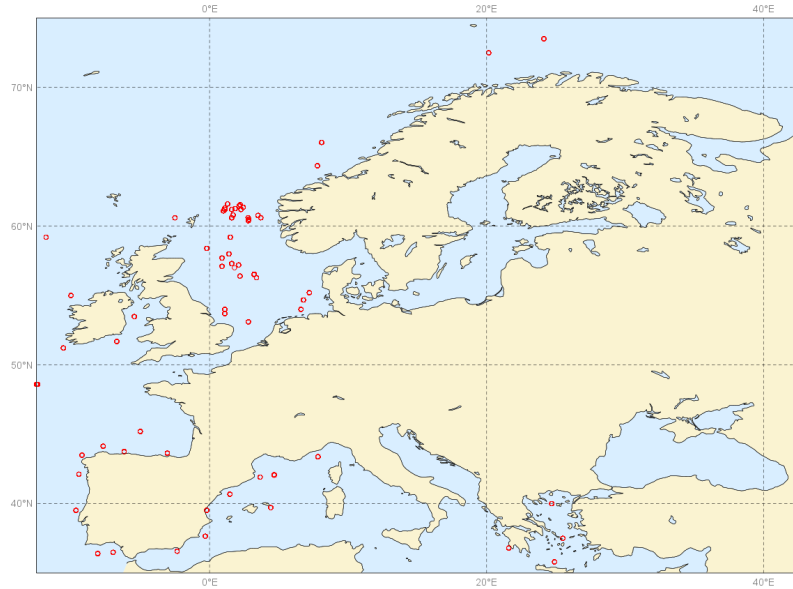
**Northern Hemisphere.** Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

Buoys observations - from 20210901 to 20211130 - (10ff)



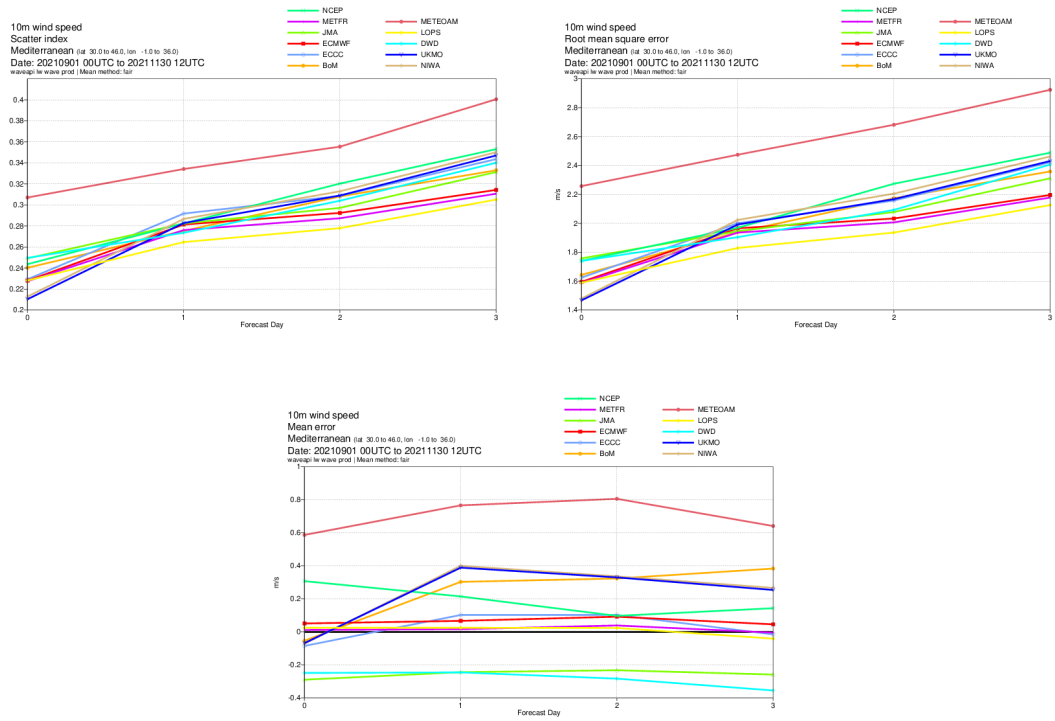
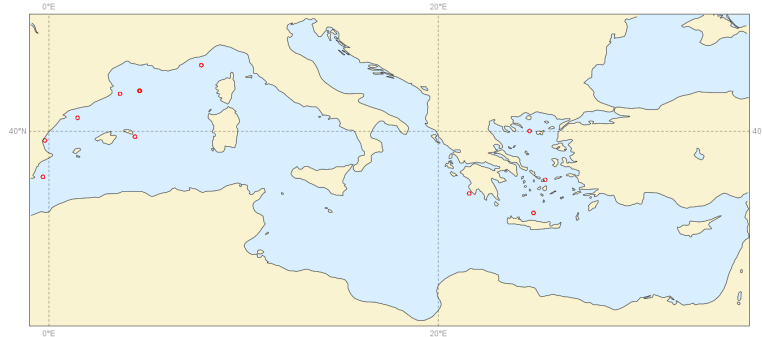
**Tropics.** Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

Buoys observations - from 20210901 to 20211130 - (10ff)



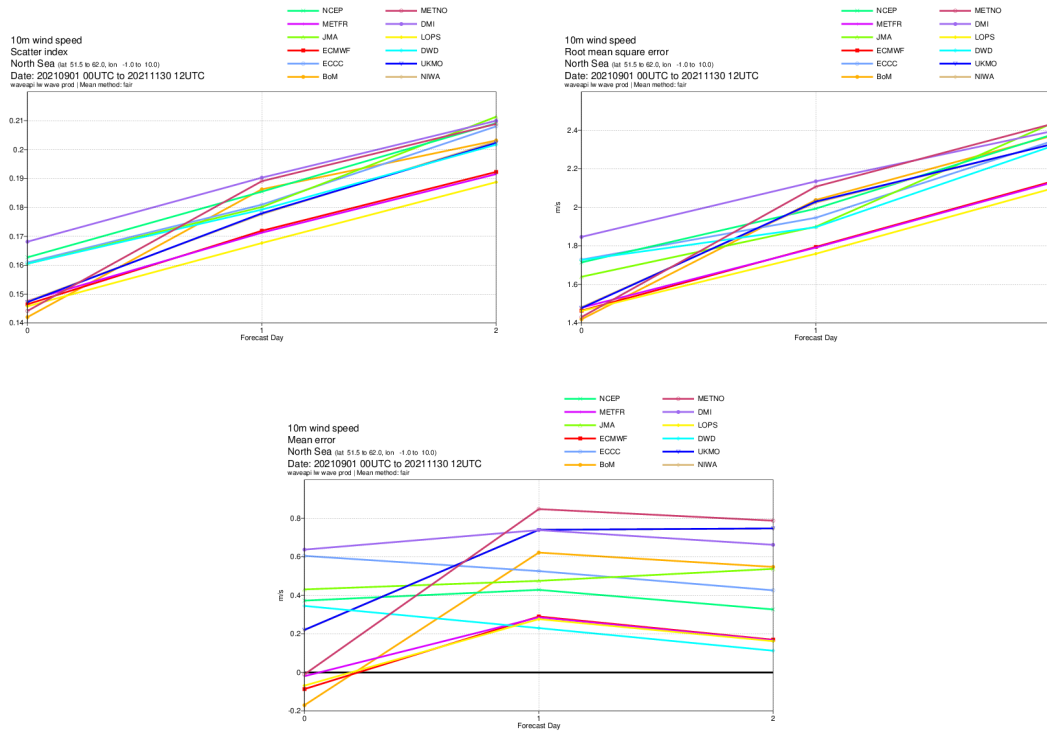
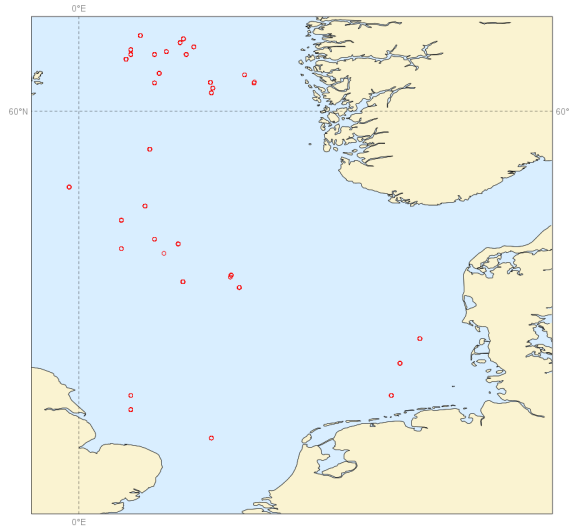
**Europe.** Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

Buoys observations - from 20210901 to 20211130 - (10ff)



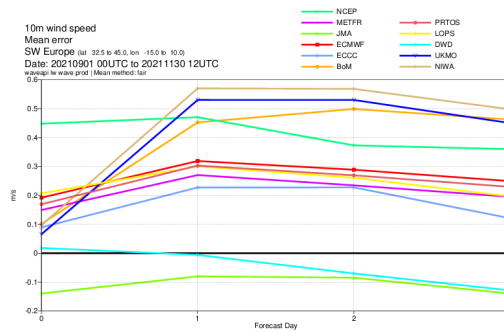
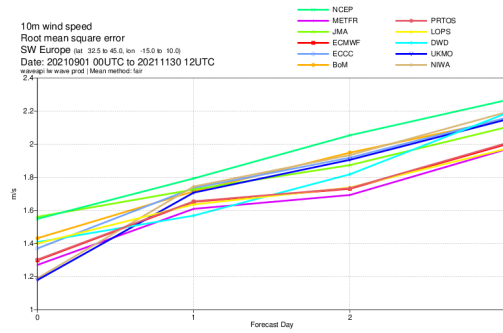
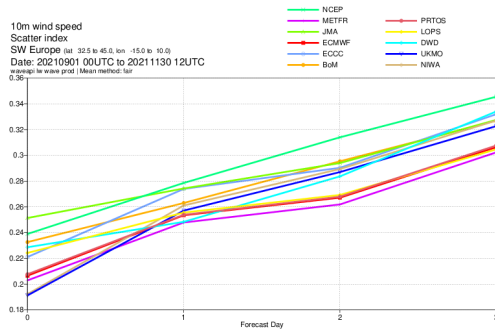
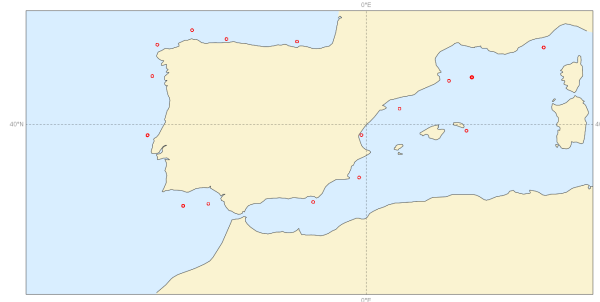
**Mediterranean Sea.** Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

Buoys observations - from 20210901 to 20211130 - (10ff)



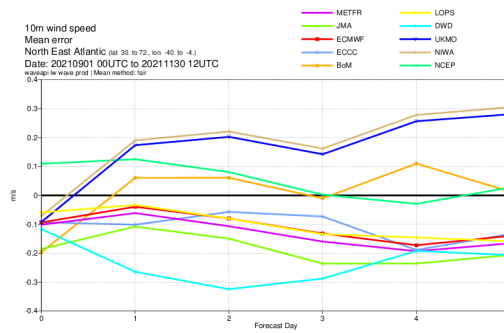
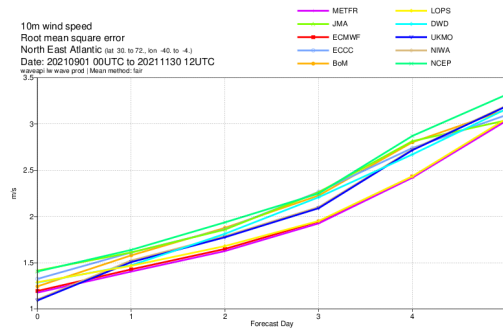
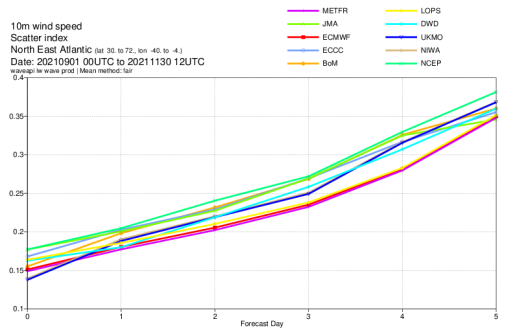
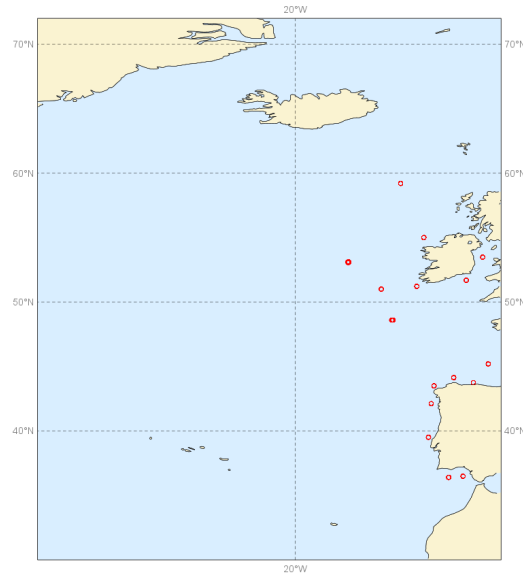
**North Sea.** Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

Buoys observations - from 20210901 to 20211130 - (10ff)



**South West Europe.** Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

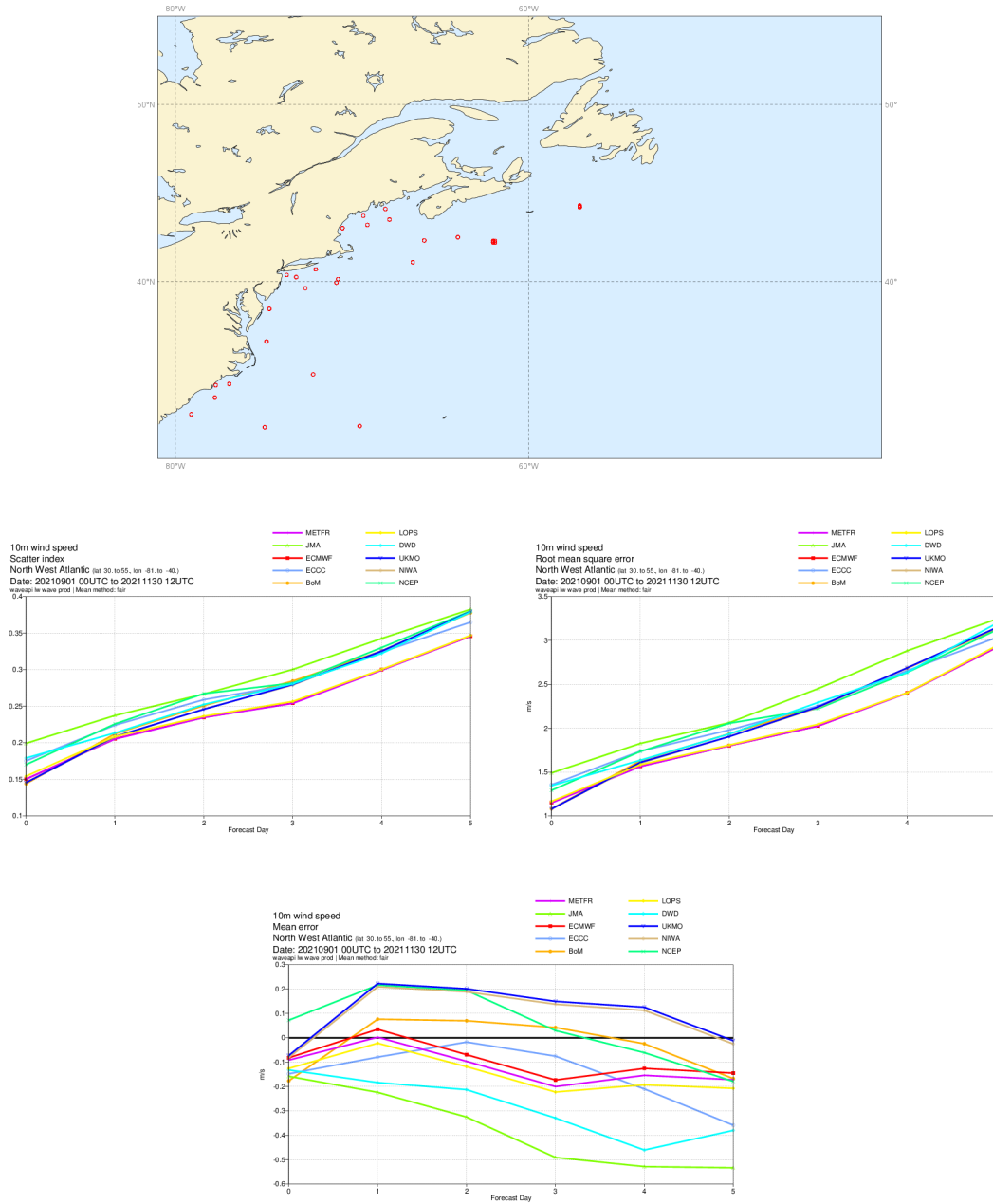
Buoys observations - from 20210901 to 20211130 - (10ff)



**North East Atlantic.** Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

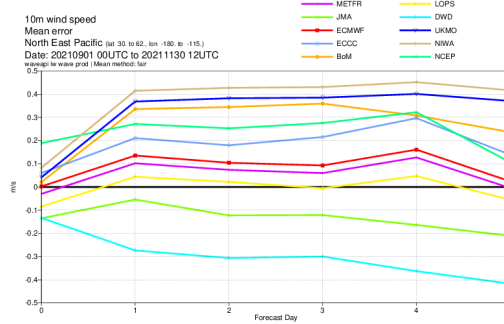
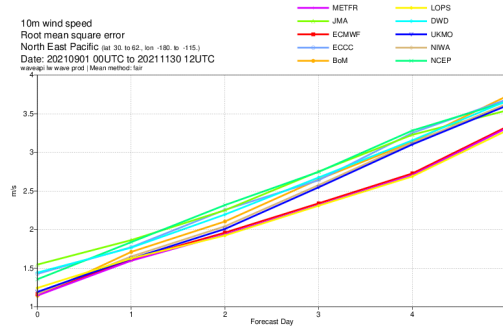
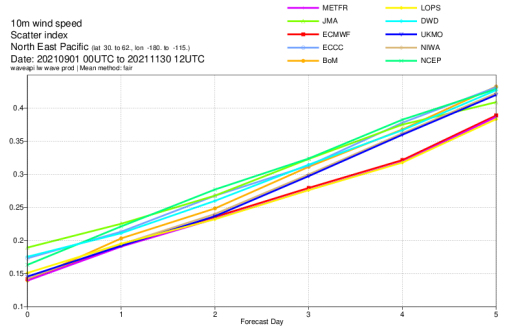
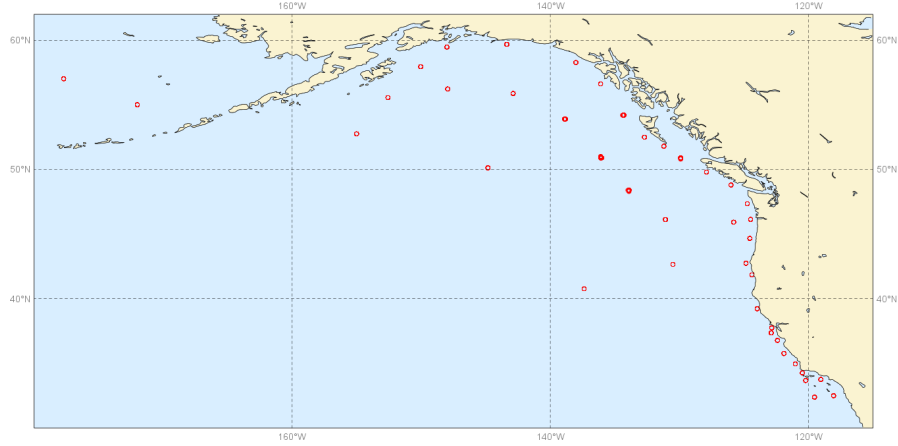


Buoys observations - from 20210901 to 20211130 - (10ff)



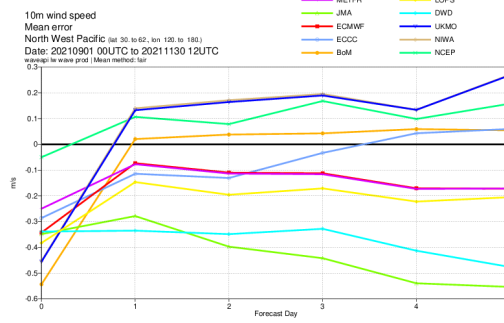
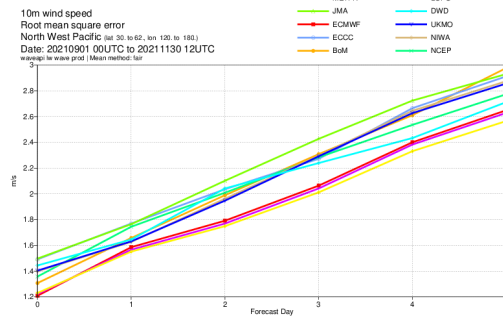
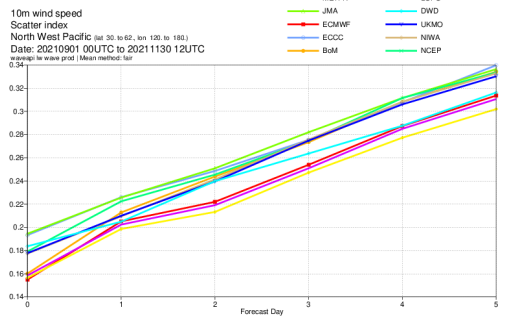
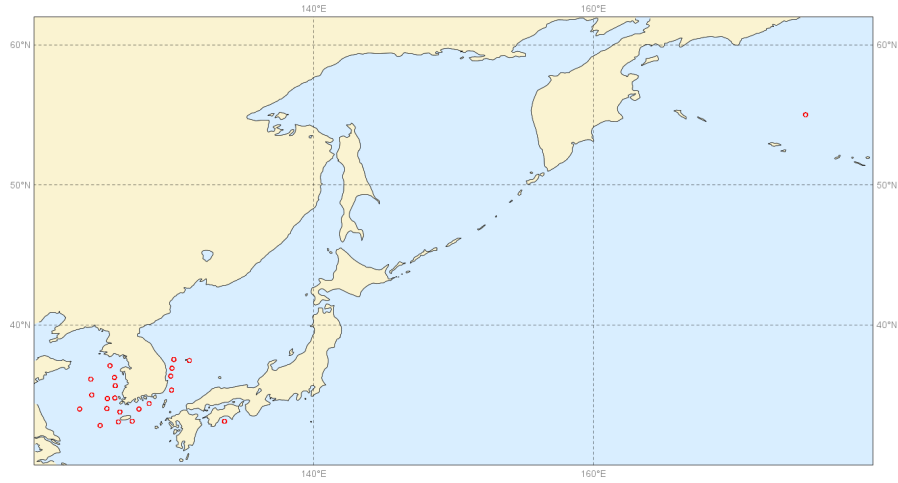
**North West Atlantic.** Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

Buoys observations - from 20210901 to 20211130 - (10ff)



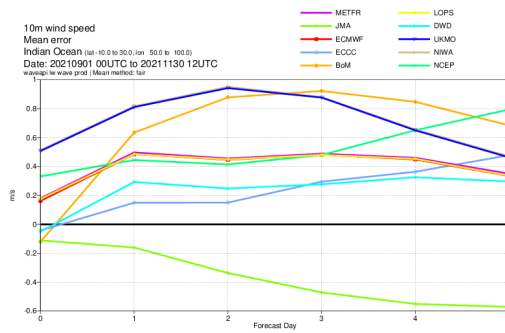
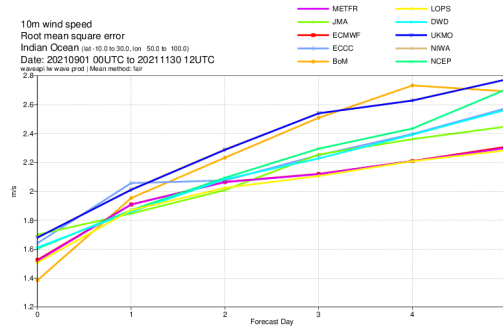
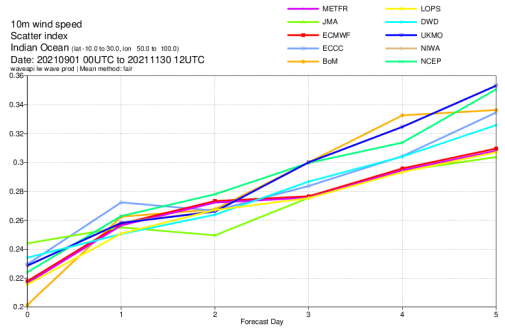
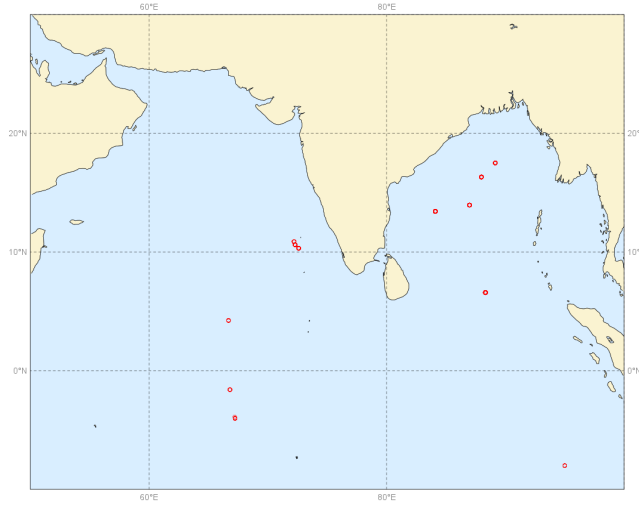
**North East Pacific.** Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

Buoys observations - from 20210901 to 20211130 - (10ff)



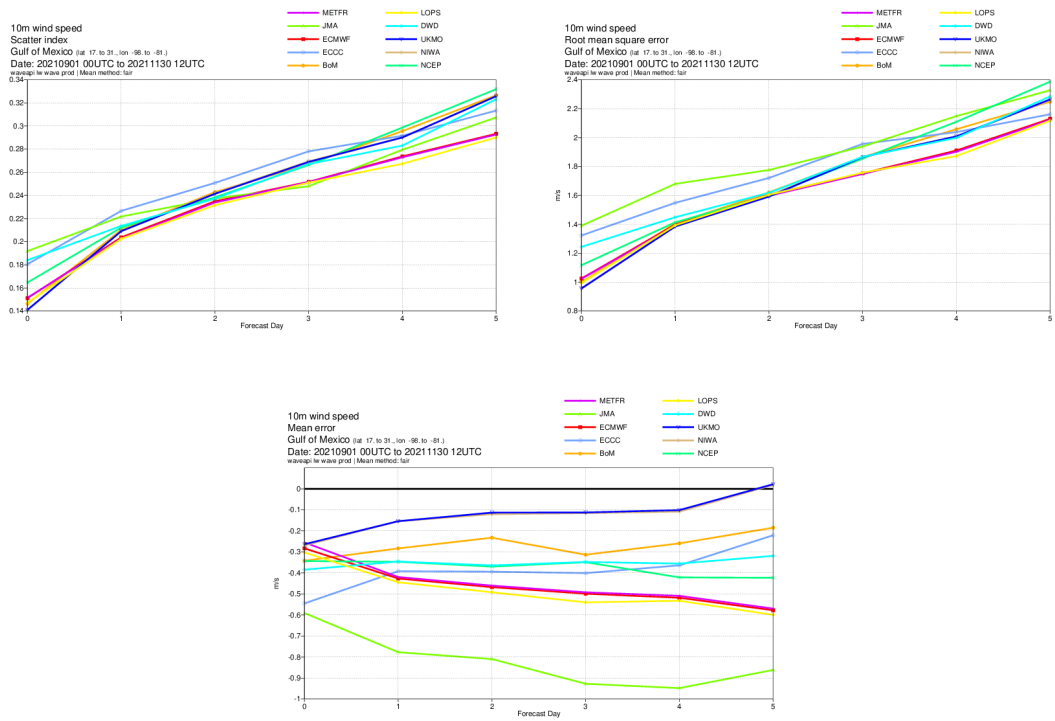
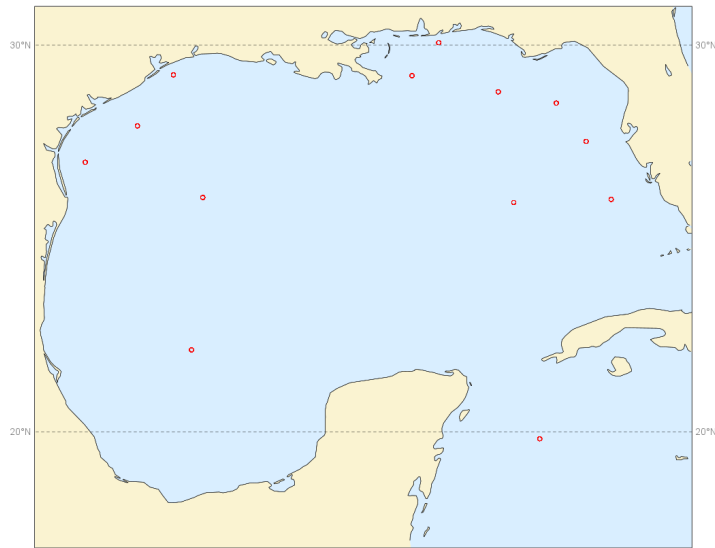
**North West Pacific.** Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

Buoys observations - from 20210901 to 20211130 - (10ff)



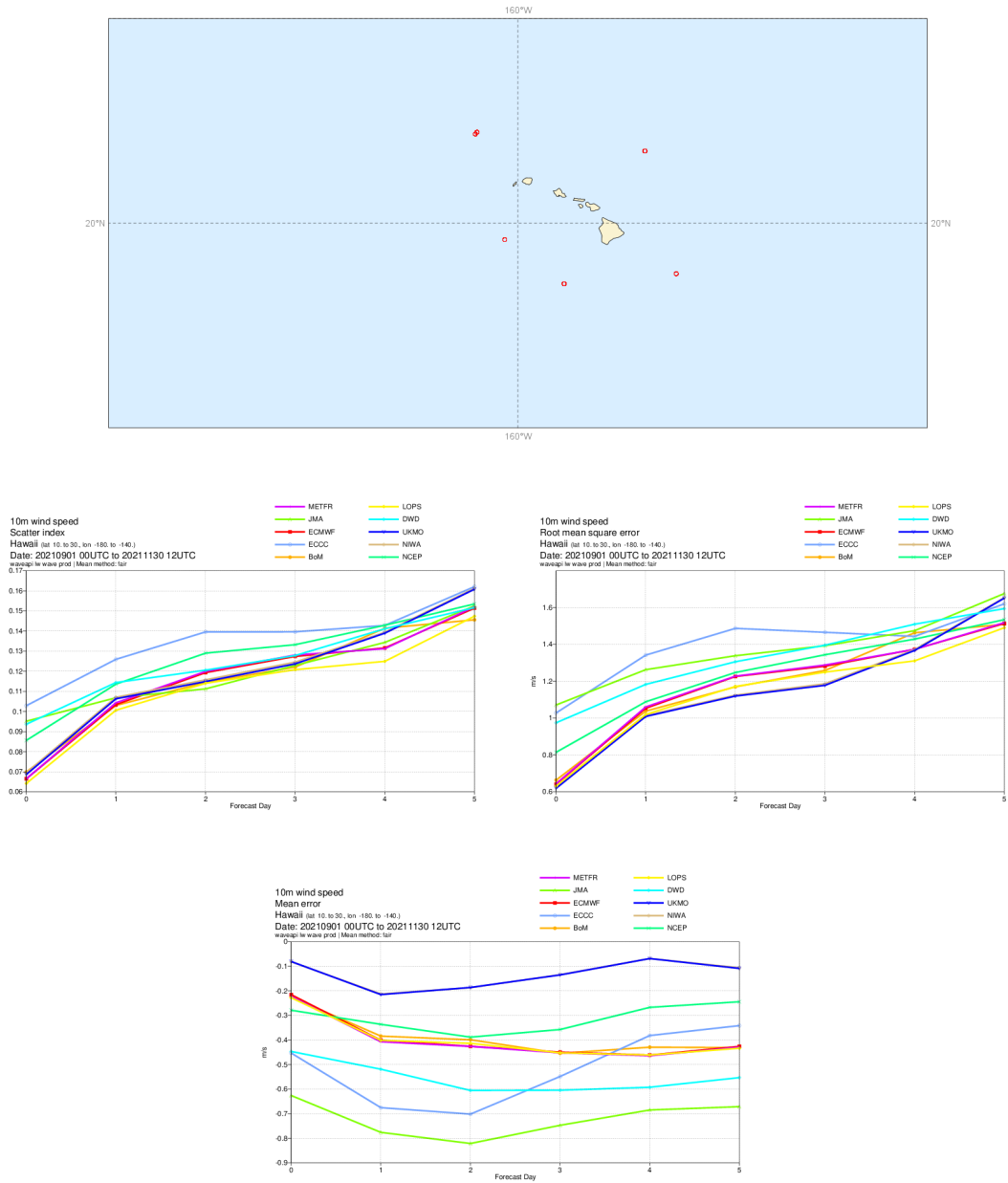
**Indian Ocean.** Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

Buoys observations - from 20210901 to 20211130 - (10ff)



**Gulf of Mexico.** Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

Buoys observations - from 20210901 to 20211130 - (10ff)

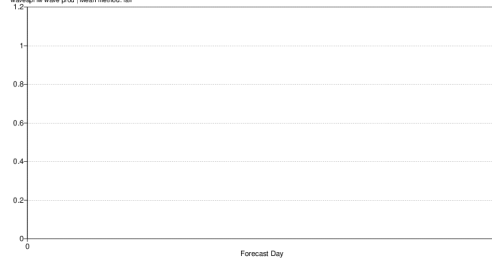


**Hawaii.** Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

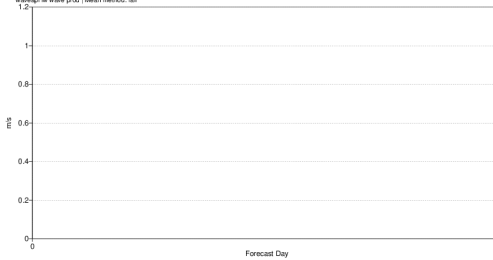
Buoys observations - from 20210901 to 20211130 - (10ff)



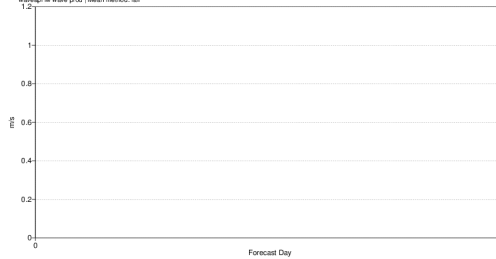
10m wind speed  
Scatter index  
S America (south) (lat -57.5 to -12.5, lon -80.0 to -42.5)  
Date: 20210901 00UTC to 20211130 12UTC  
Average for every grid. Mean method. lat



10m wind speed  
Root mean square error  
S America (south) (lat -57.5 to -12.5, lon -80.0 to -42.5)  
Date: 20210901 00UTC to 20211130 12UTC  
Average for every grid. Mean method. lat

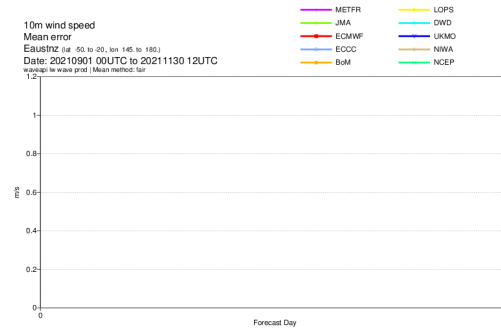
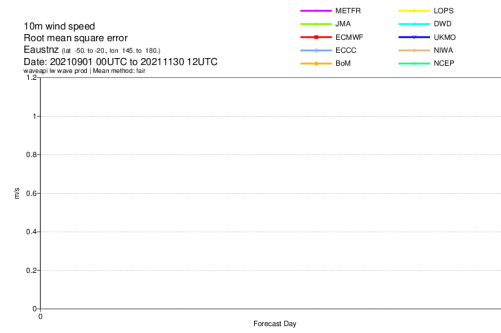
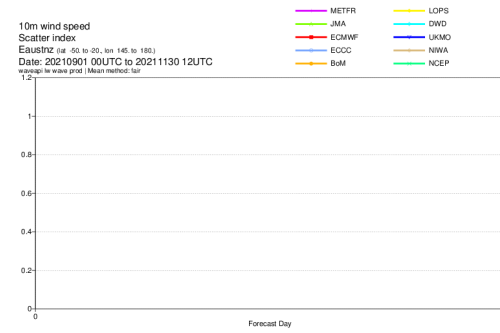
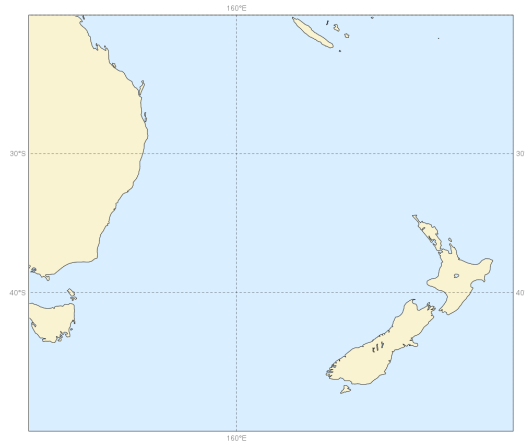


10m wind speed  
Mean error  
S America (south) (lat -57.5 to -12.5, lon -80.0 to -42.5)  
Date: 20210901 00UTC to 20211130 12UTC  
Average for every grid. Mean method. lat



**South of South America.** Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

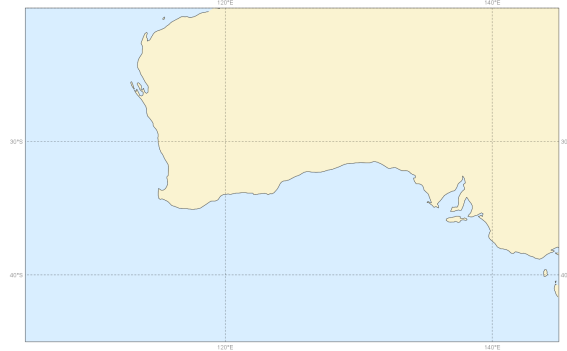
Buoys observations - from 20210901 to 20211130 - (10ff)



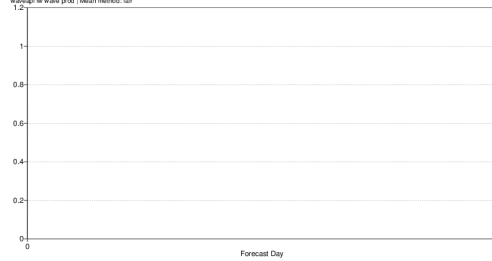
**East Australia - New Zealand.** Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).



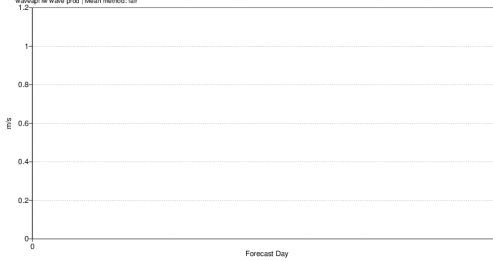
Buoys observations - from 20210901 to 20211130 - (10ff)



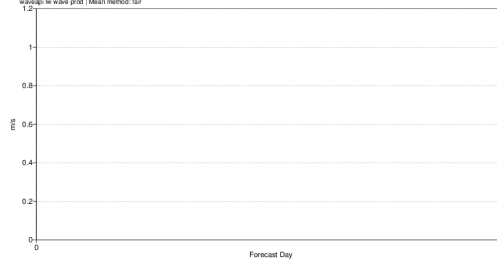
10m wind speed  
Scatter index  
Ssw.australia (lat 45 to 30, lon 105 to 145)  
Date: 20210901 00UTC to 20211130 12UTC  
wpsq: le wave prod | Mean method: tar



10m wind speed  
Root mean square error  
Ssw.australia (lat 45 to 30, lon 105 to 145)  
Date: 20210901 00UTC to 20211130 12UTC  
wpsq: le wave prod | Mean method: tar



10m wind speed  
Mean error  
Ssw.australia (lat 45 to 30, lon 105 to 145)  
Date: 20210901 00UTC to 20211130 12UTC  
wpsq: le wave prod | Mean method: tar



**South South West Australia.** Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).