

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

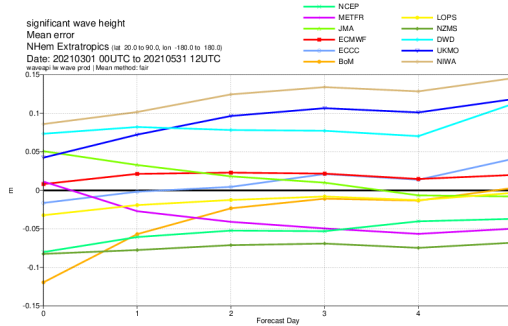
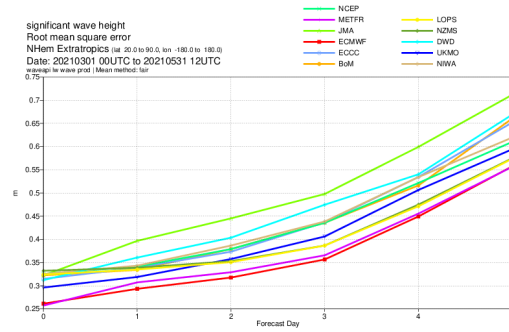
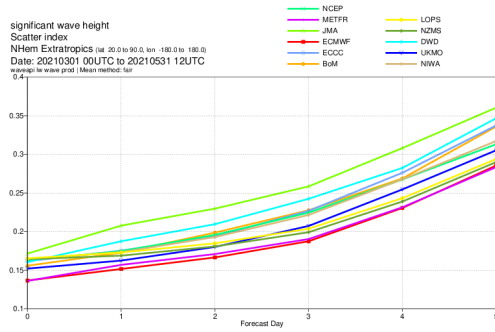
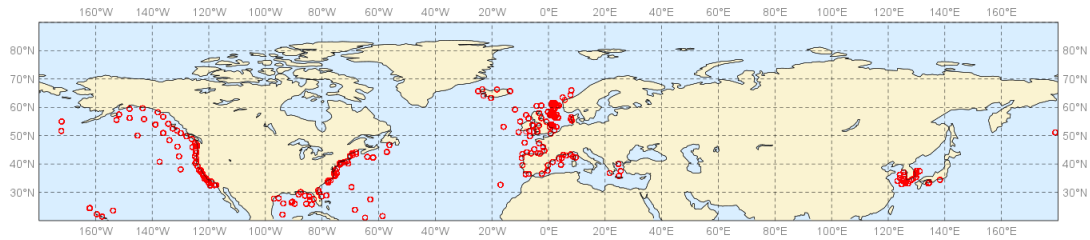
00 and 12 UTC runs

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

June 21, 2021

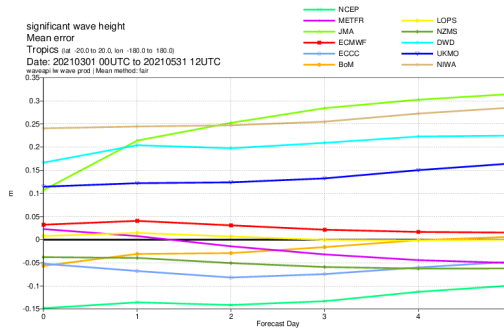
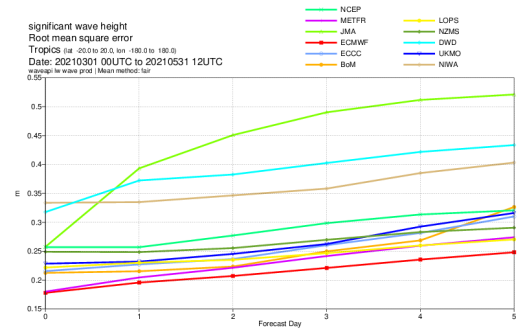
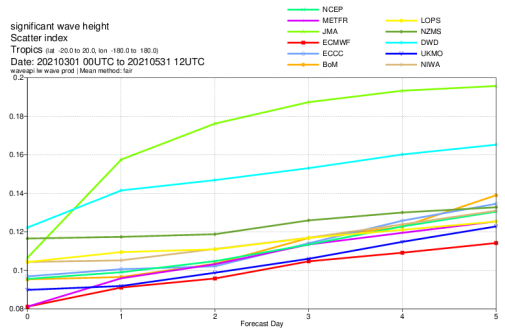
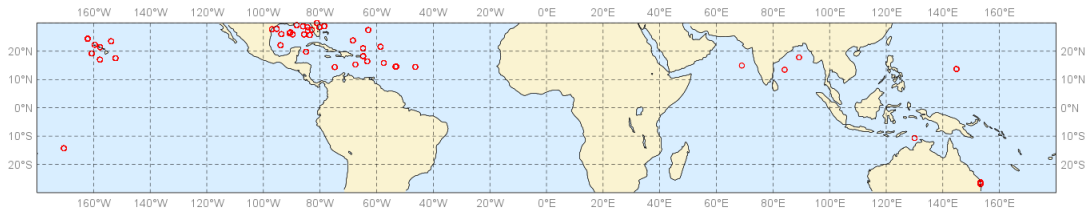
**PART I: significant wave height (SWH)**

Buoys observations - from 20210301 to 20210531 - (swh)



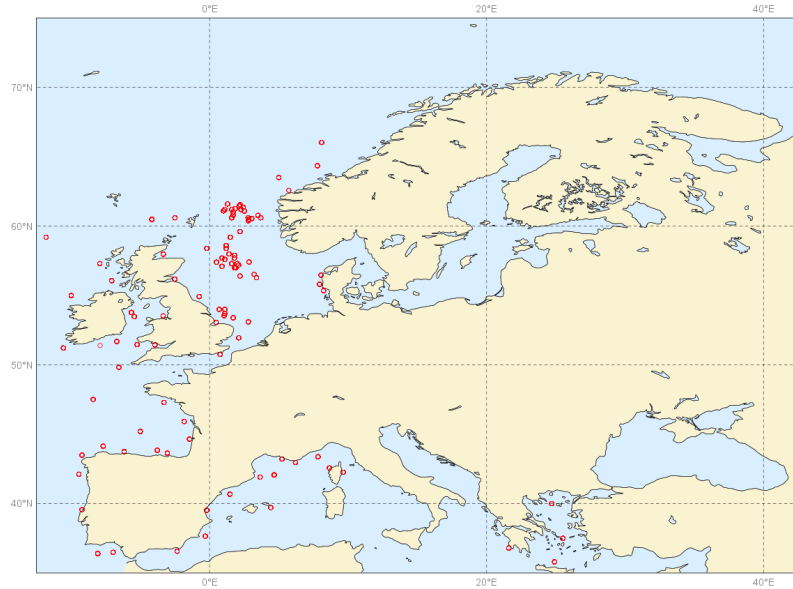
**Northern Hemisphere.** Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

Buoys observations - from 20210301 to 20210531 - (swh)

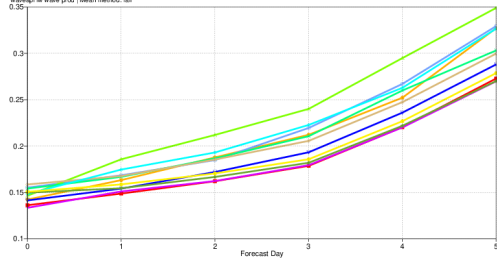


**Tropics.** Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

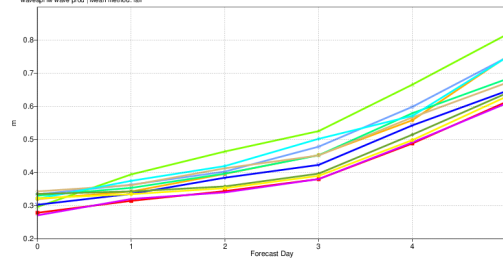
Buoys observations - from 20210301 to 20210531 - (swh)



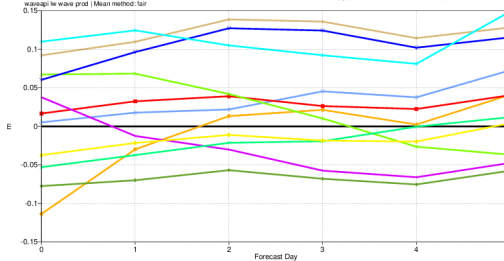
significant wave height  
Scatter index  
Europe (lat: 35.0 to 75.0, lon: -12.5 to 42.5)  
Date: 20210301 00UTC to 20210531 12UTC  
Average for wave prod. (Mean method, lat)



significant wave height  
Root mean square error  
Europe (lat: 35.0 to 75.0, lon: -12.5 to 42.5)  
Date: 20210301 00UTC to 20210531 12UTC  
Average for wave prod. (Mean method, lat)

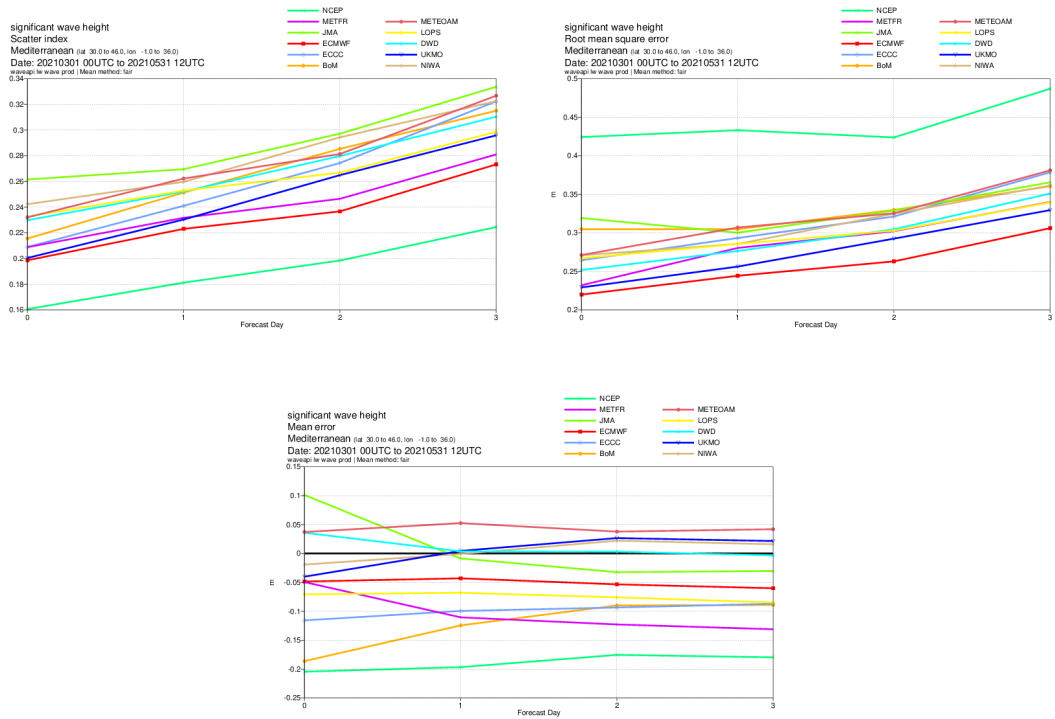
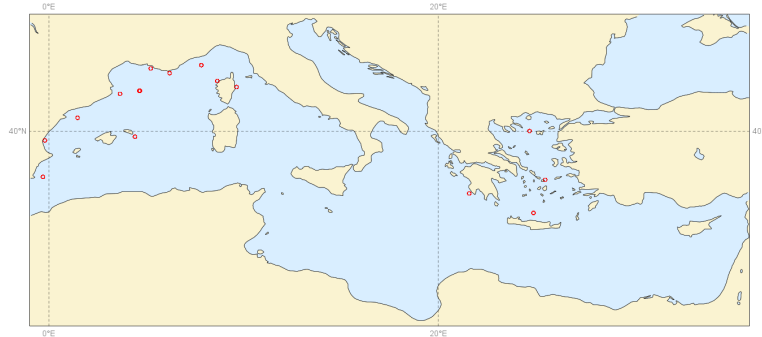


significant wave height  
Mean error  
Europe (lat: 35.0 to 75.0, lon: -12.5 to 42.5)  
Date: 20210301 00UTC to 20210531 12UTC  
Average for wave prod. (Mean method, lat)



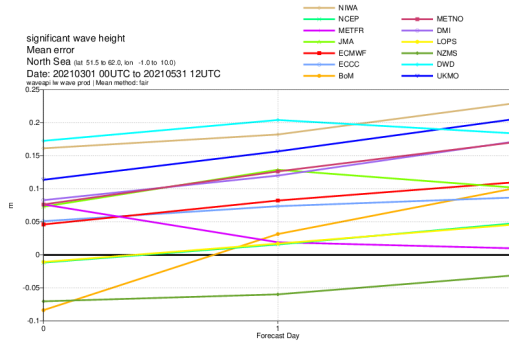
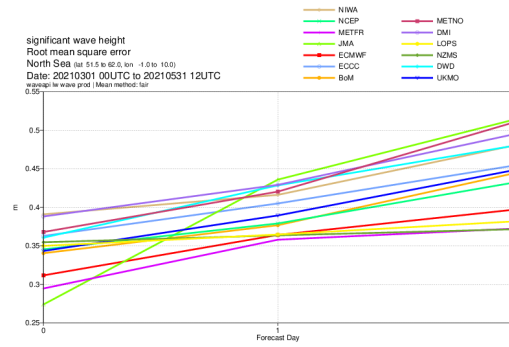
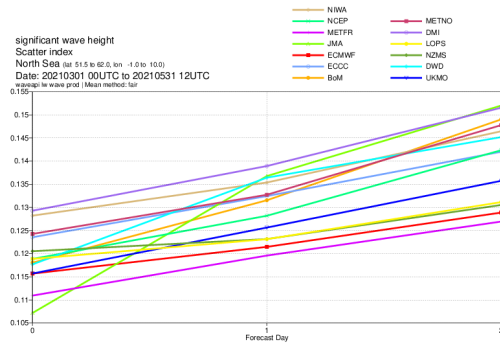
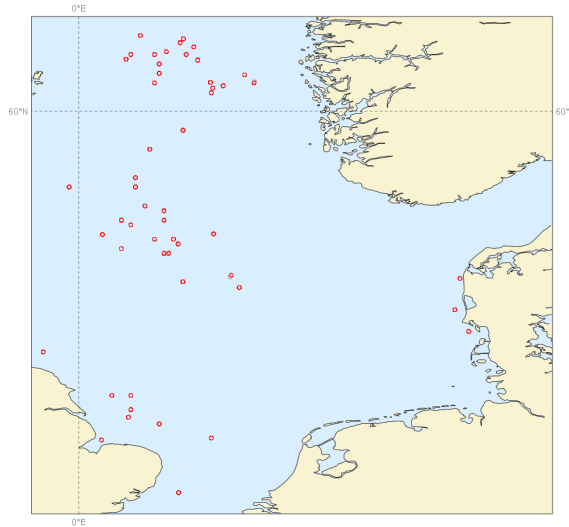
**Europe.** Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

Buoys observations - from 20210301 to 20210531 - (swh)



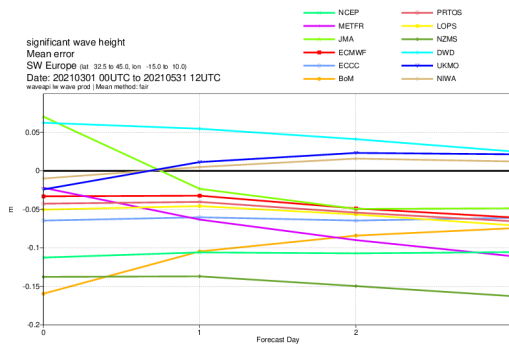
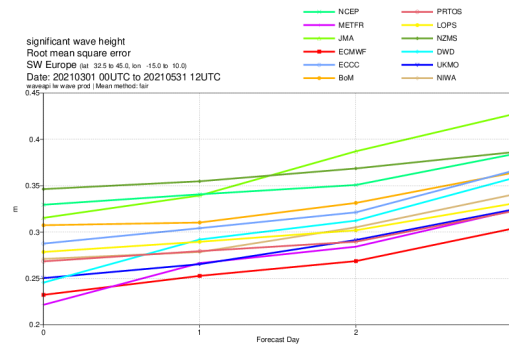
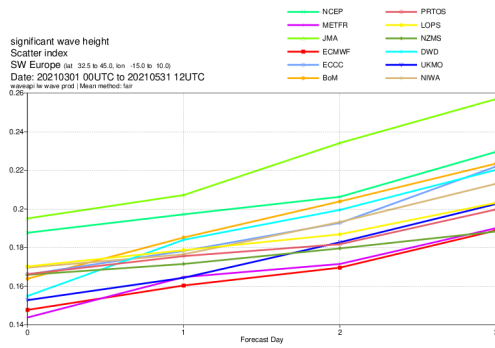
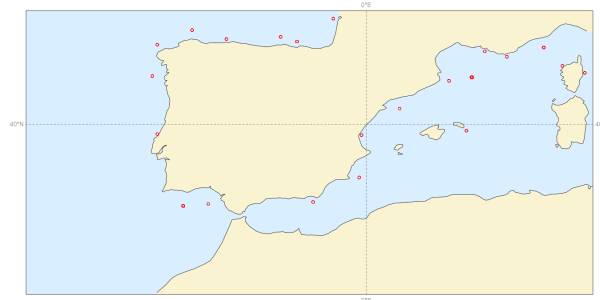
**Mediterranean Sea.** Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

Buoys observations - from 20210301 to 20210531 - (swh)



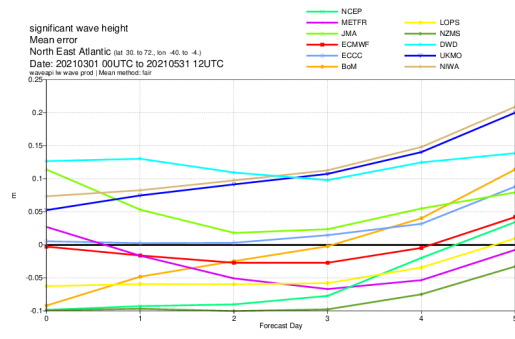
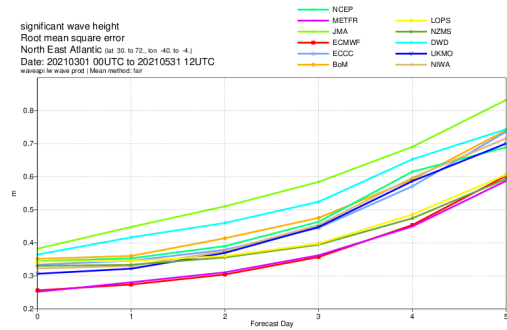
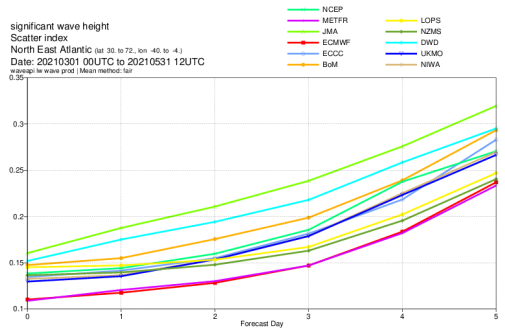
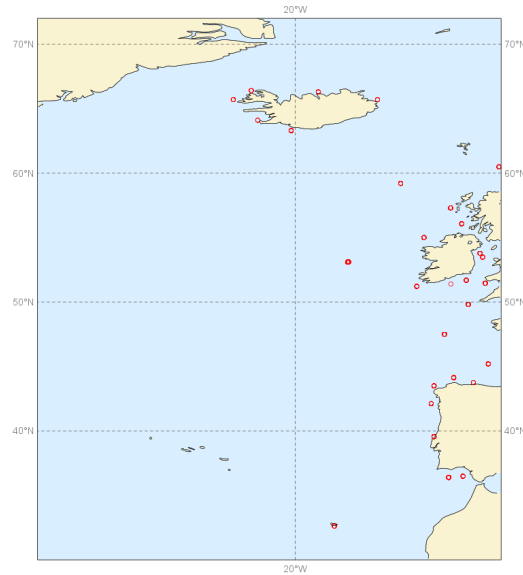
**North Sea.** Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

Buoys observations - from 20210301 to 20210531 - (swh)



**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).

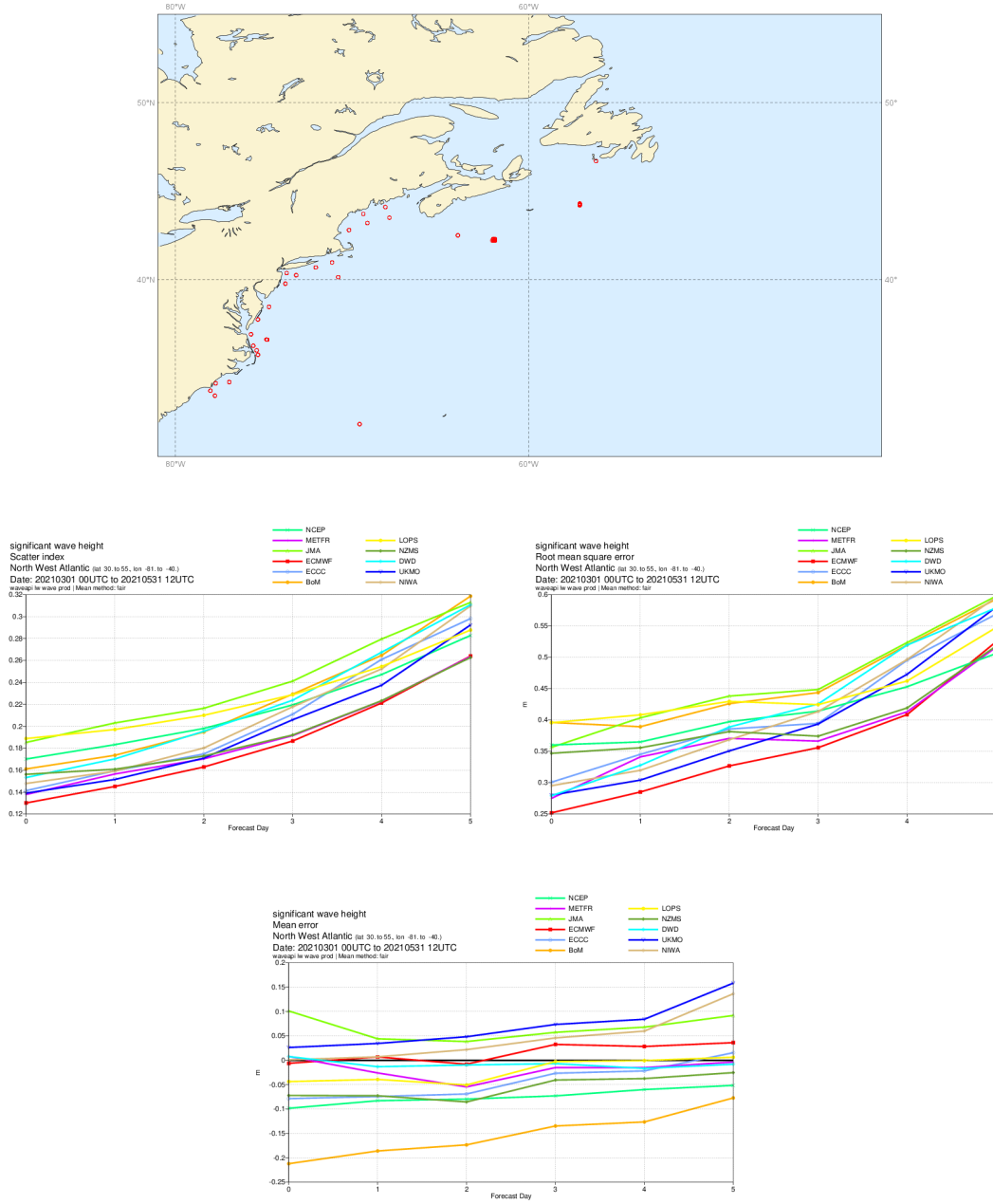
Buoys observations - from 20210301 to 20210531 - (swh)



**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).

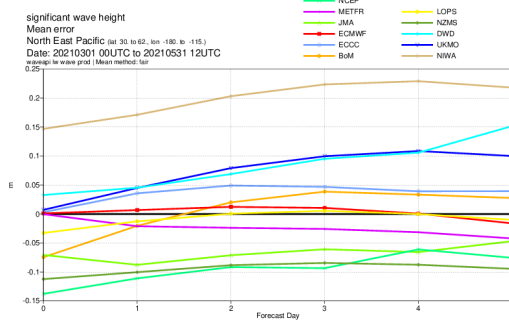
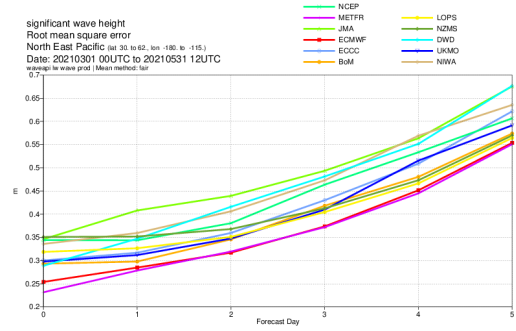
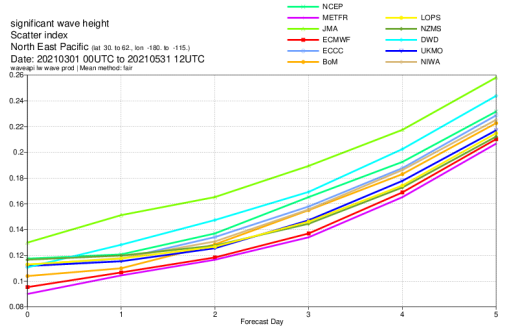
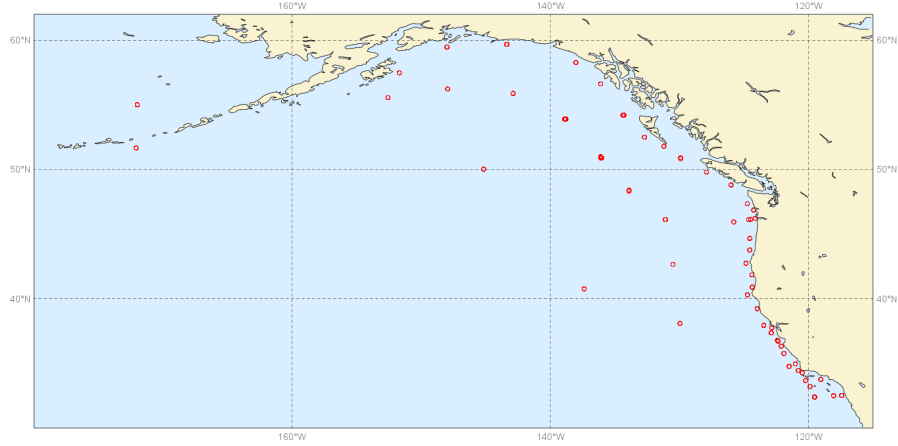


Buoys observations - from 20210301 to 20210531 - (swh)



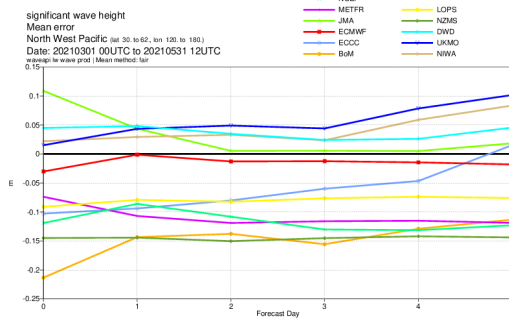
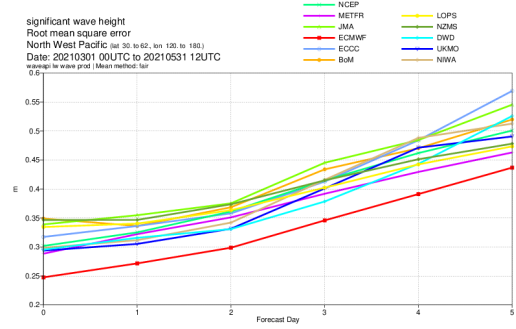
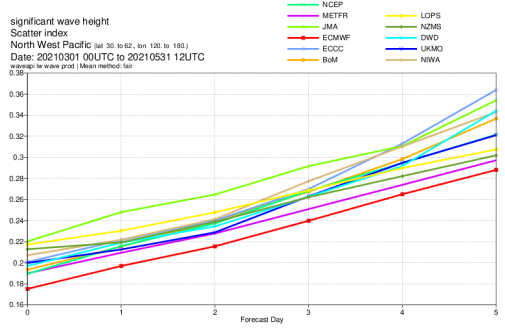
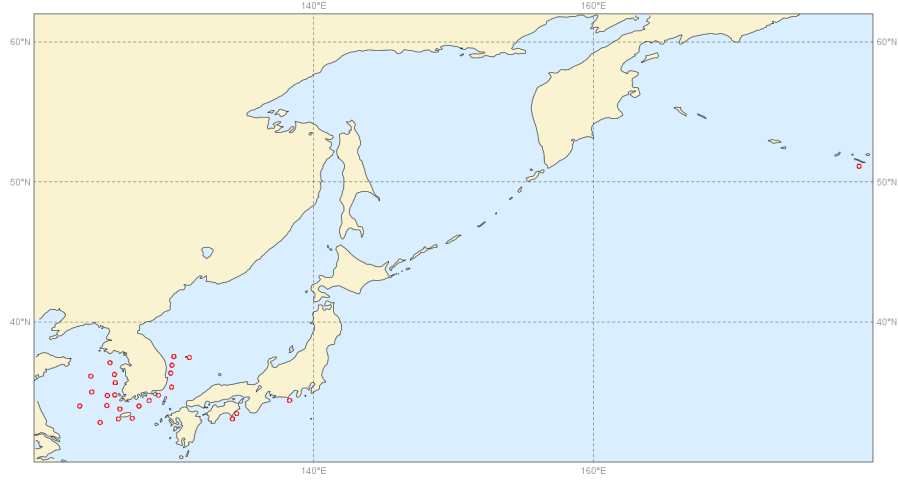
**North West Atlantic.** Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

Buoys observations - from 20210301 to 20210531 - (swh)



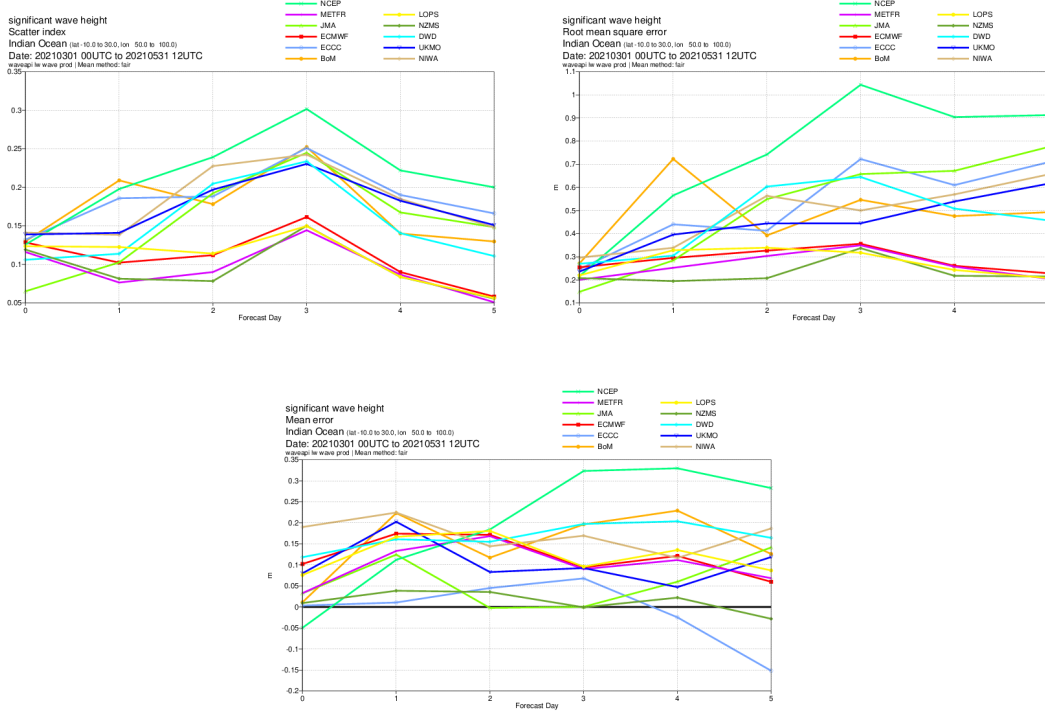
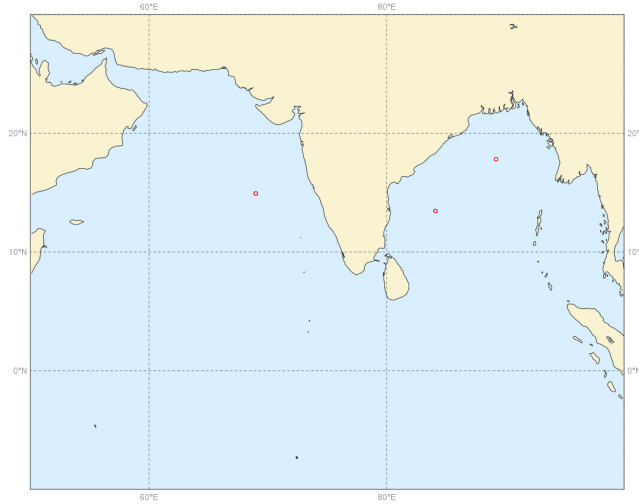
**North East Pacific.** Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

Buoys observations - from 20210301 to 20210531 - (swh)



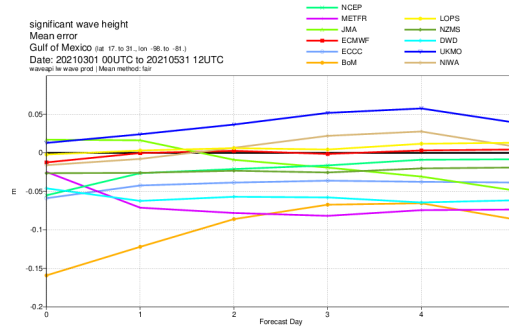
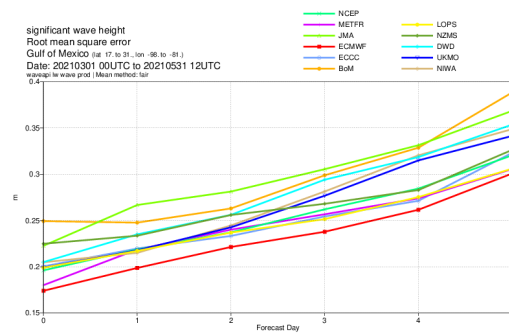
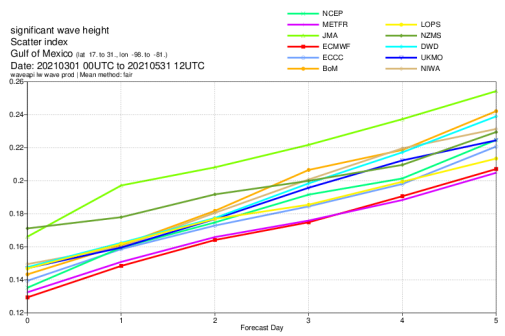
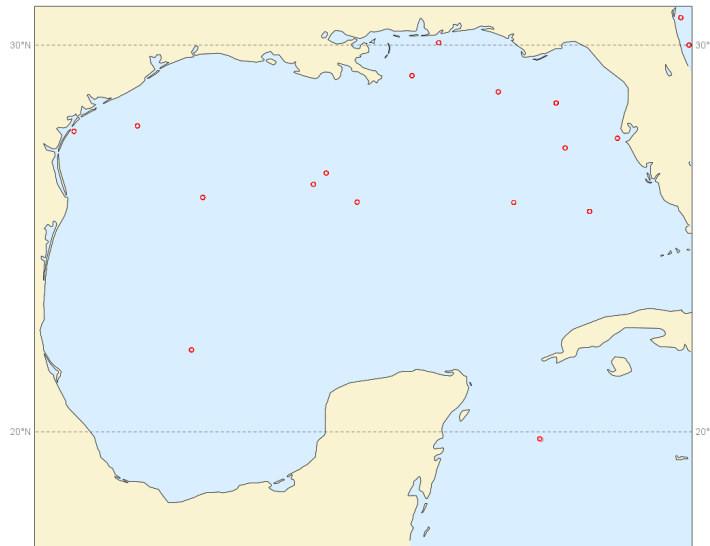
**North West Pacific.** Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

Buoys observations - from 20210301 to 20210531 - (swh)



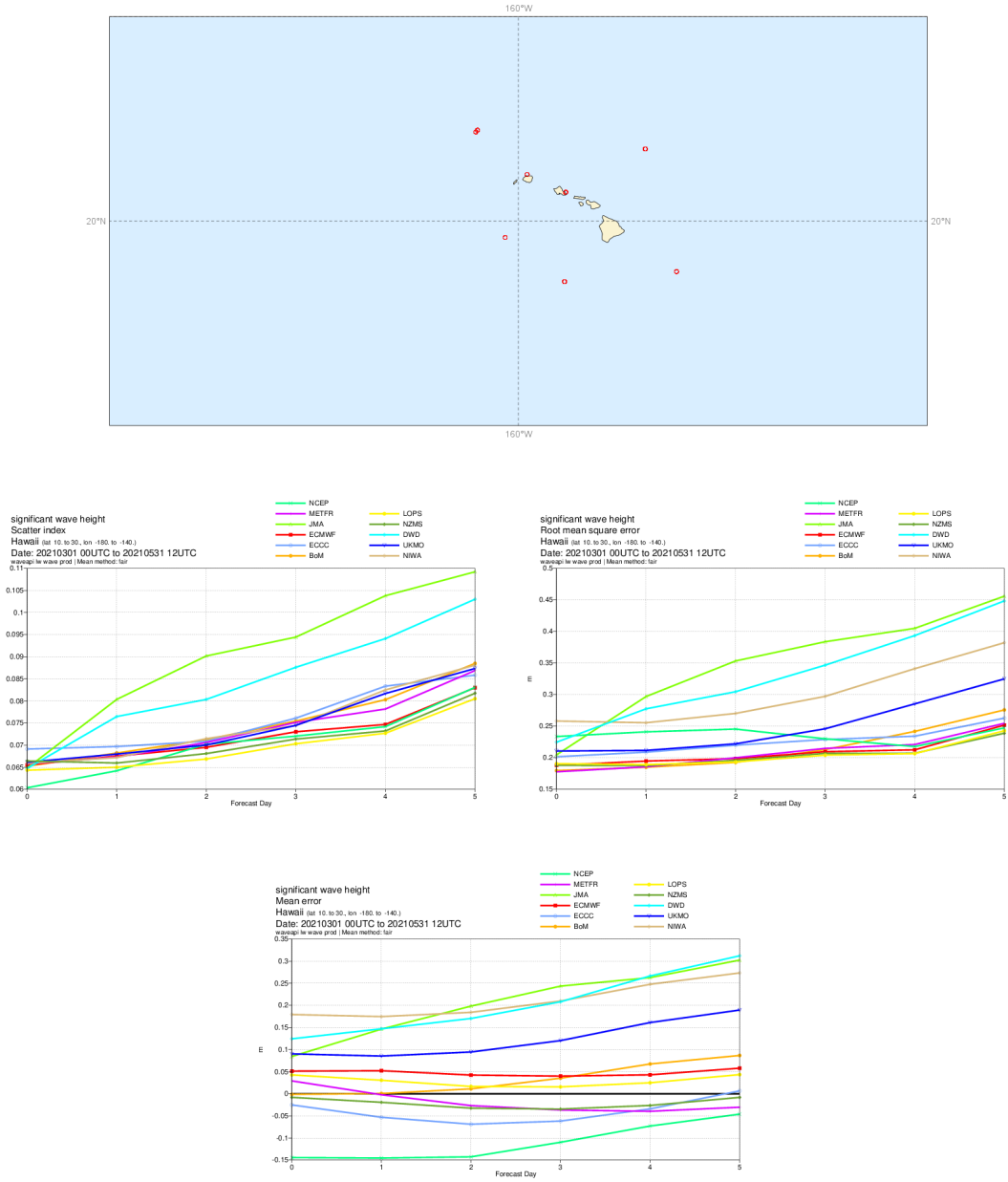
**Indian Ocean.** Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

Buoys observations - from 20210301 to 20210531 - (swH)



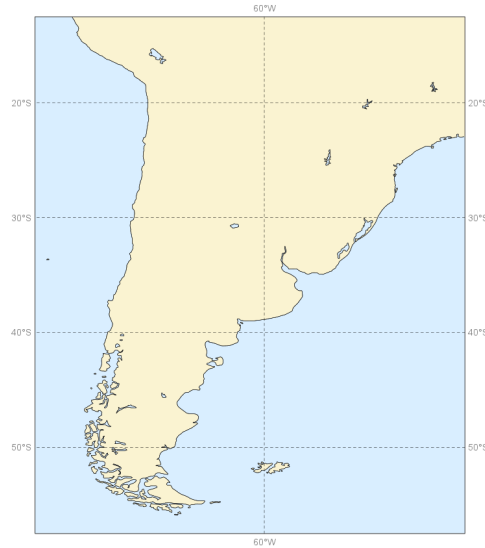
**Gulf of Mexico.** Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

Buoys observations - from 20210301 to 20210531 - (swh)

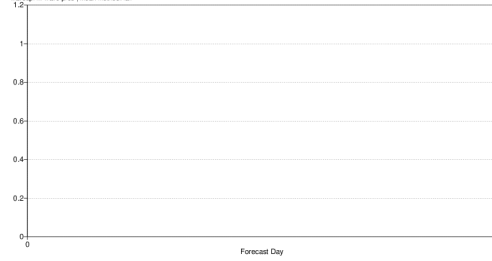


**Hawaii.** Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

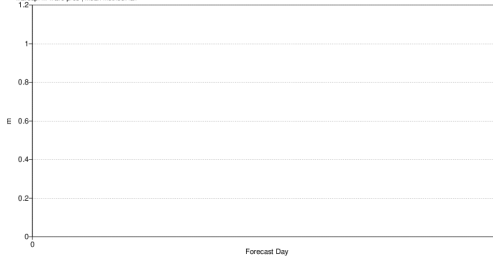
Buoys observations - from 20210301 to 20210531 - (swh)



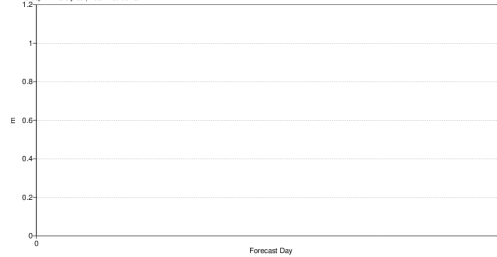
significant wave height  
Scatter index  
S America (south) (lat: 57.5 to 12.5, lon: -80.0 to -42.5)  
Date: 20210301 00UTC to 20210531 12UTC  
Average for every grid. Mean method. lat



significant wave height  
Root mean square error  
S America (south) (lat: 57.5 to 12.5, lon: -80.0 to -42.5)  
Date: 20210301 00UTC to 20210531 12UTC  
Average for every grid. Mean method. lat

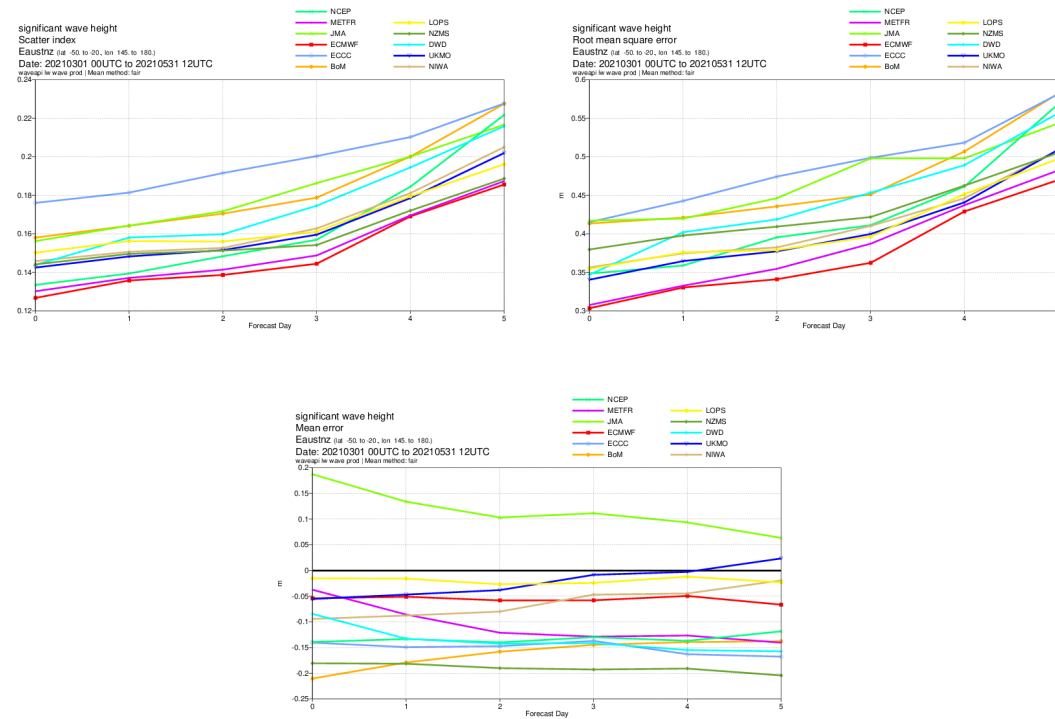
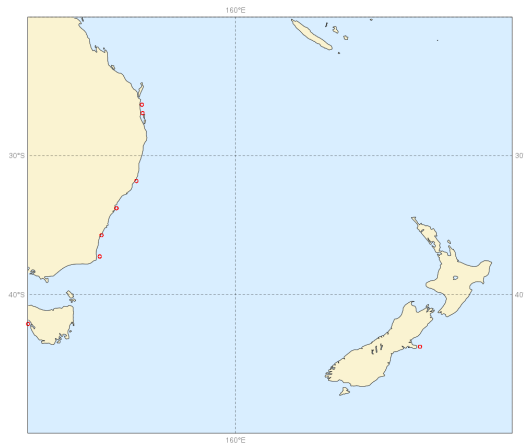


significant wave height  
Mean error  
S America (south) (lat: 57.5 to 12.5, lon: -80.0 to -42.5)  
Date: 20210301 00UTC to 20210531 12UTC  
Average for every grid. Mean method. lat



**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).

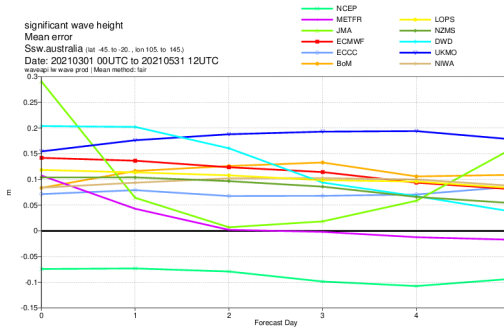
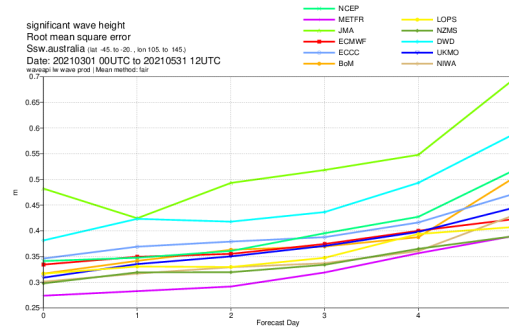
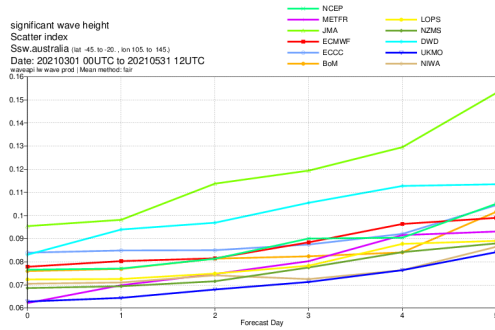
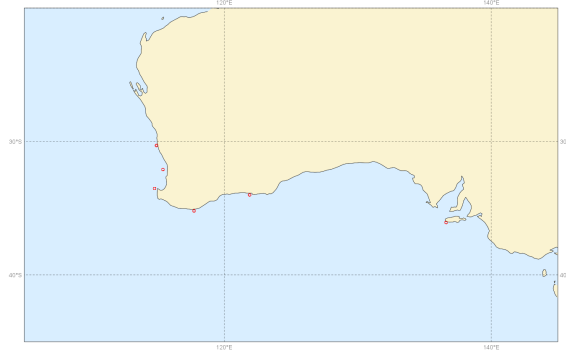
Buoys observations - from 20210301 to 20210531 - (swh)



**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 20210301 to 20210531 - (swH)



**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).