

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

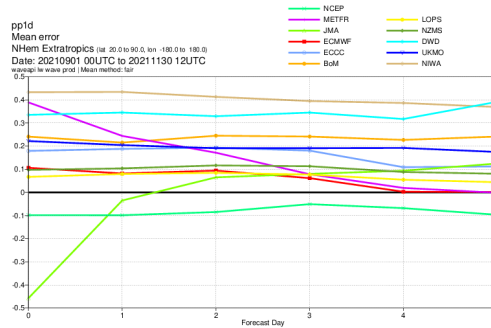
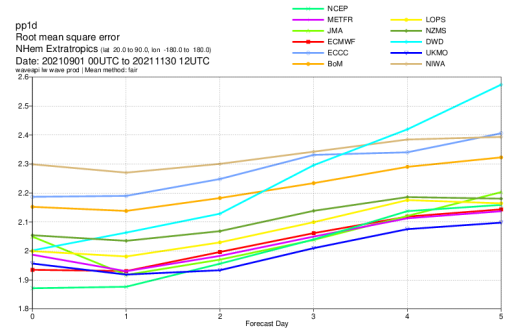
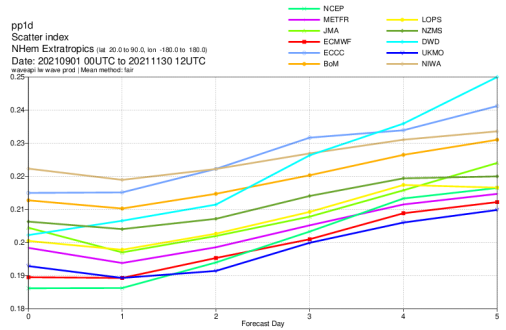
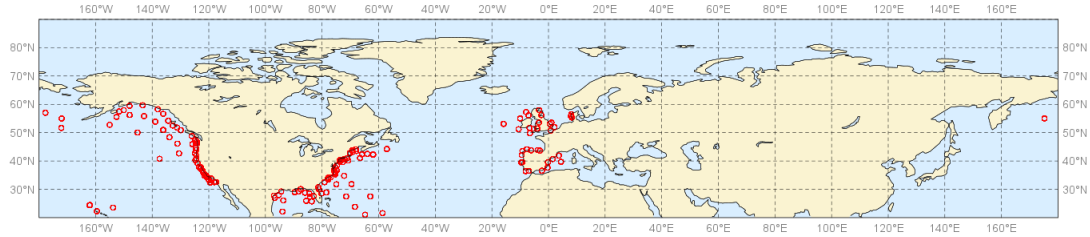
00 and 12 UTC runs

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

December 13, 2021

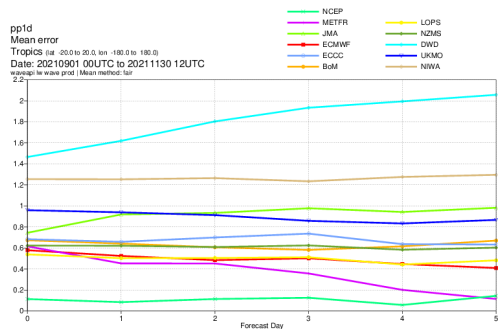
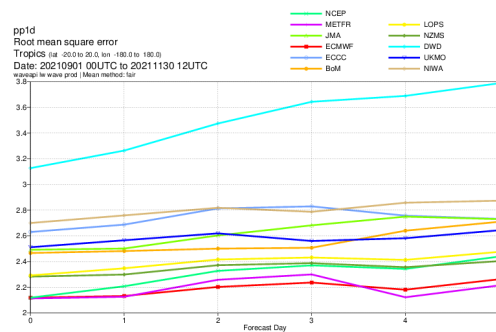
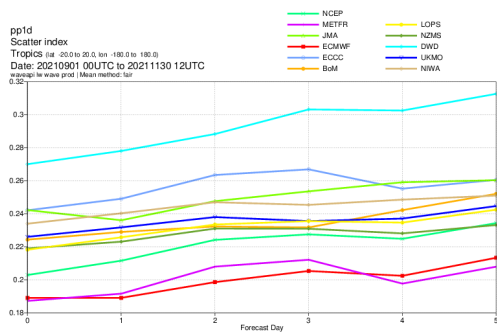
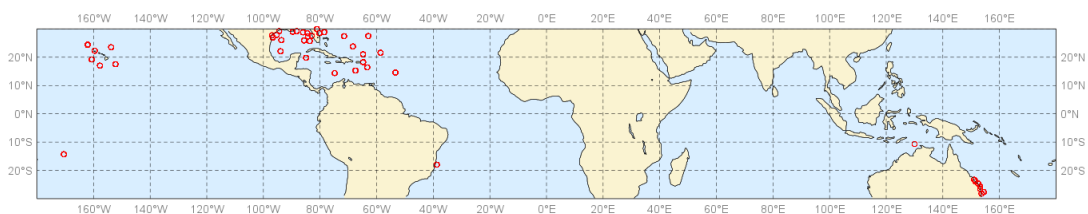
**PART II: Peak wave period (PP1D)**

Buoys observations - from 20210901 to 20211130 - (pp1d)



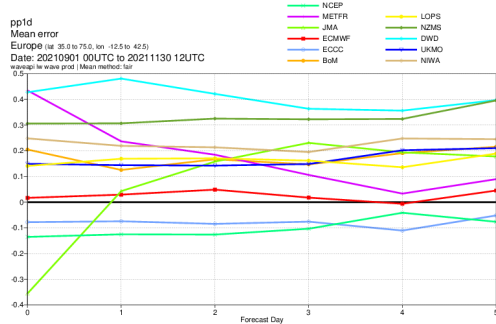
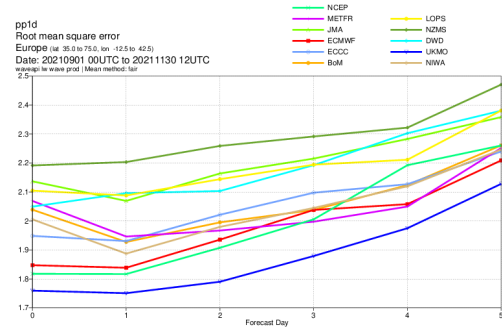
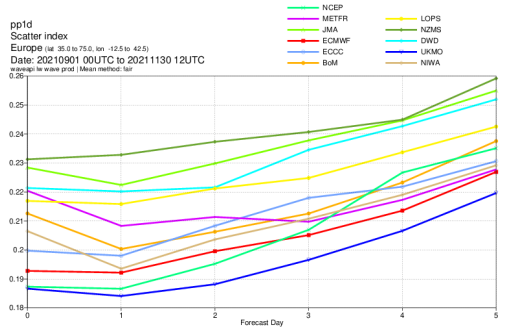
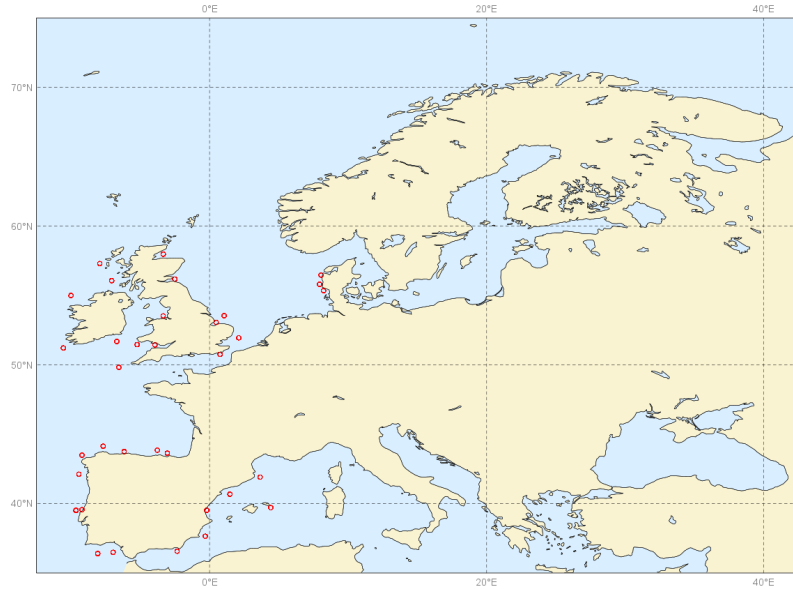
**Northern Hemisphere.** Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

Buoys observations - from 20210901 to 20211130 - (pp1d)



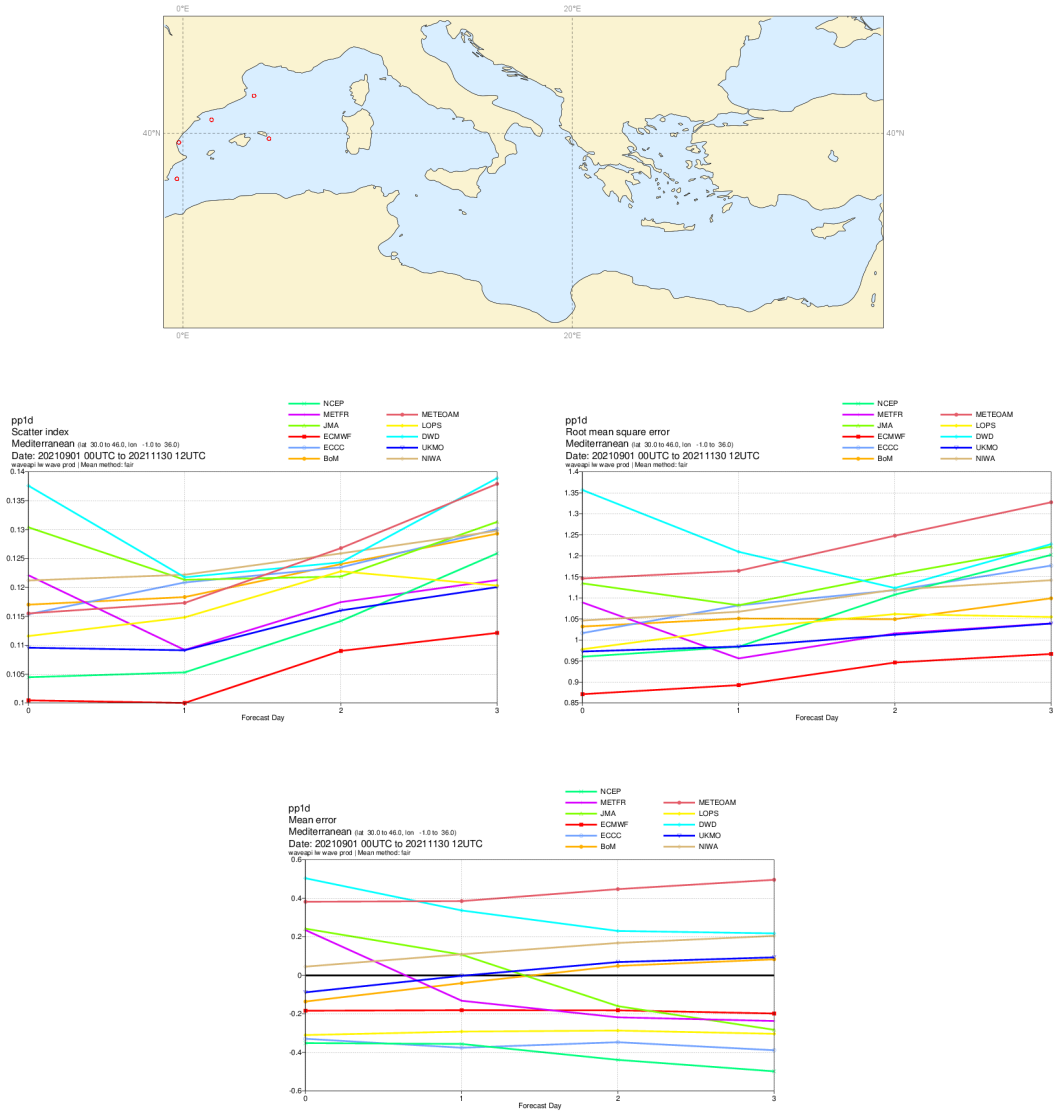
**Tropics.** Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

Buoys observations - from 20210901 to 20211130 - (pp1d)



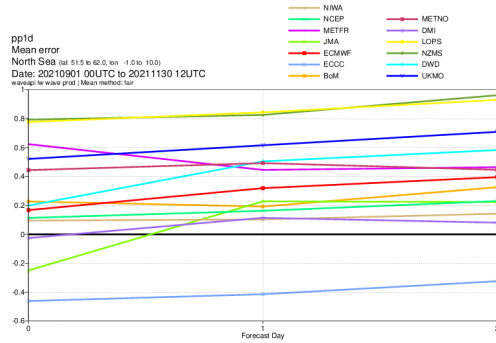
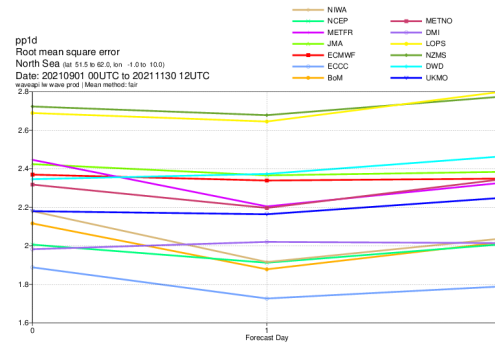
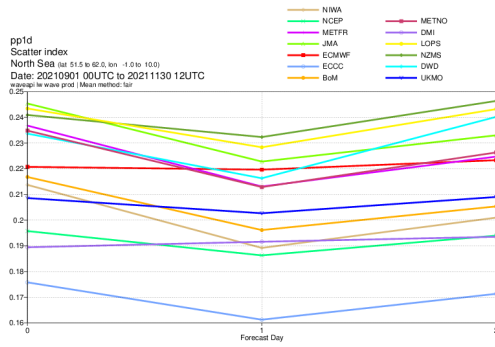
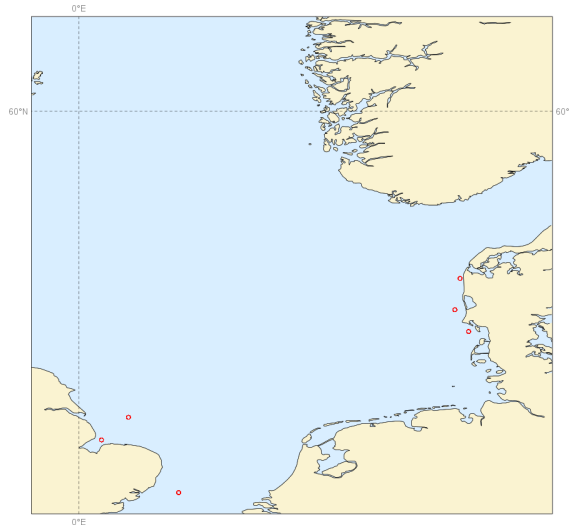
**Europe.** Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

Buoys observations - from 20210901 to 20211130 - (pp1d)



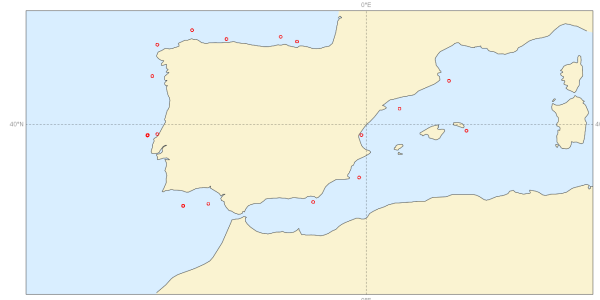
**Mediterranean Sea.** Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

Buoys observations - from 20210901 to 20211130 - (pp1d)

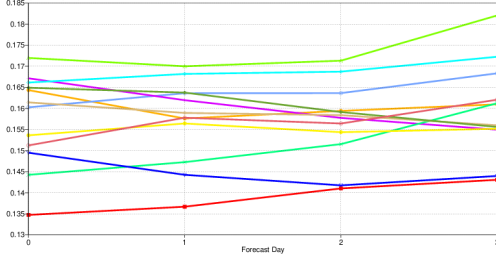


**North Sea.** Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

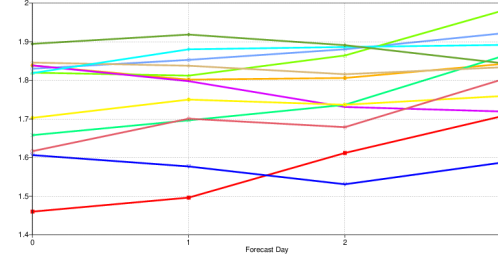
Buoys observations - from 20210901 to 20211130 - (pp1d)



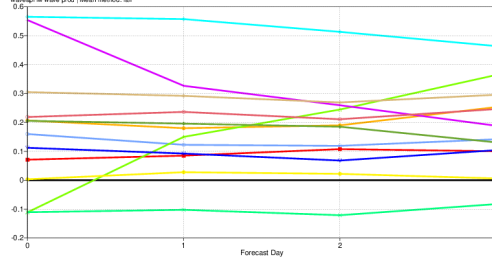
pp1d  
Scatter index  
SW Europe (lat: 47.5 to 49.0, lon: -15.0 to -10.0)  
Date: 20210901 00UTC to 20211130 12UTC  
waveapi le wave prod | Mean method: tar



pp1d  
Root mean square error  
SW Europe (lat: 47.5 to 49.0, lon: -15.0 to -10.0)  
Date: 20210901 00UTC to 20211130 12UTC  
waveapi le wave prod | Mean method: tar

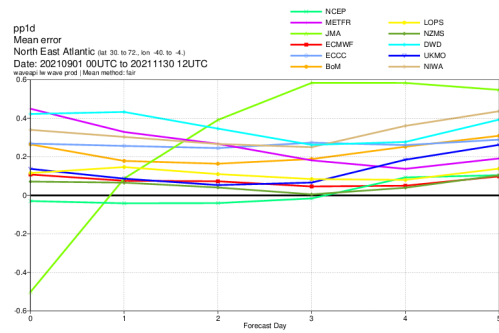
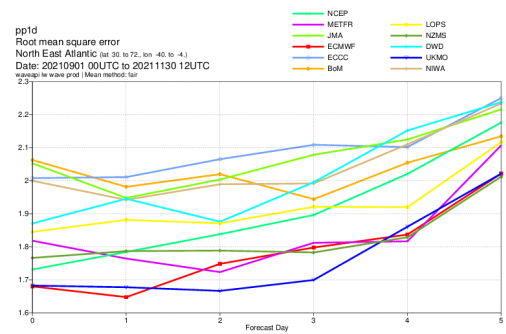
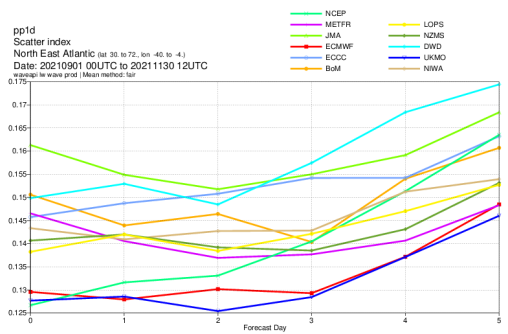
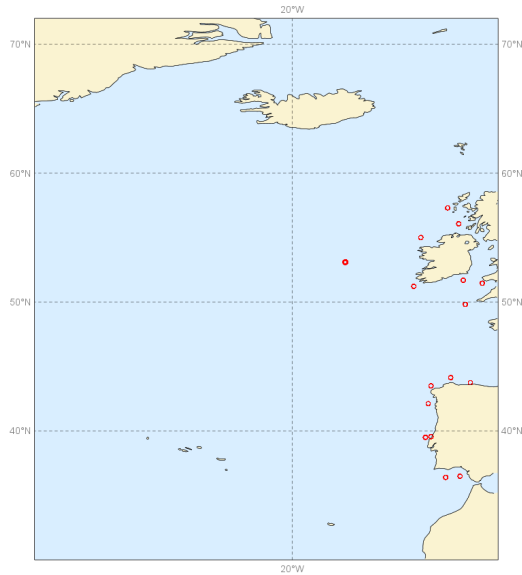


pp1d  
Mean error  
SW Europe (lat: 47.5 to 49.0, lon: -15.0 to -10.0)  
Date: 20210901 00UTC to 20211130 12UTC  
waveapi le wave prod | Mean method: tar



**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).

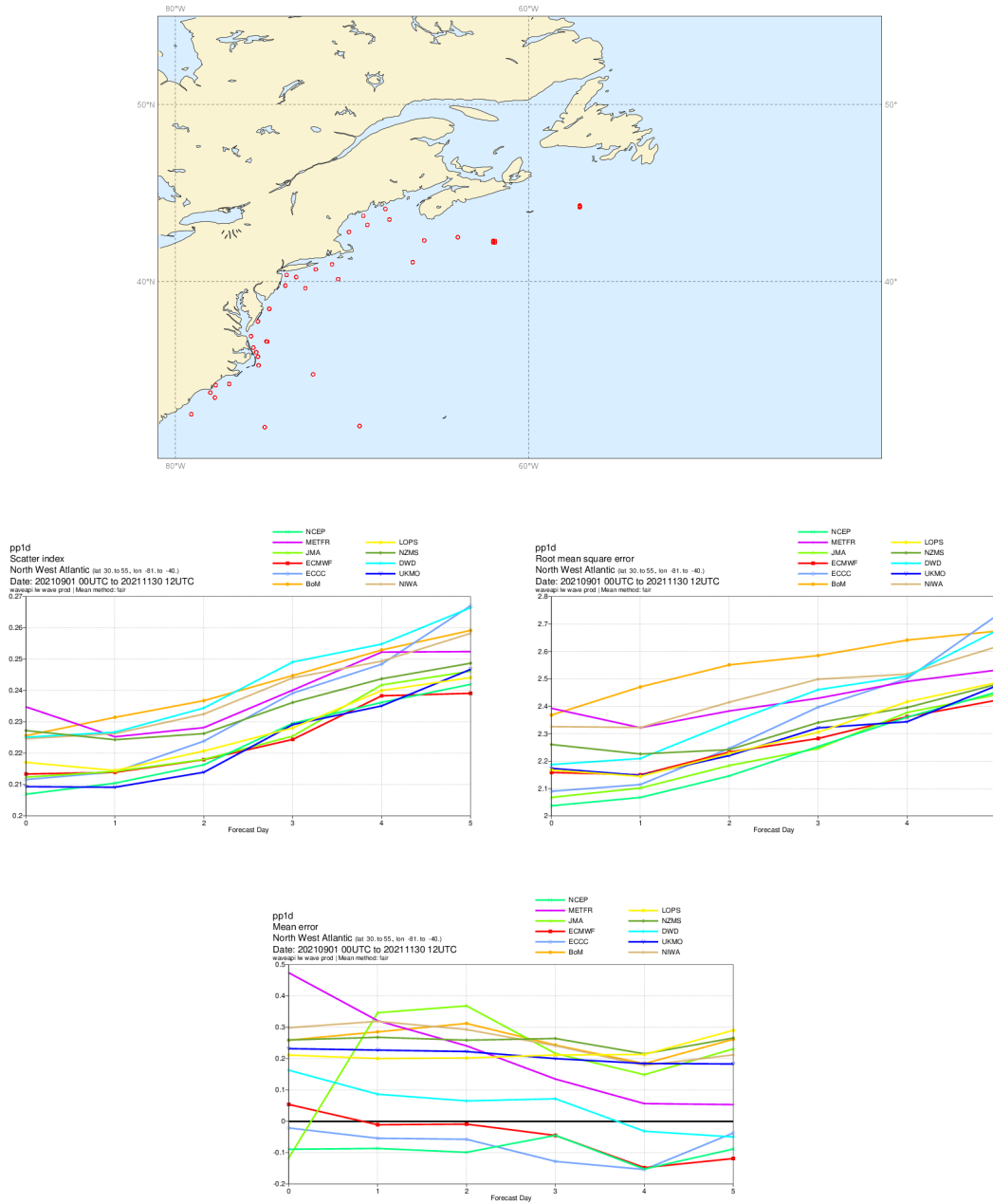
Buoys observations - from 20210901 to 20211130 - (pp1d)



**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).

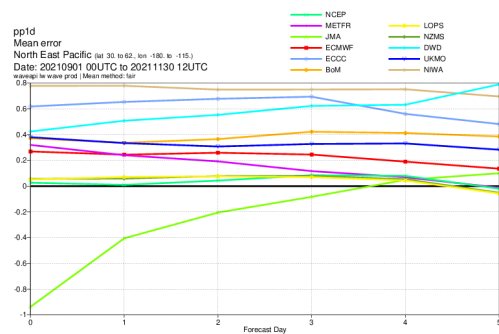
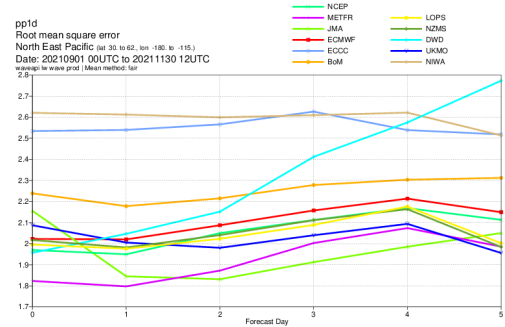
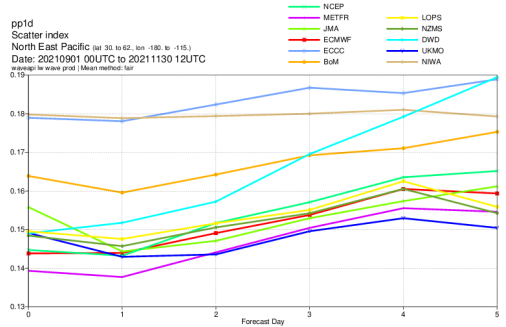
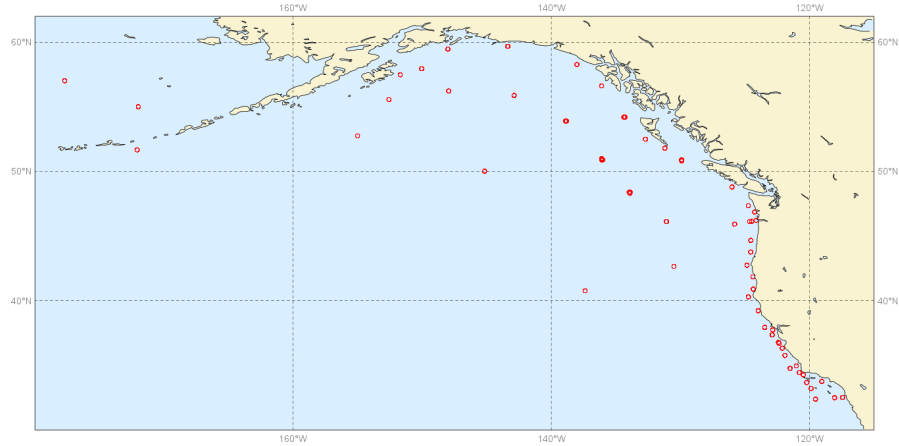


Buoys observations - from 20210901 to 20211130 - (pp1d)



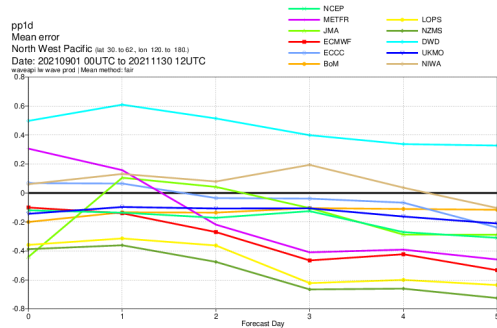
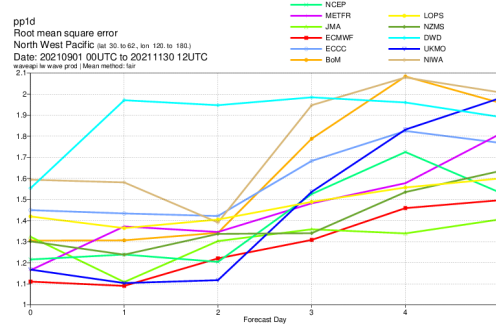
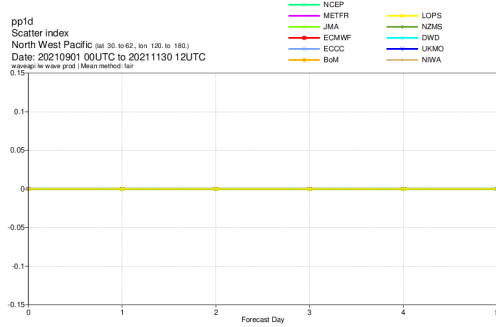
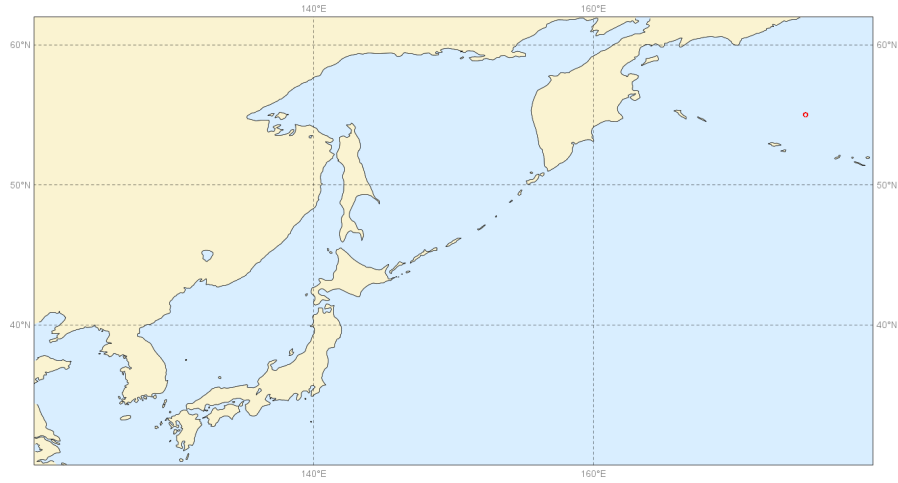
**North West Atlantic.** Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

Buoys observations - from 20210901 to 20211130 - (pp1d)



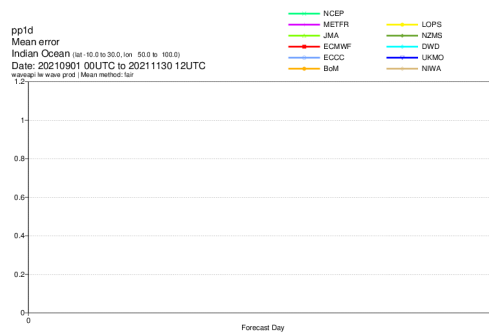
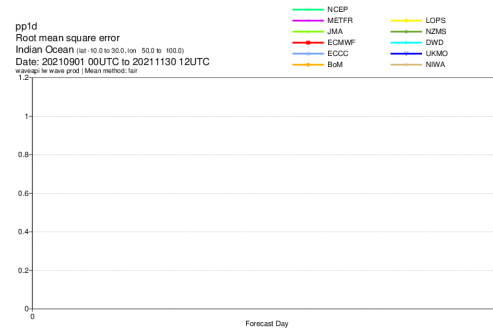
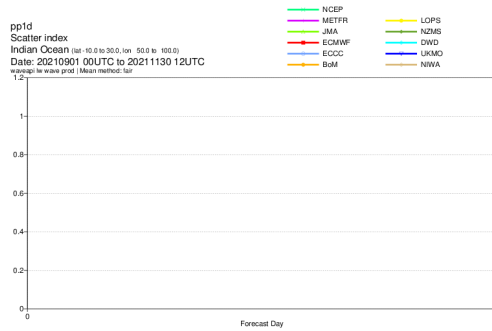
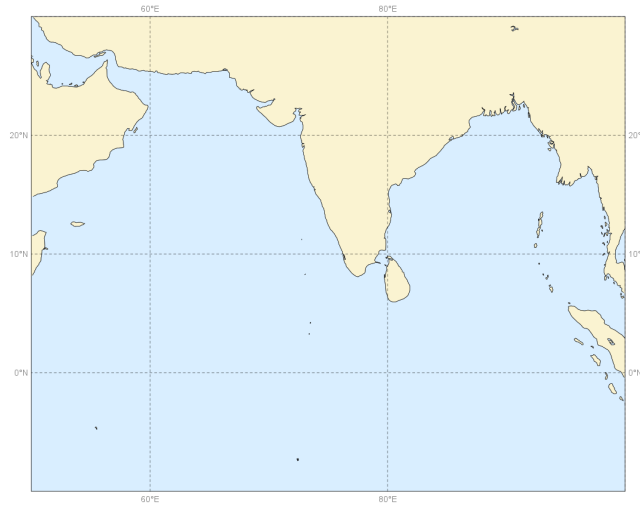
**North East Pacific.** Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

Buoys observations - from 20210901 to 20211130 - (pp1d)



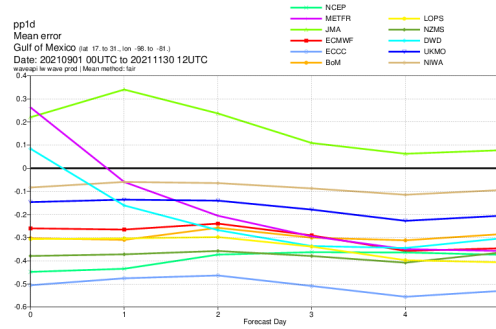
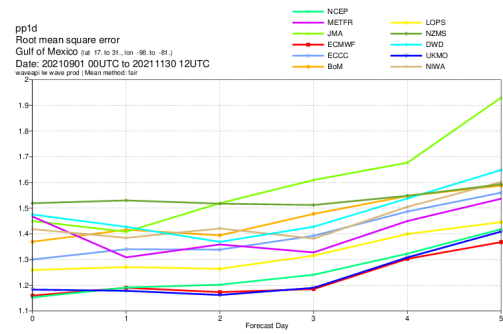
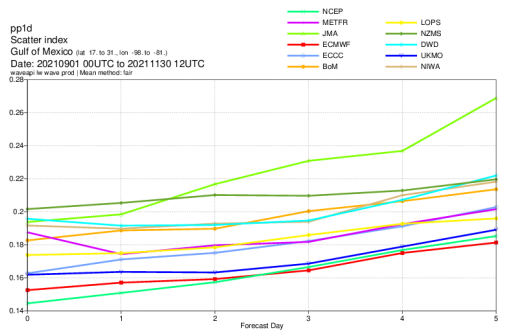
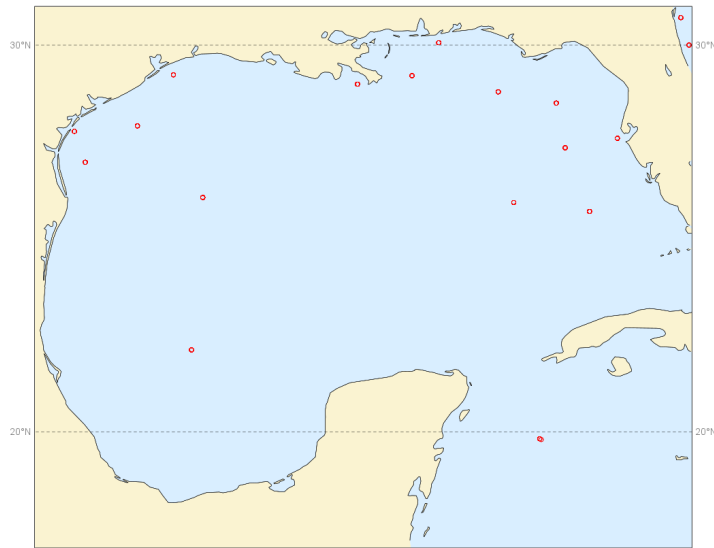
**North West Pacific.** Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

Buoys observations - from 20210901 to 20211130 - (pp1d)



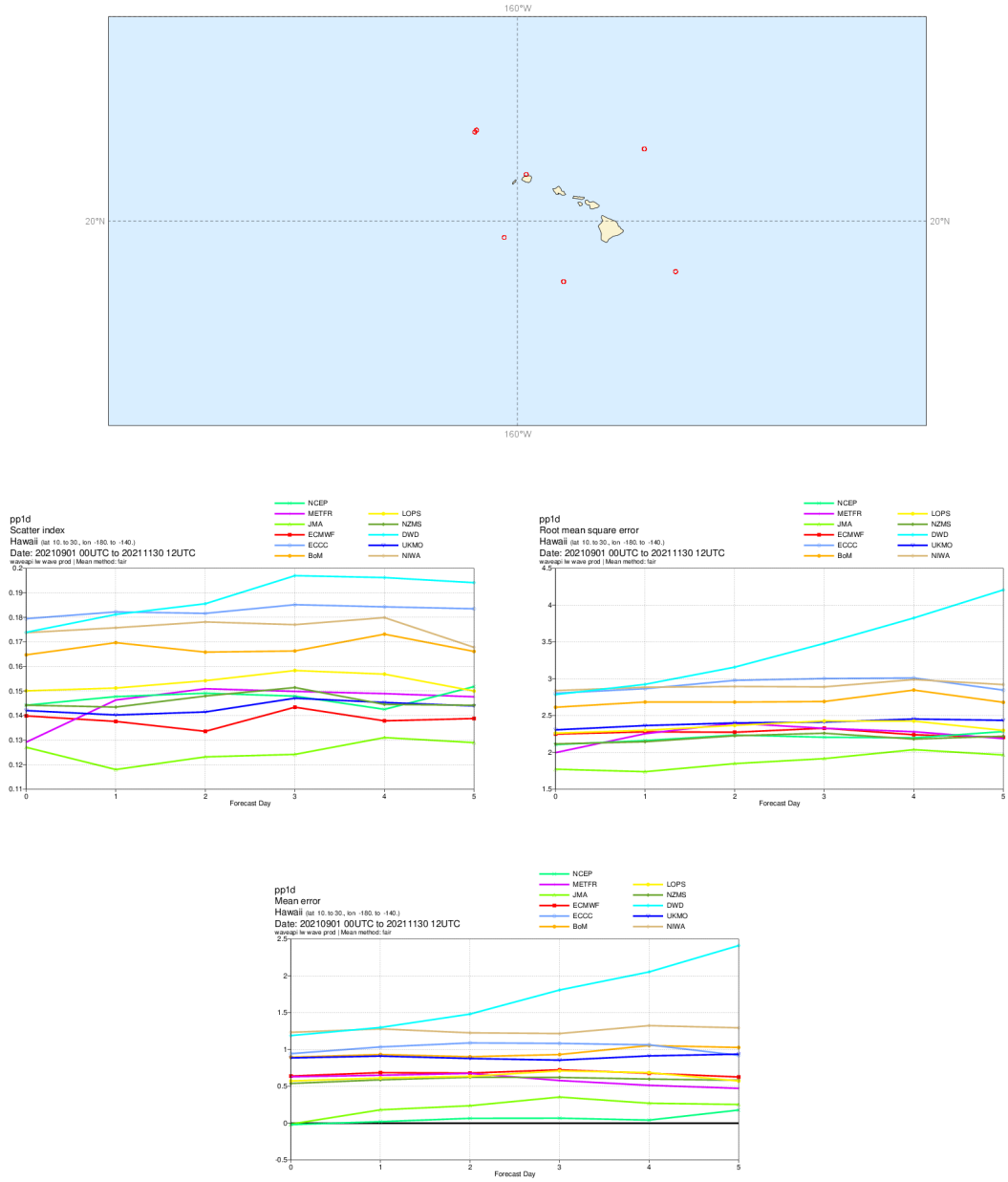
**Indian Ocean.** Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

Buoys observations - from 20210901 to 20211130 - (pp1d)



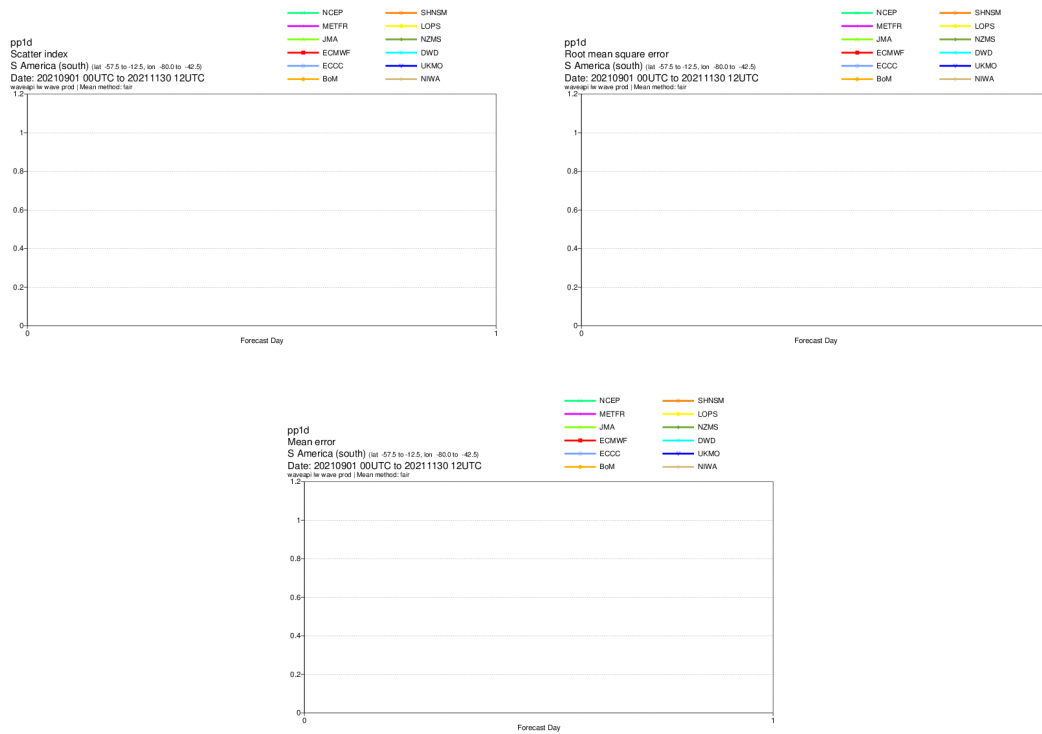
**Gulf of Mexico.** Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

Buoys observations - from 20210901 to 20211130 - (pp1d)



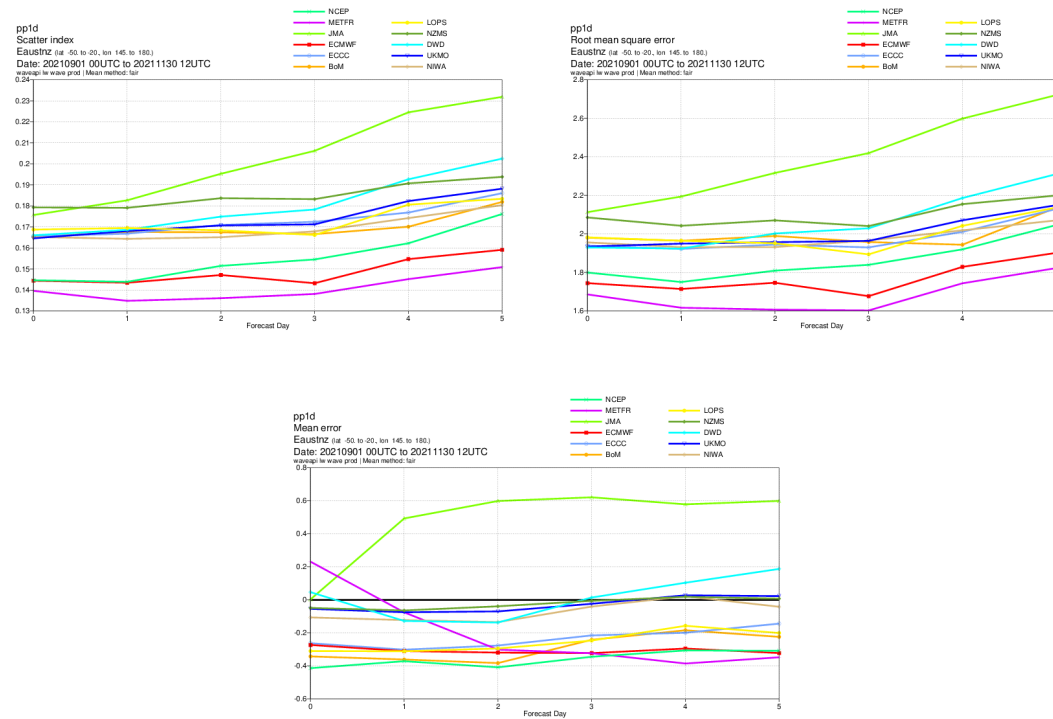
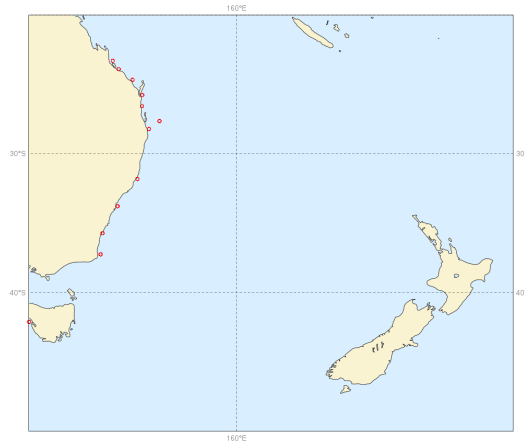
**Hawaii.** Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

Buoys observations - from 20210901 to 20211130 - (pp1d)



**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).

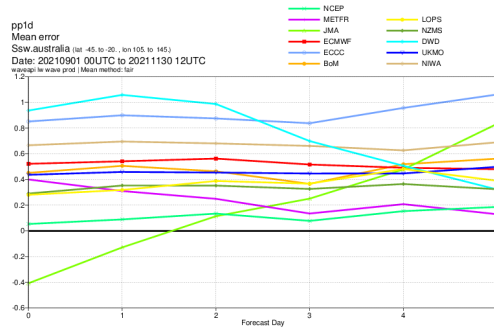
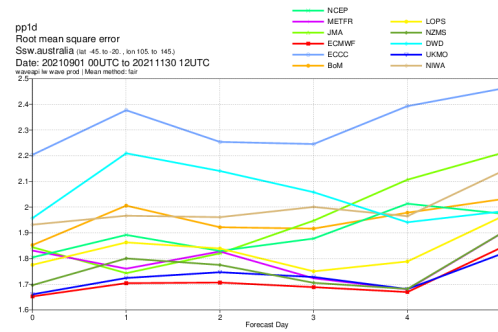
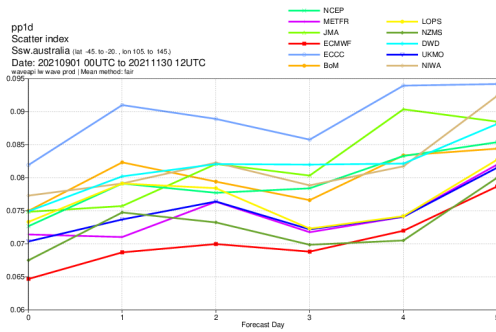
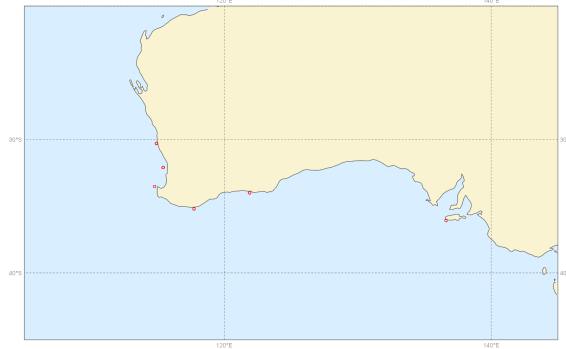
Buoys observations - from 20210901 to 20211130 - (pp1d)



**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 - (pp1d)



**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).