

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

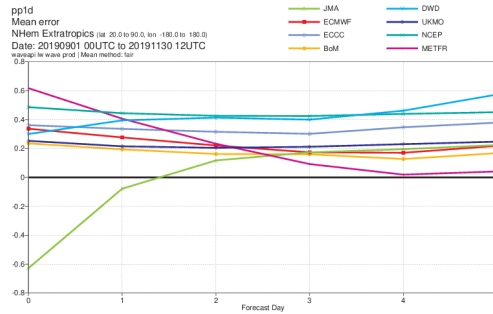
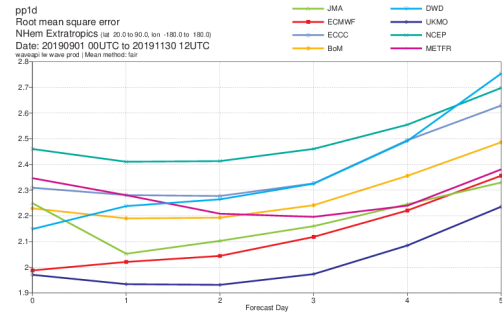
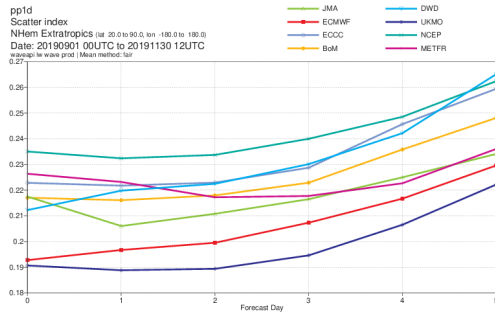
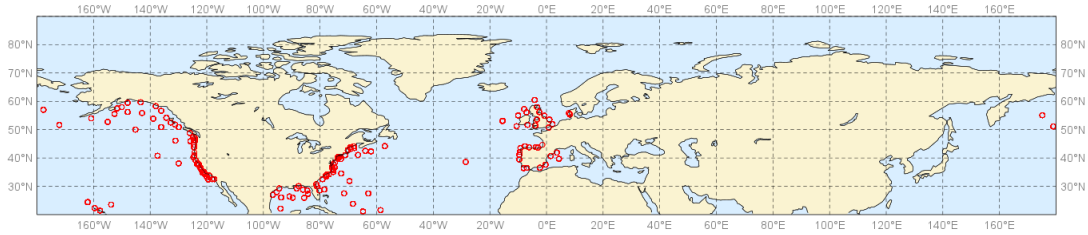
00 and 12 UTC runs

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

December 19, 2019

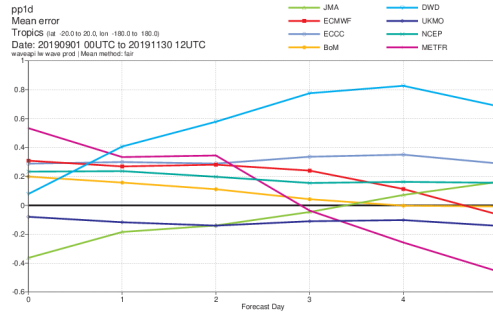
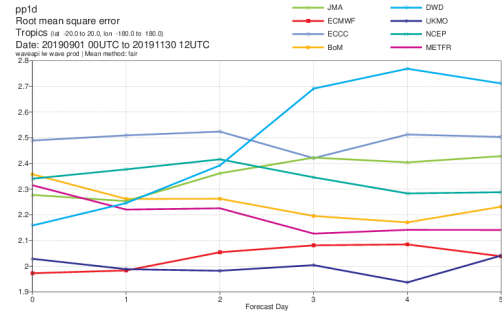
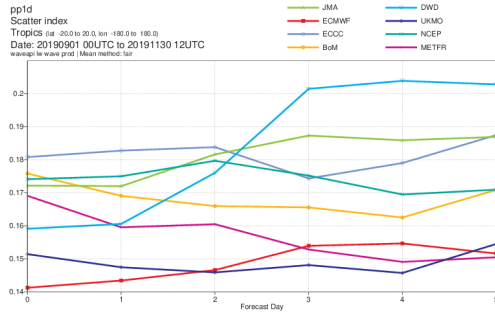
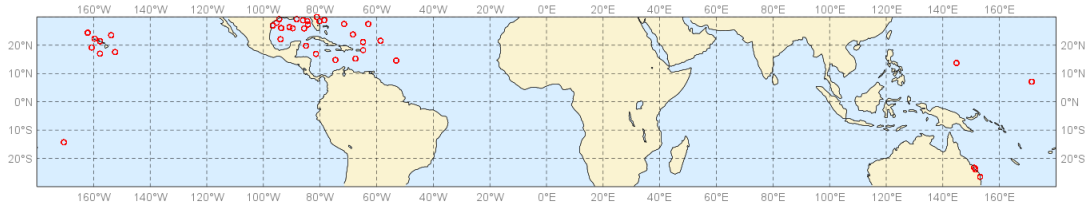
**PART II: Peak wave period (PP1D)**

Buoys observations - from 20190901 to 20191130 - (pp1d)



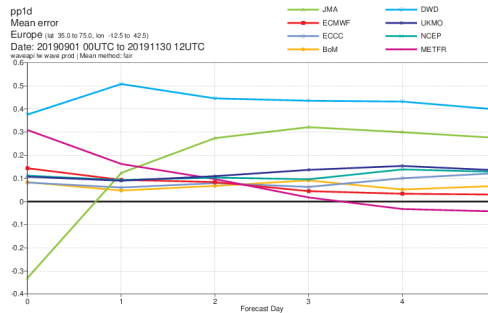
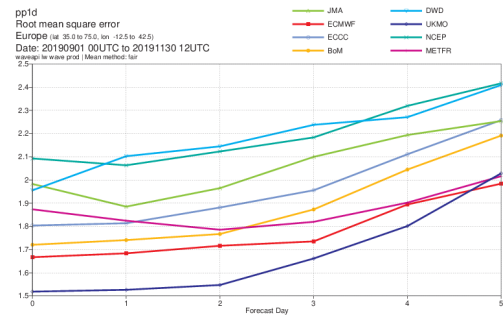
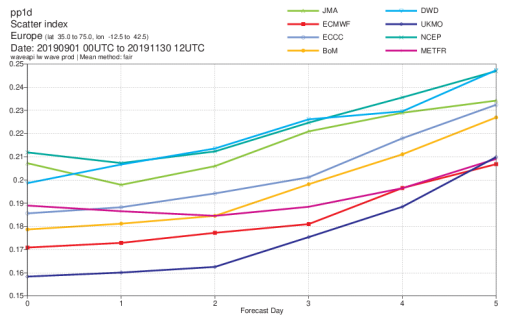
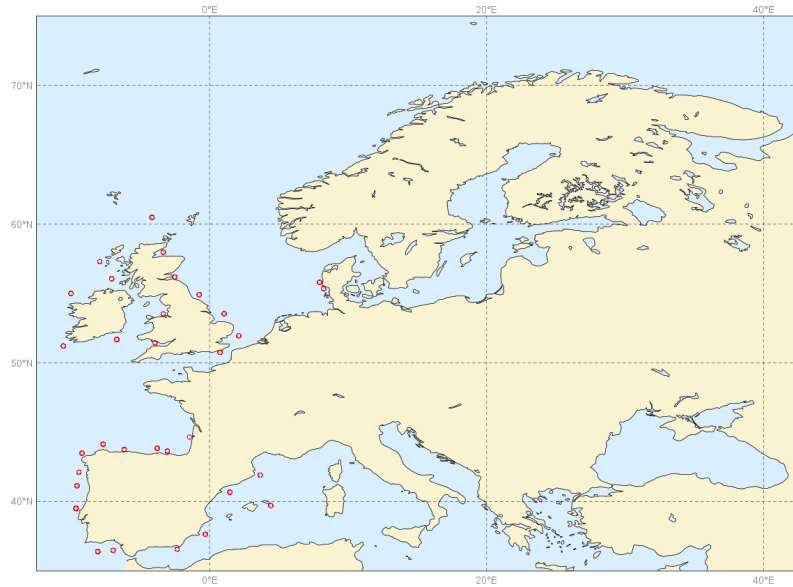
**Northern Hemisphere.** Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

Buoys observations - from 20190901 to 20191130 - (pp1d)



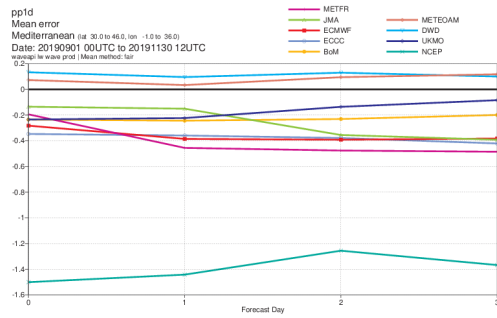
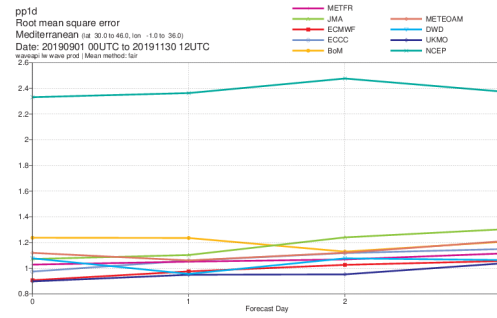
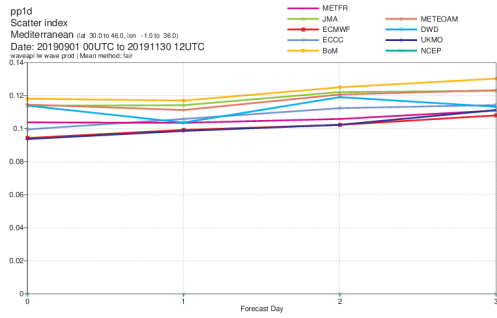
**Tropics.** Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

Buoys observations - from 20190901 to 20191130 - (pp1d)



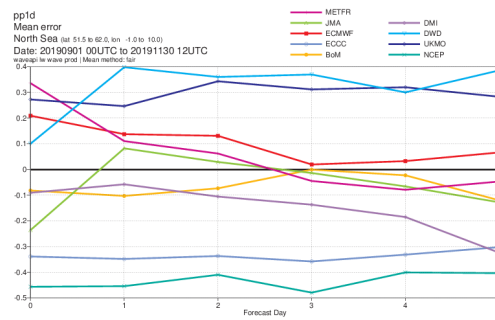
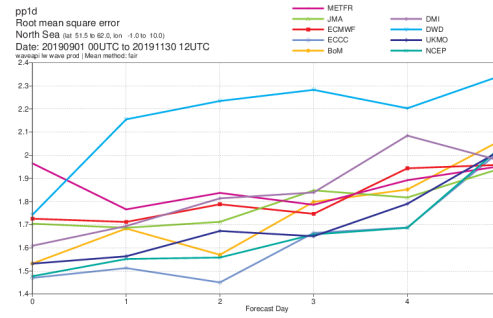
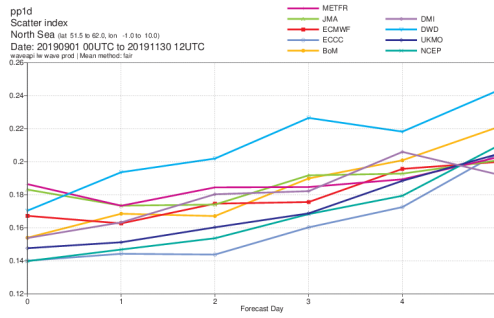
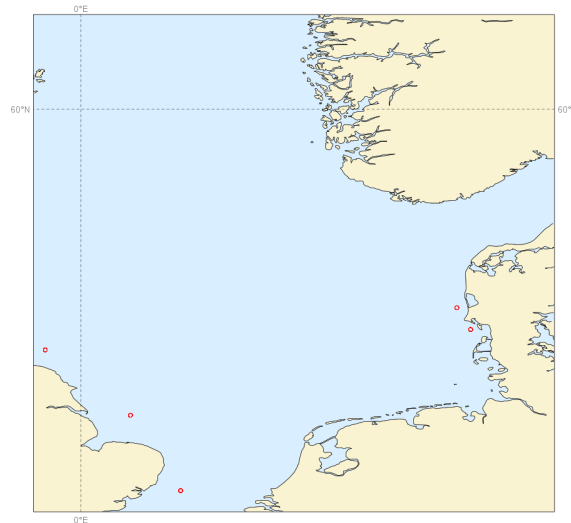
**Europe.** Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

Buoys observations - from 20190901 to 20191130 - (pp1d)



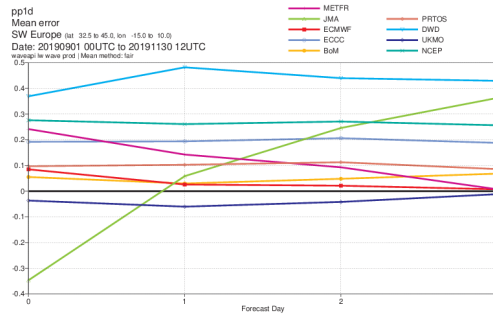
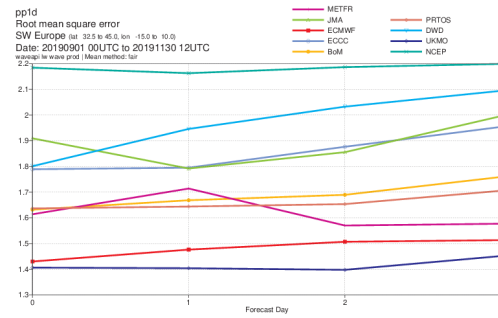
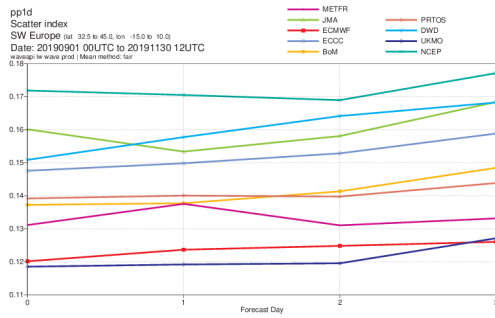
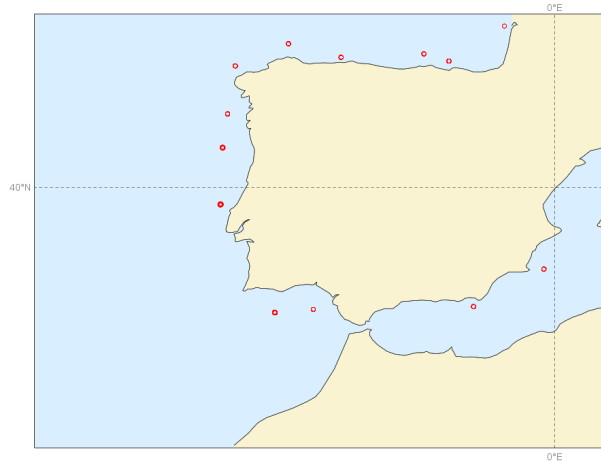
**Mediterranean Sea.** Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

Buoys observations - from 20190901 to 20191130 - (pp1d)



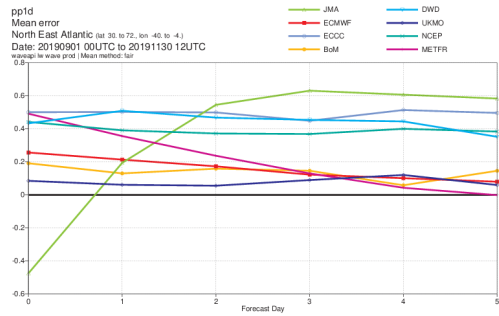
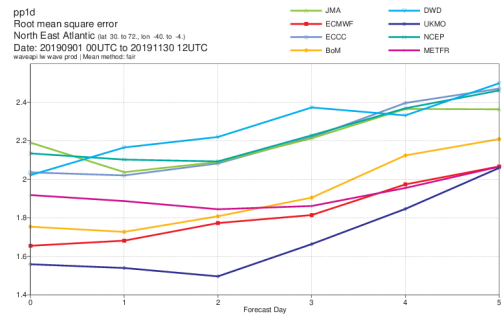
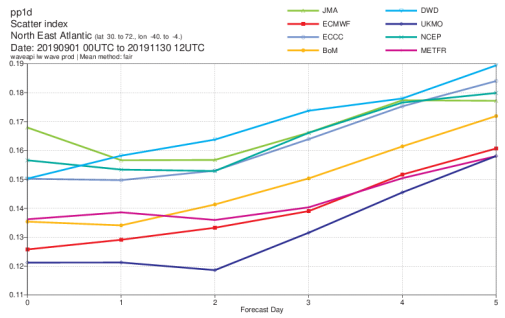
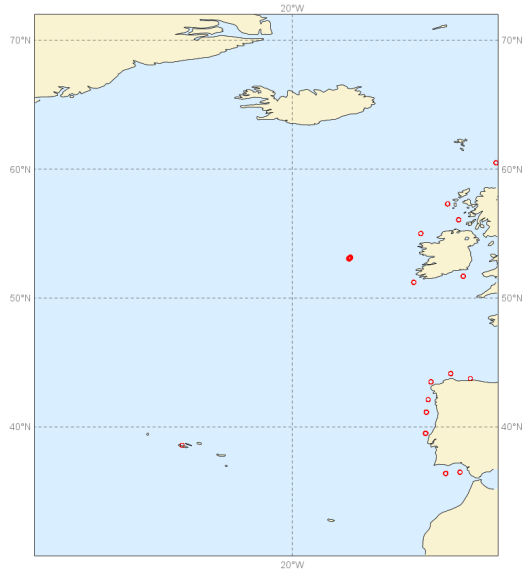
**North Sea.** Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

Buoys observations - from 20190901 to 2019



**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).

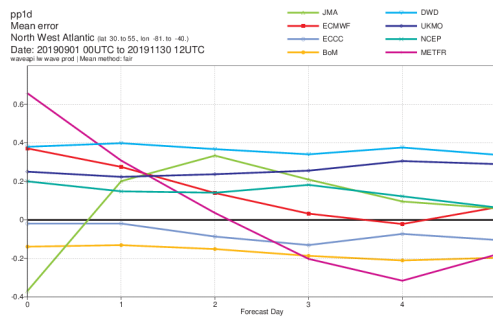
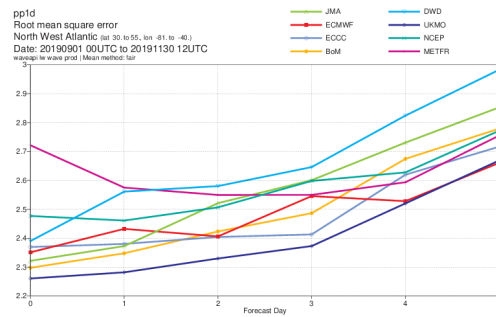
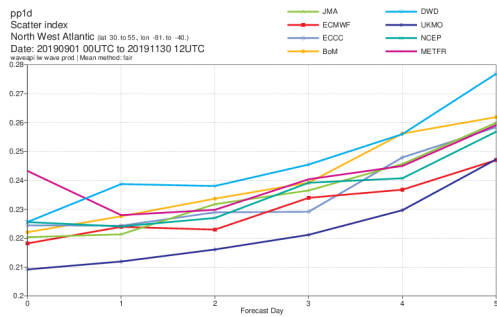
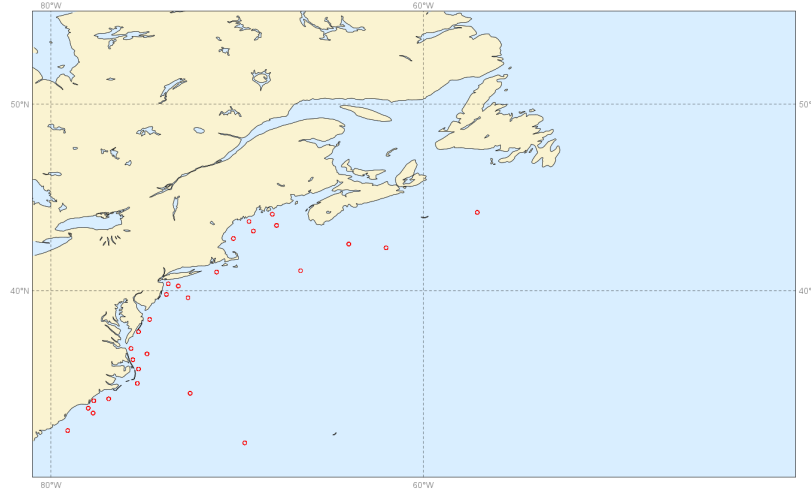
Buoys observations - from 20190901 to 20191130 - (pp1d)



**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).

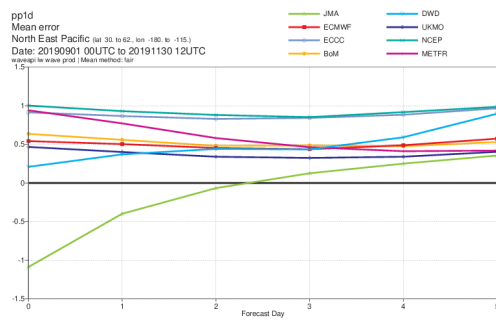
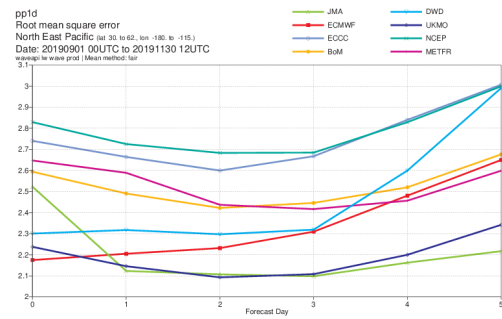
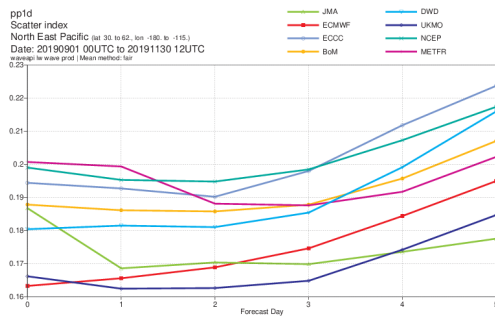
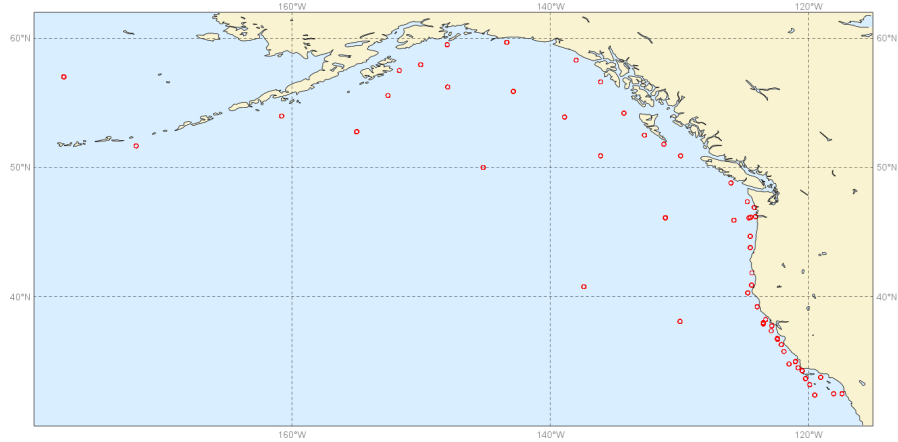


Buoys observations - from 20190901 to 20191130 - (pp1d)



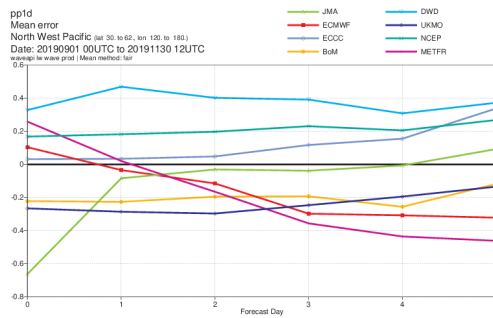
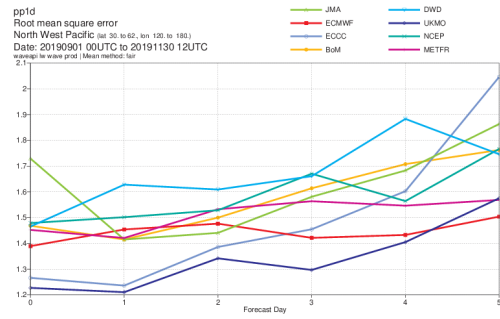
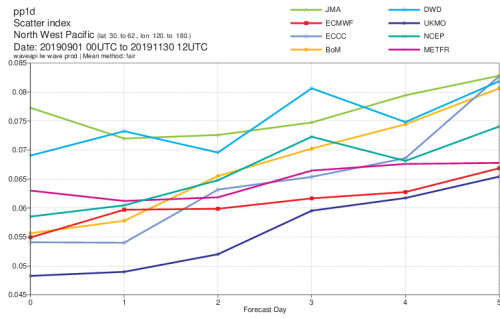
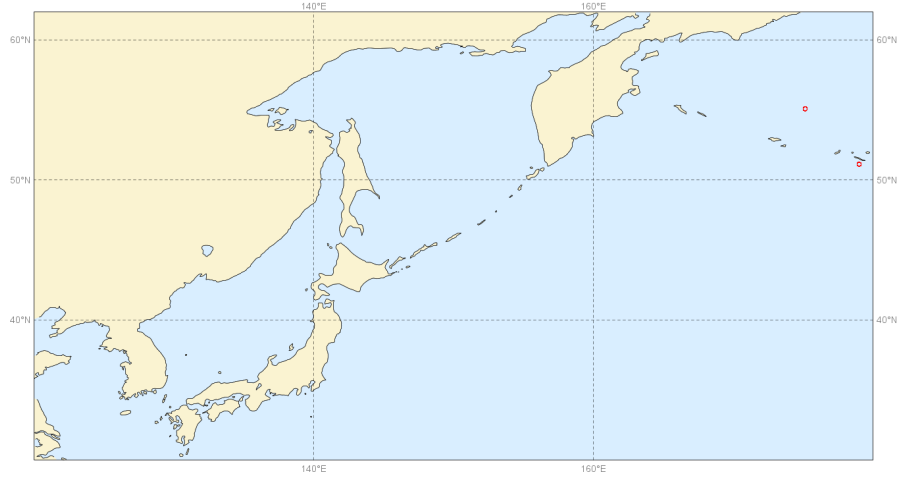
**North West Atlantic.** Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

Buoys observations - from 20190901 to 20191130 - (pp1d)



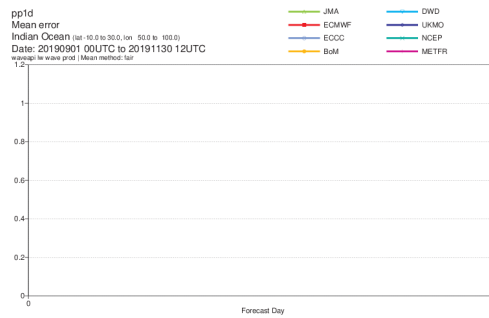
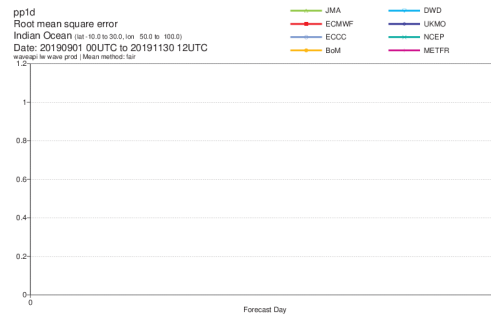
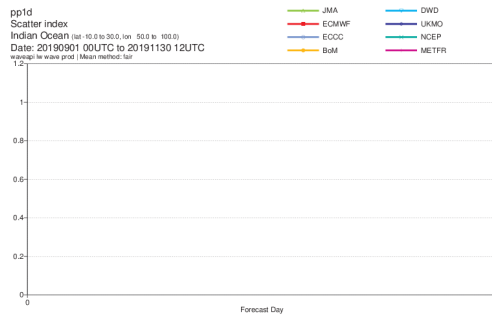
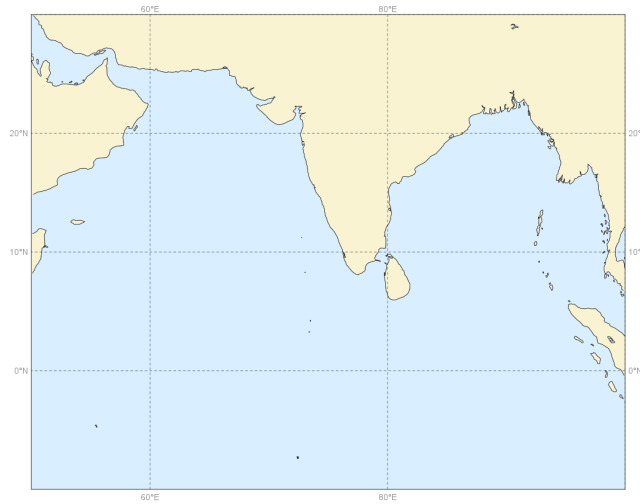
**North East Pacific.** Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

Buoys observations - from 20190901 to 20191130 - (pp1d)



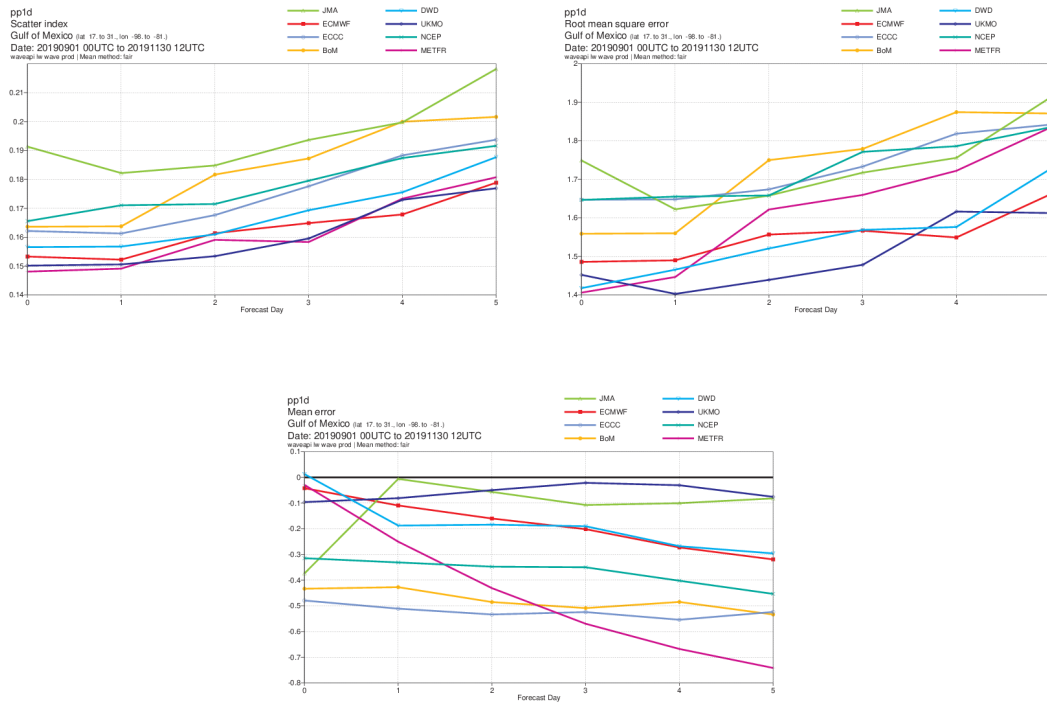
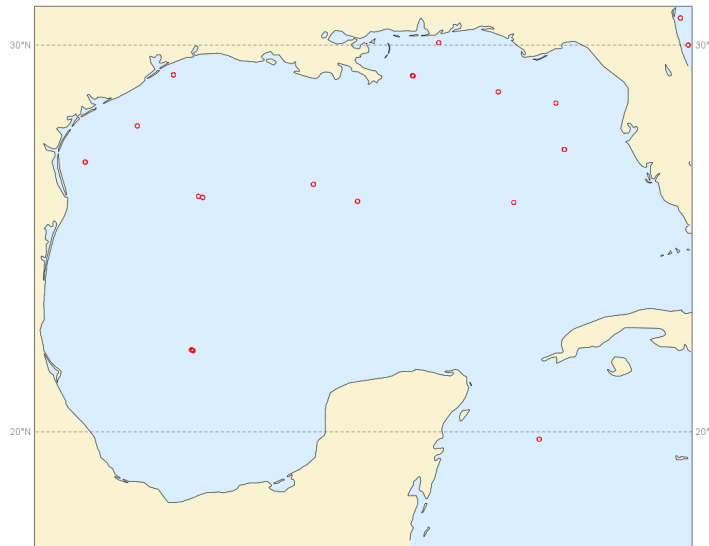
**North West Pacific.** Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

Buoys observations - from 20190901 to 20191130 - (pp1d)



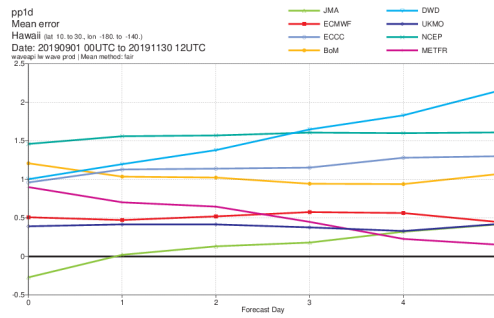
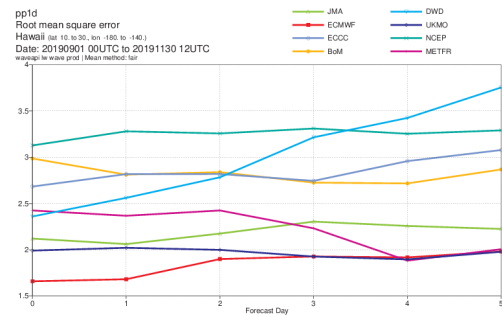
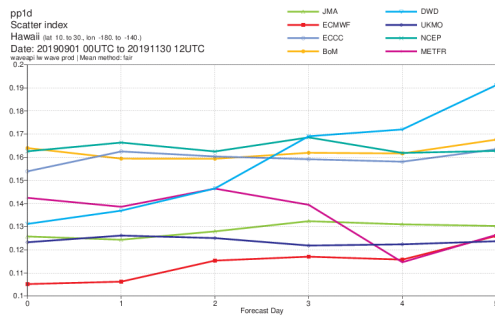
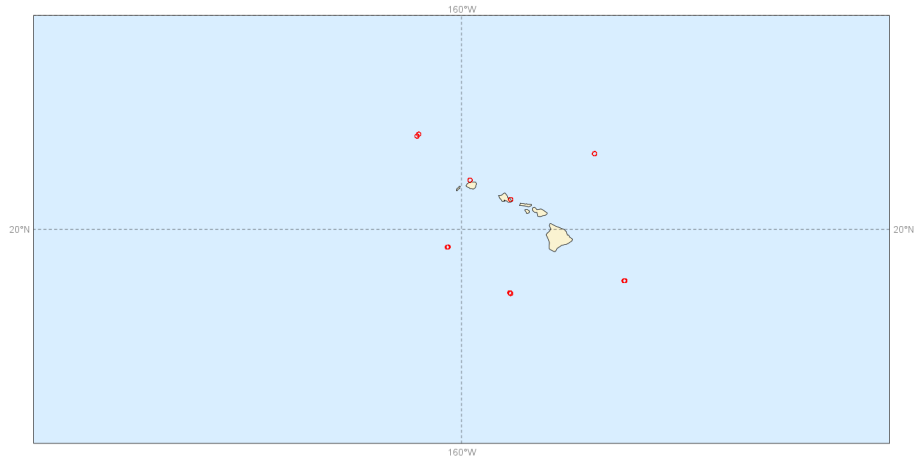
**Indian Ocean.** Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

Buoys observations - from 20190901 to 20191130 - (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 20190901 to 20191130 - (pp1d)

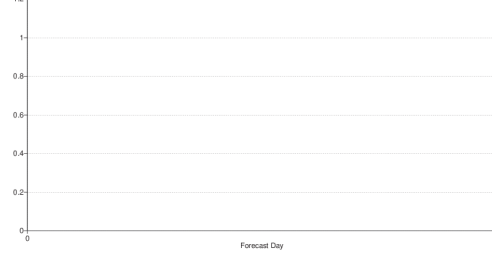


**Hawaii.** Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

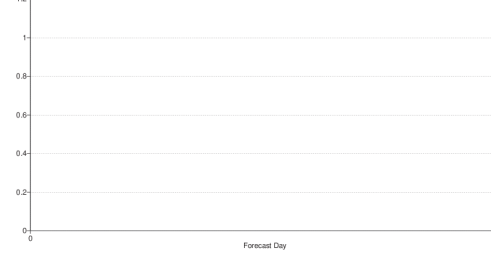
Buoys observations - from 20190901 to 20191130 - (pp1d)



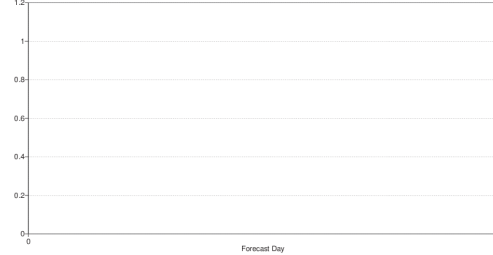
pp1d  
Scatter index  
S America (south) (lat: 57.5 to 12.5, lon: -80.0 to -42.5)  
Date: 20190901 00UTC to 20191130 12UTC  
Average for every grid. Mean method. lat



pp1d  
Root mean square error  
S America (south) (lat: 57.5 to 12.5, lon: -80.0 to -42.5)  
Date: 20190901 00UTC to 20191130 12UTC  
Average for every grid. Mean method. lat



pp1d  
Mean error  
S America (south) (lat: 57.5 to 12.5, lon: -80.0 to -42.5)  
Date: 20190901 00UTC to 20191130 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).