

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

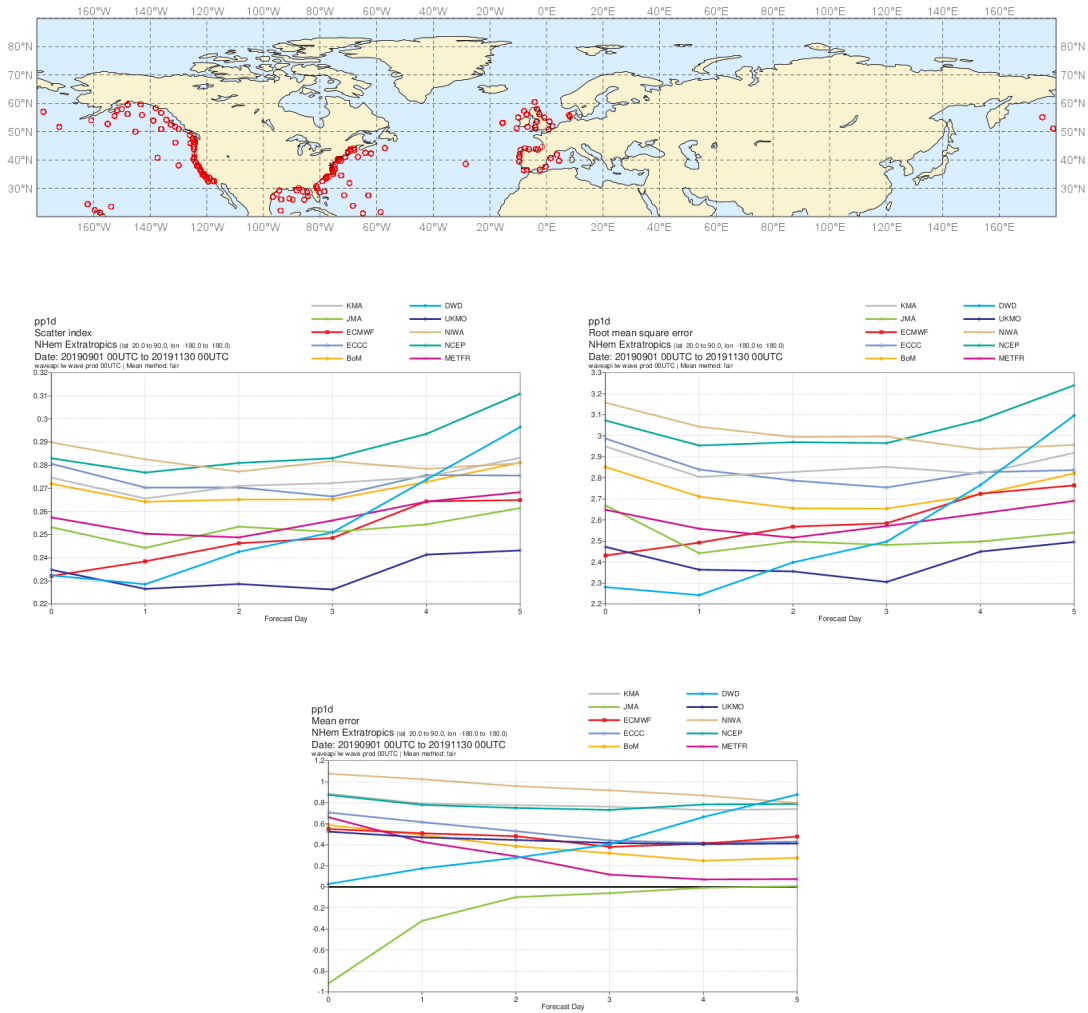
00 UTC runs only

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

December 19, 2019

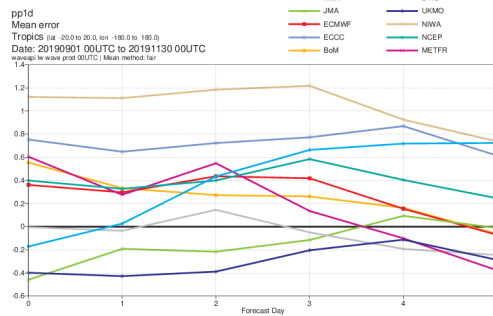
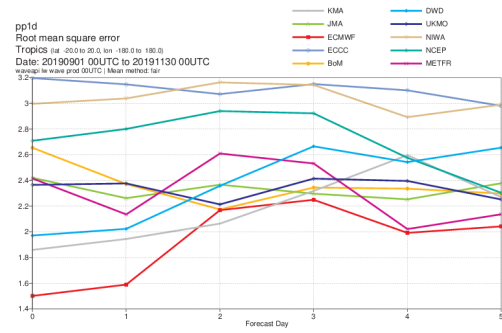
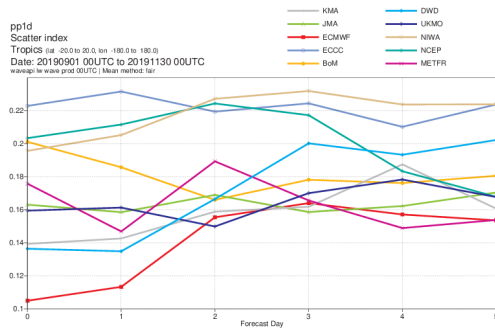
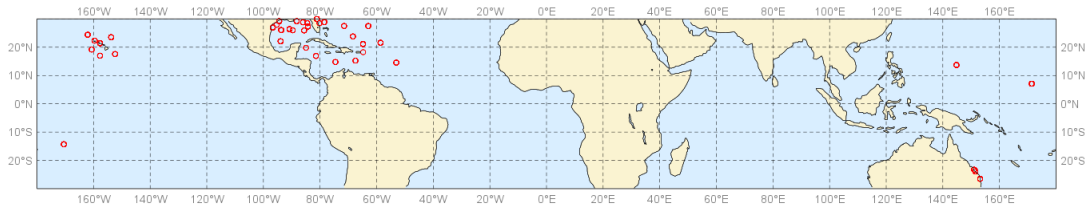
**PART II: Peak wave period (PP1D)**

Buoys observations - from 20190901 to 20191130 - (pp1d)



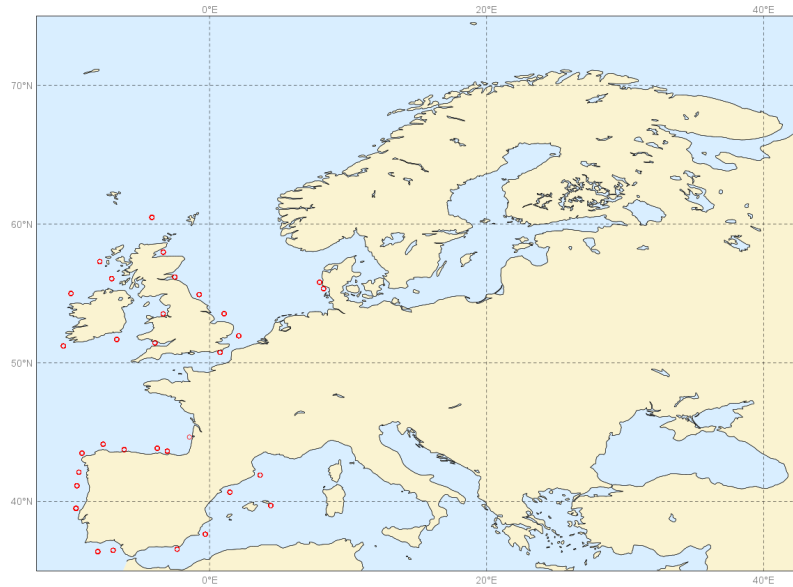
**Northern Hemisphere.** Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

Buoys observations - from 20190901 to 20191130 - (pp1d)

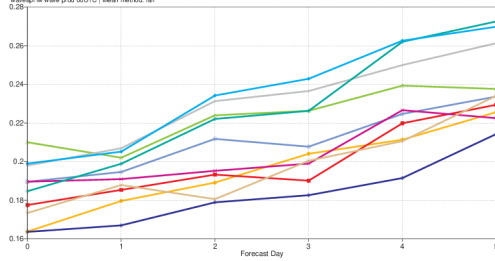


**Tropics.** Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

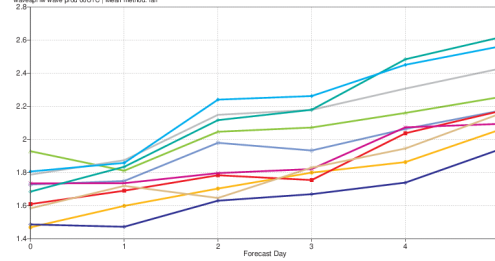
Buoys observations - from 20190901 to 20191130 - (pp1d)



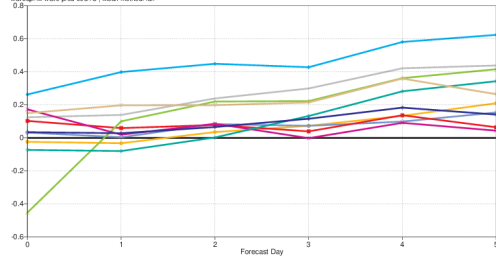
pp1d  
Scatter index  
Europe (lat: 35.0 to 75.0, lon: -12.5 to 42.5)  
Date: 20190901 00UTC to 20191130 00UTC  
Average for every grid 00UTC. Mean method for



pp1d  
Root mean square error  
Europe (lat: 35.0 to 75.0, lon: -12.5 to 42.5)  
Date: 20190901 00UTC to 20191130 00UTC  
Average for every grid 00UTC. Mean method for

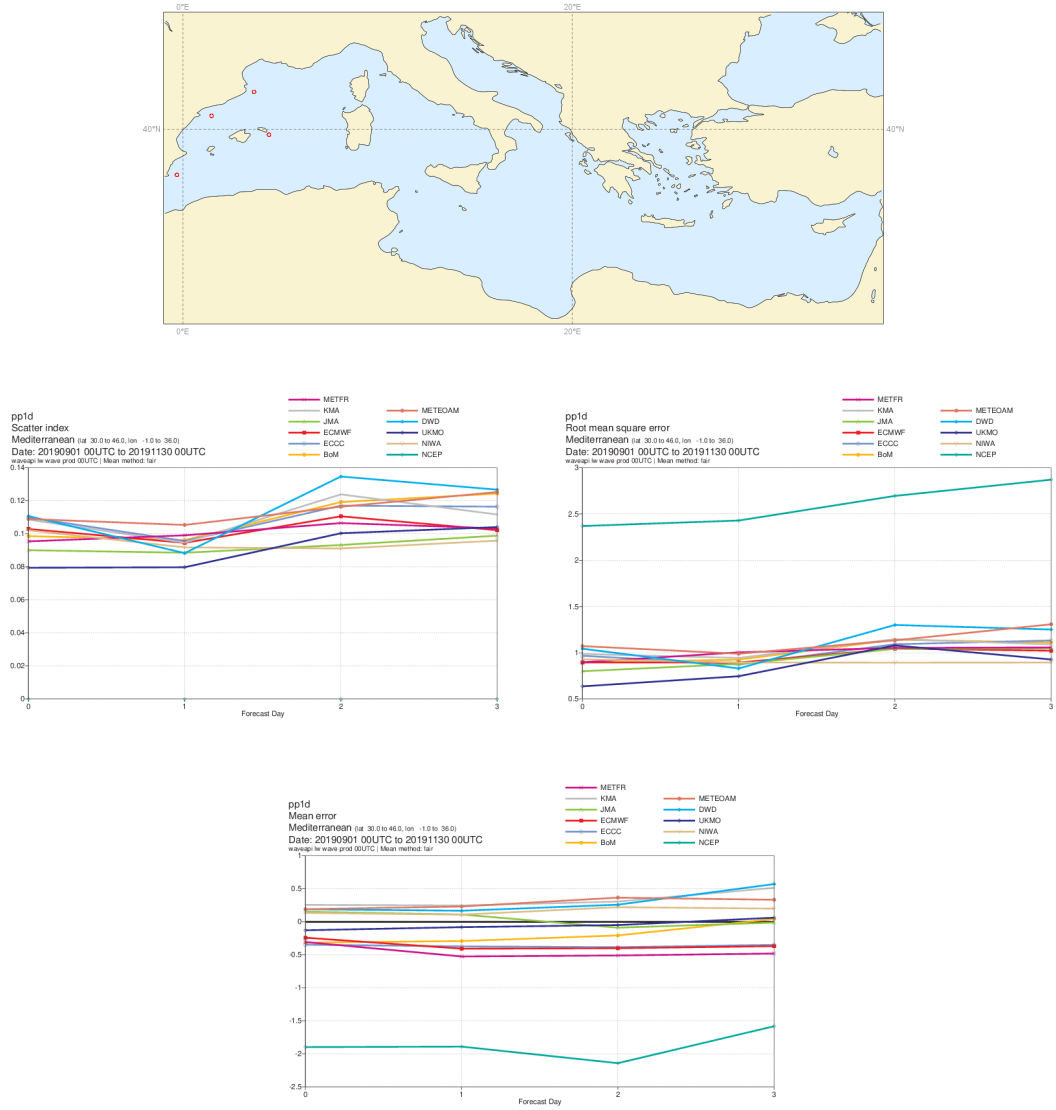


pp1d  
Mean error  
Europe (lat: 35.0 to 75.0, lon: -12.5 to 42.5)  
Date: 20190901 00UTC to 20191130 00UTC  
Average for every grid 00UTC. Mean method for



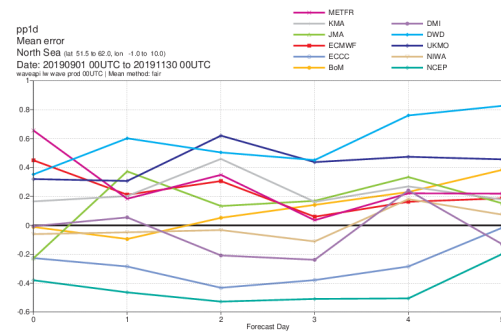
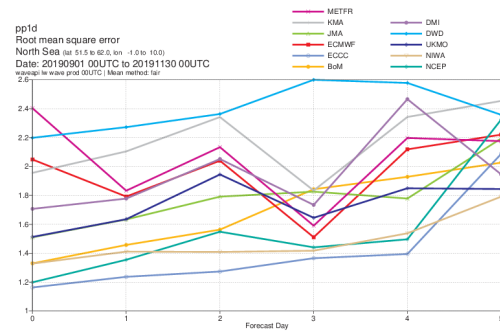
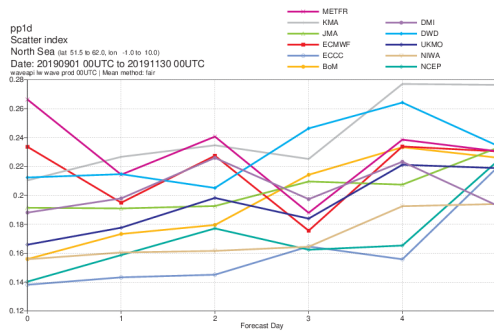
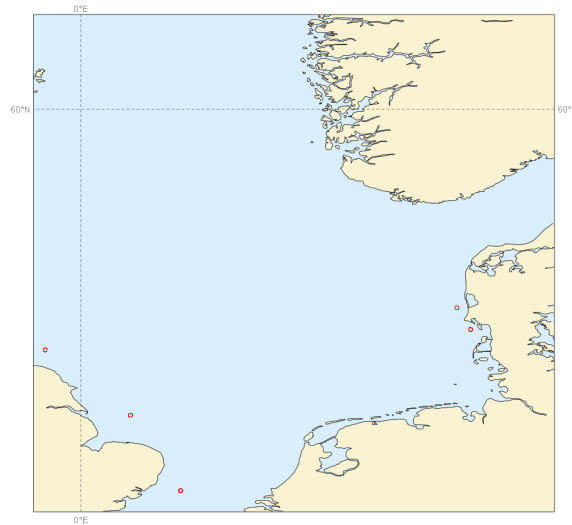
**Europe.** Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

Buoys observations - from 20190901 to 20191130 - (pp1d)



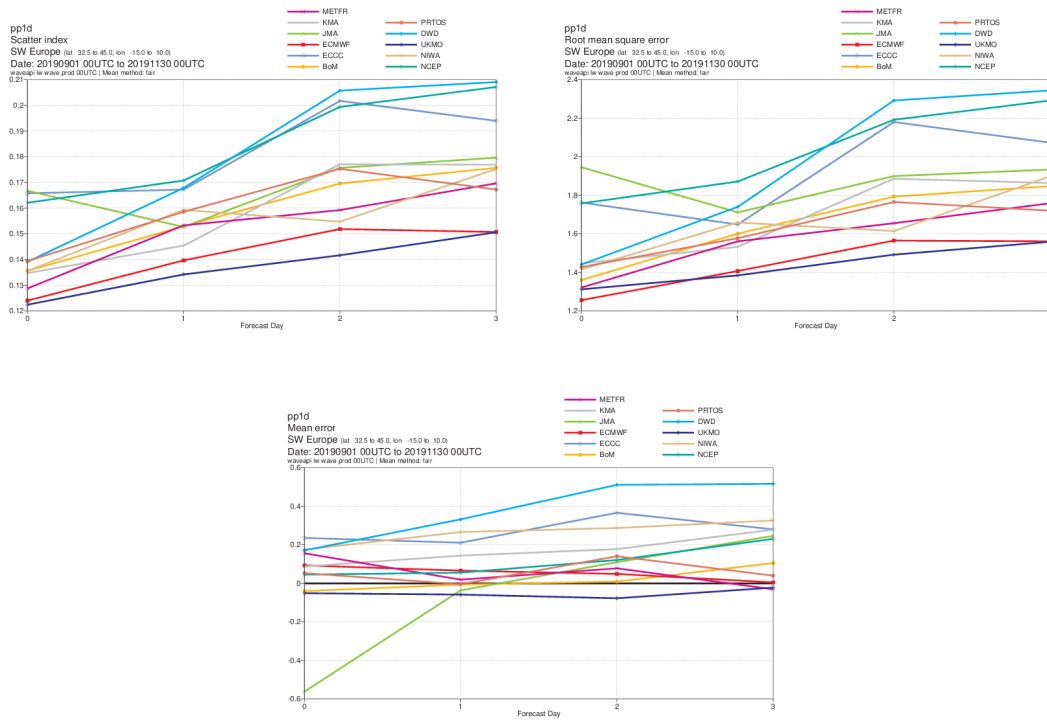
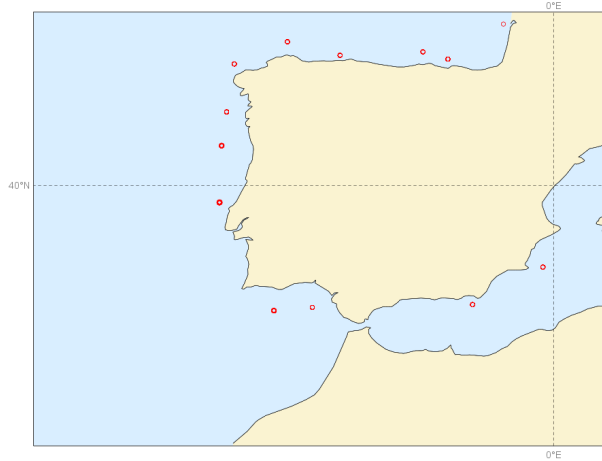
**Mediterranean Sea.** Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

Buoys observations - from 20190901 to 20191130 - (pp1d)



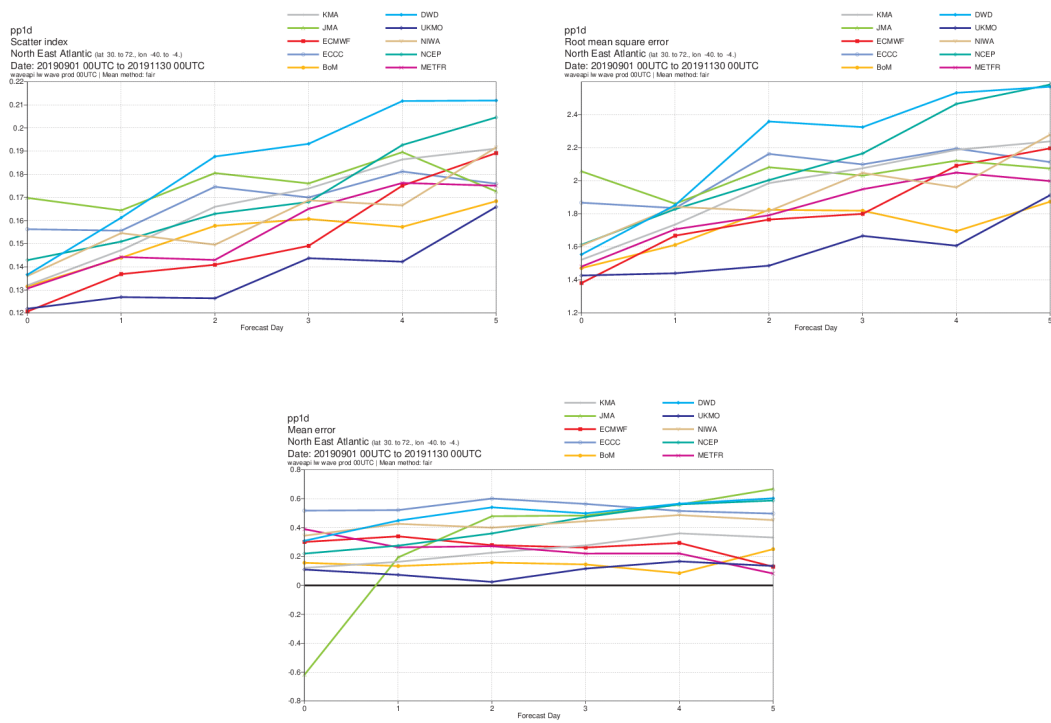
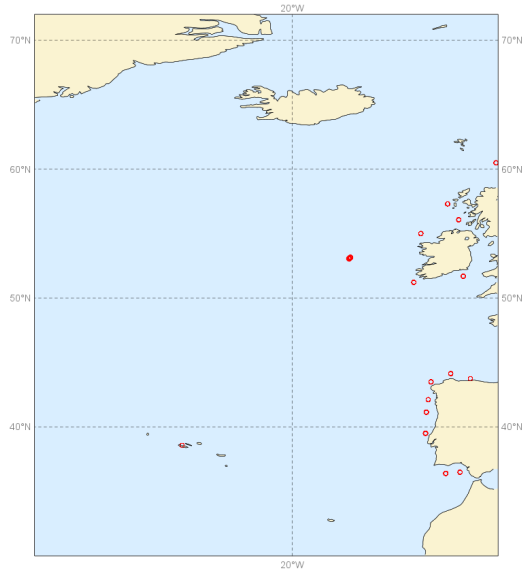
**North Sea.** Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

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).

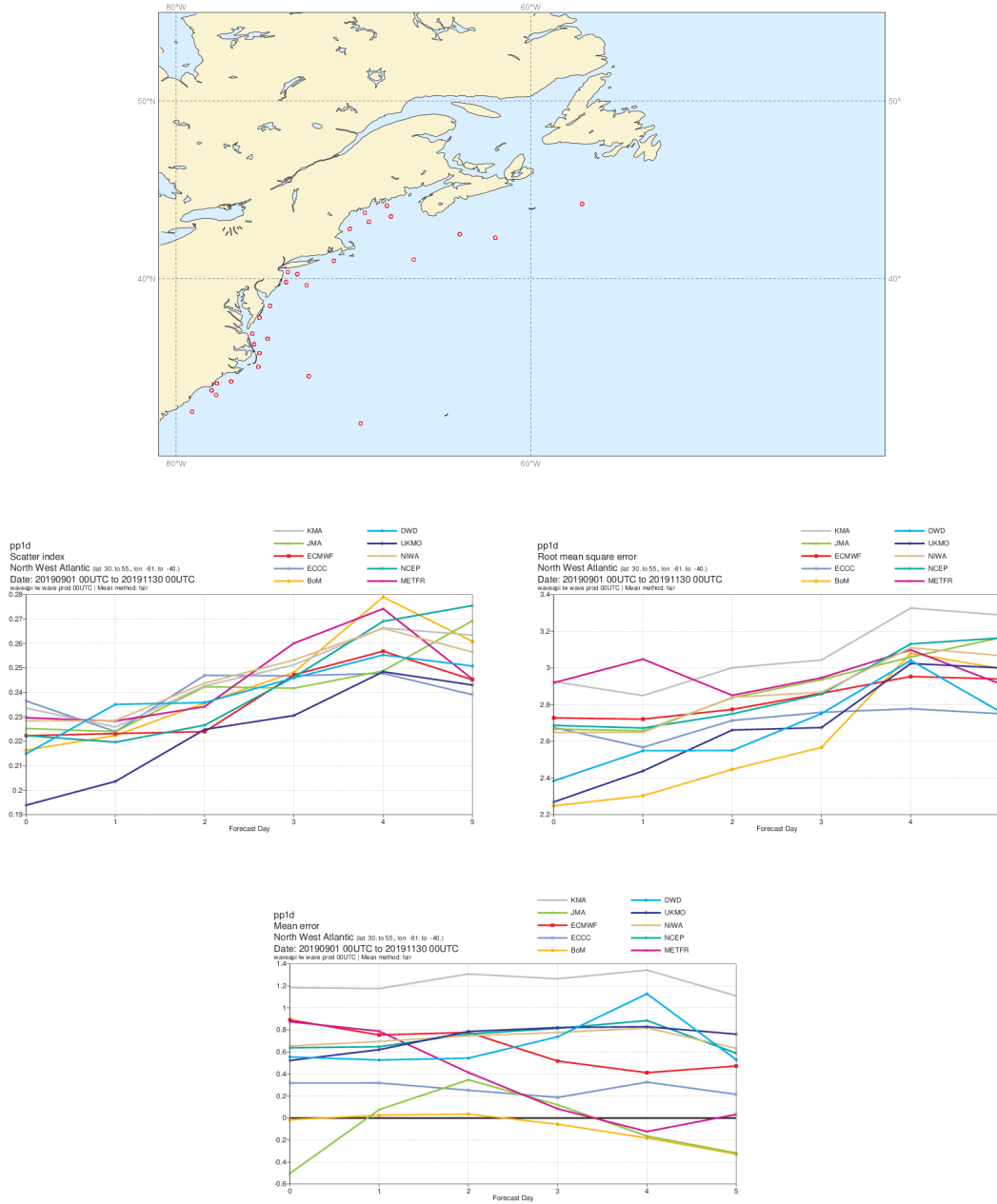
Buoys observations - from 20190901 to 20191130 - (pp1d)



**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).

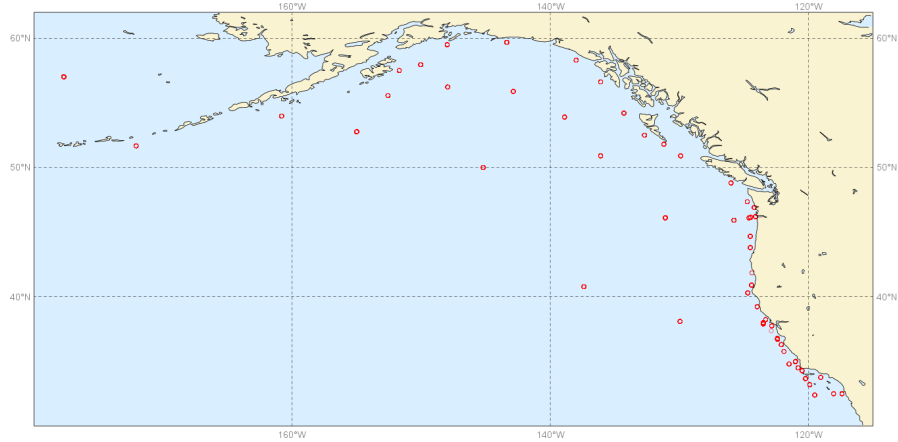


Buoys observations - from 20190901 to 20191130 - (pp1d)

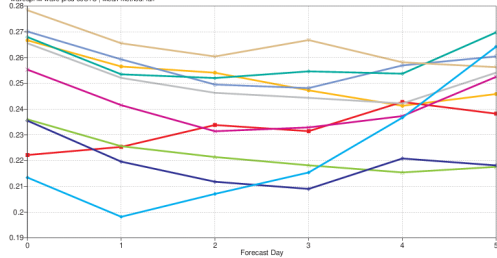


**North West Atlantic.** Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

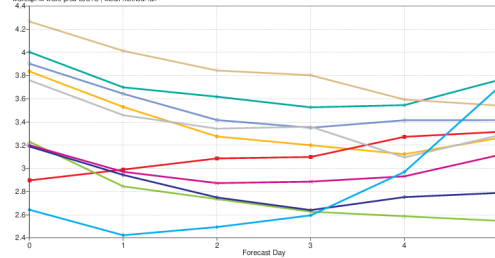
Buoys observations - from 20190901 to 20191130 - (pp1d)



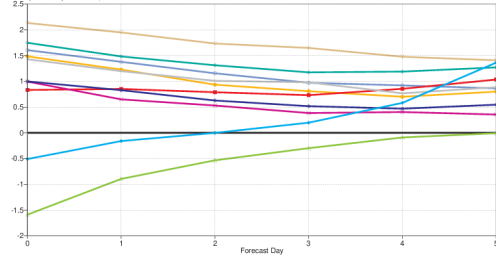
pp1d  
Scatter index  
North East Pacific (lat 30 to 62, lon -180 to -115)  
Date: 20190901 00UTC to 20191130 00UTC  
averaged by wave period (0UTC), Mean method (lat)



pp1d  
Root mean square error  
North East Pacific (lat 30 to 62, lon -180 to -115)  
Date: 20190901 00UTC to 20191130 00UTC  
averaged by wave period (0UTC), Mean method (lat)

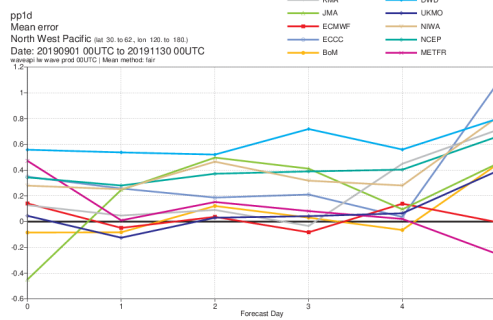
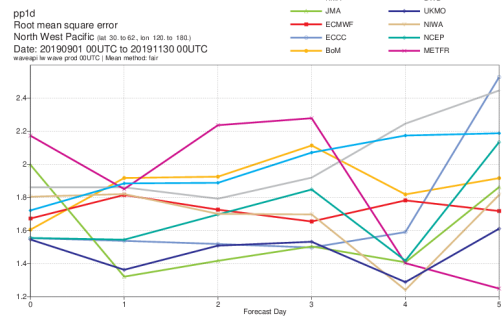
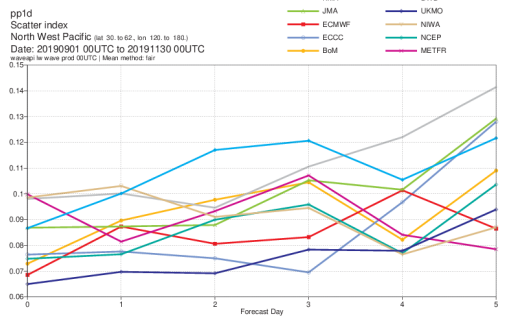
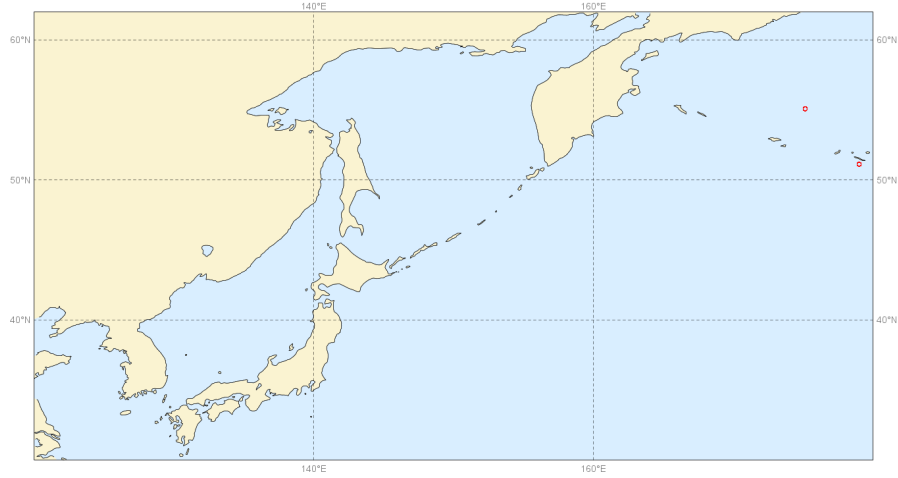


pp1d  
Mean error  
North East Pacific (lat 30 to 62, lon -180 to -115)  
Date: 20190901 00UTC to 20191130 00UTC  
averaged by wave period (0UTC), Mean method (lat)



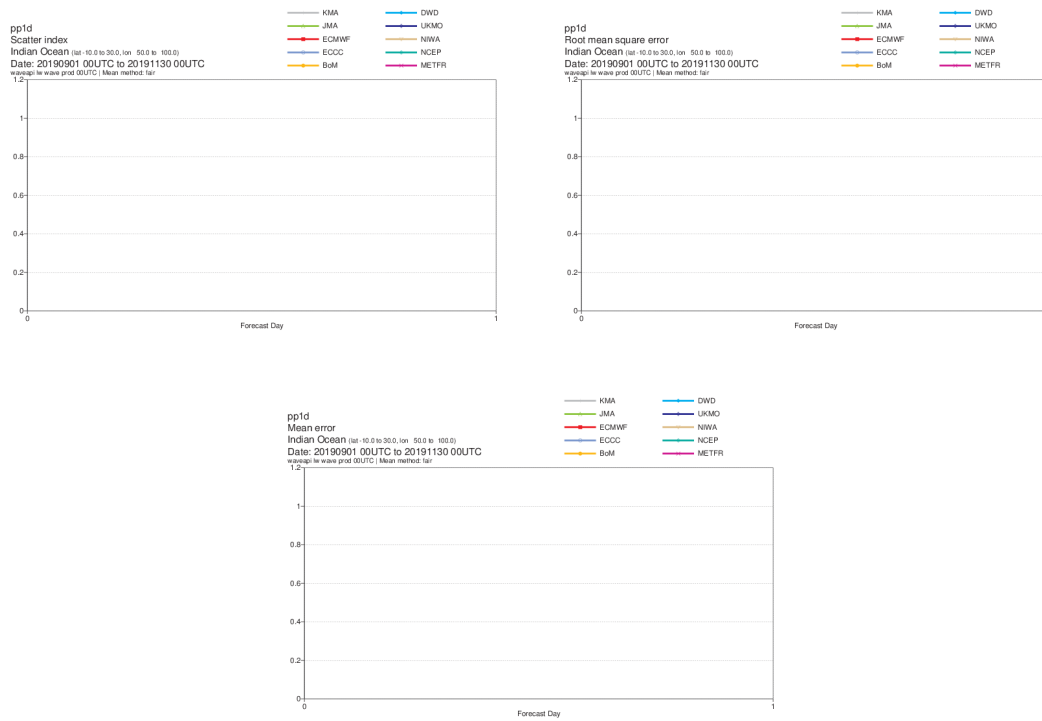
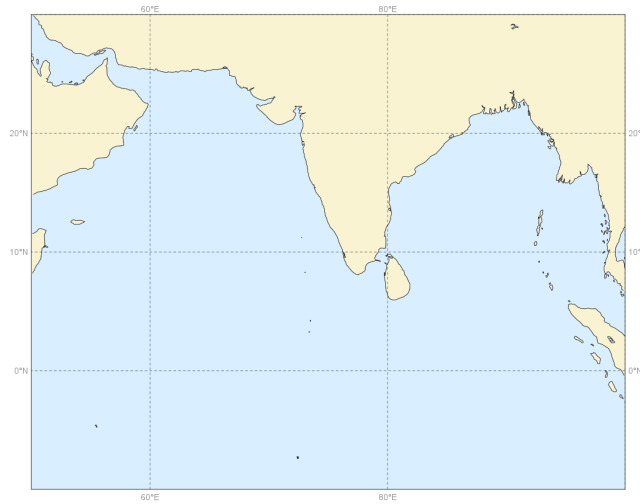
**North East Pacific.** Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

Buoys observations - from 20190901 to 20191130 - (pp1d)



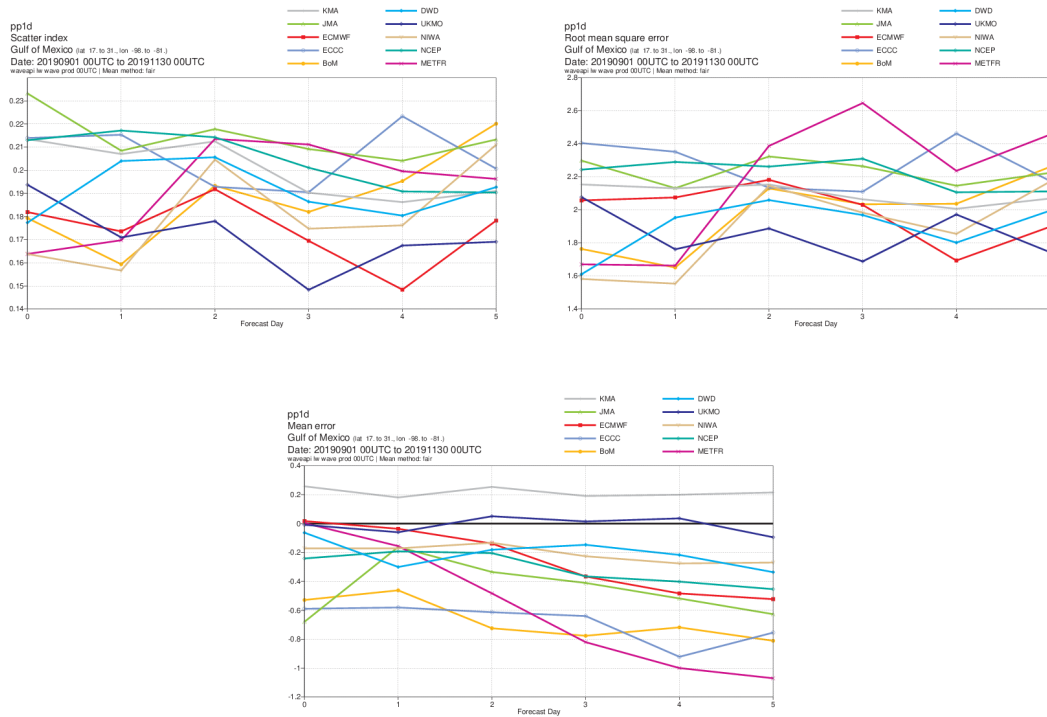
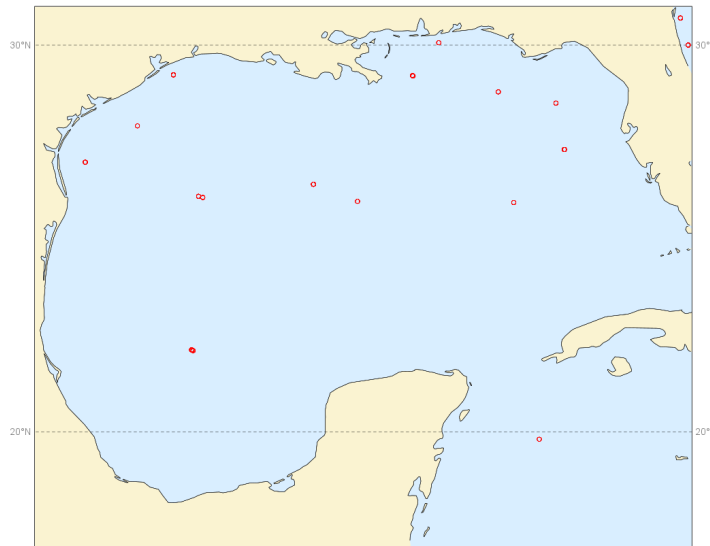
**North West Pacific.** Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

Buoys observations - from 20190901 to 20191130 - (pp1d)



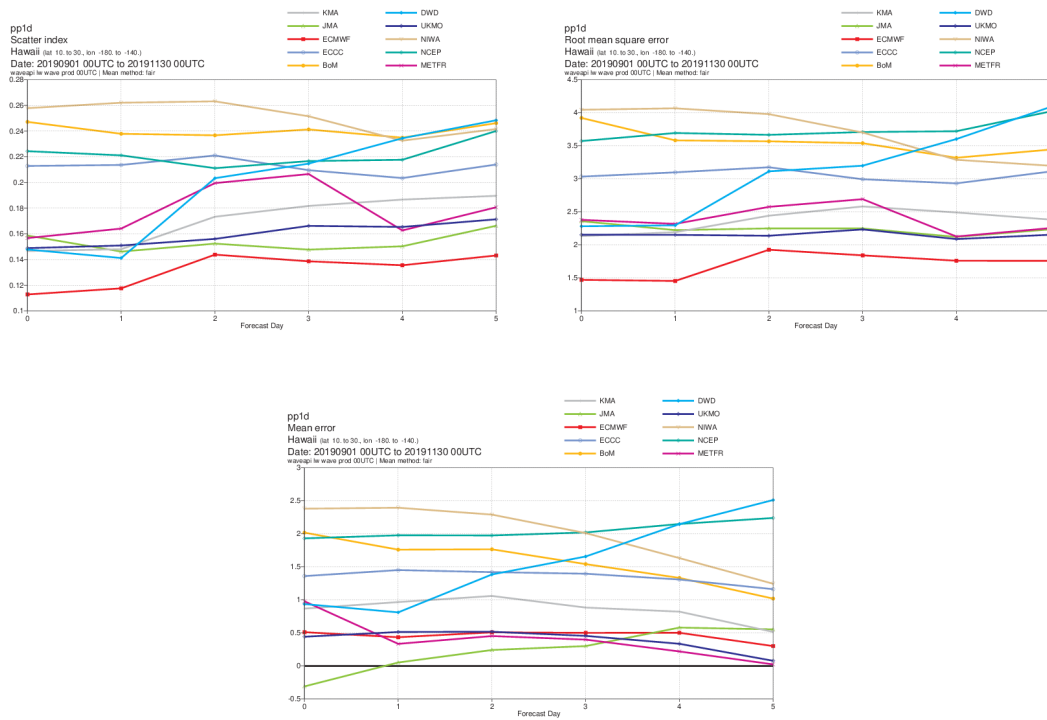
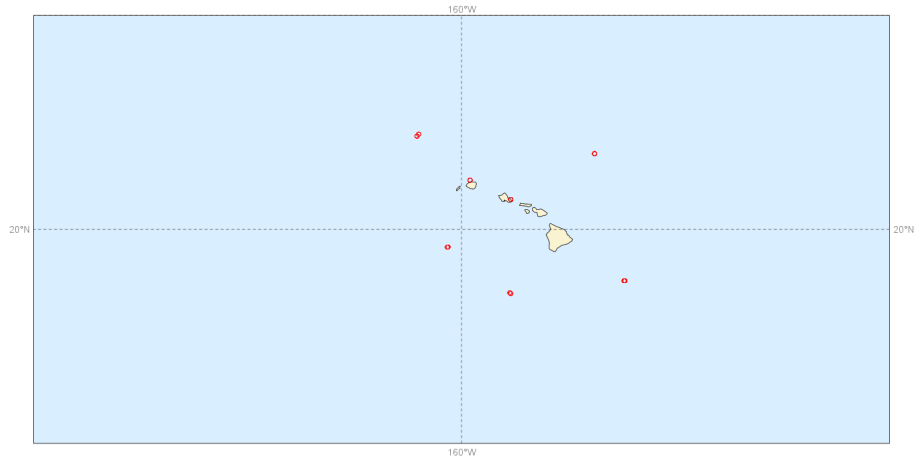
**Indian Ocean.** Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

Buoys observations - from 20190901 to 20191130 - (pp1d)



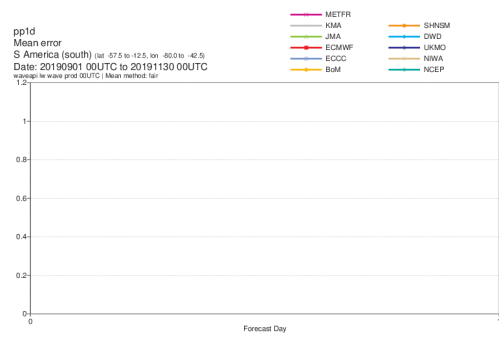
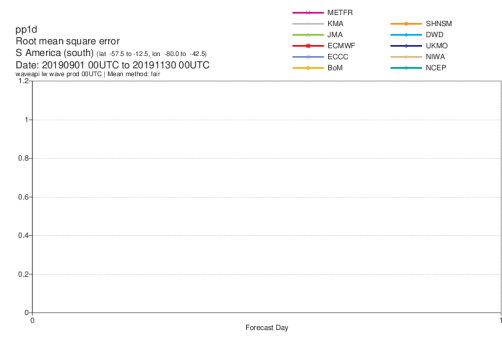
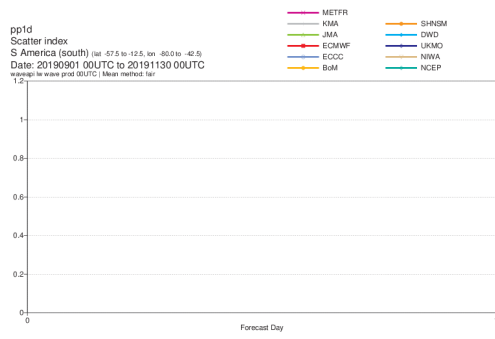
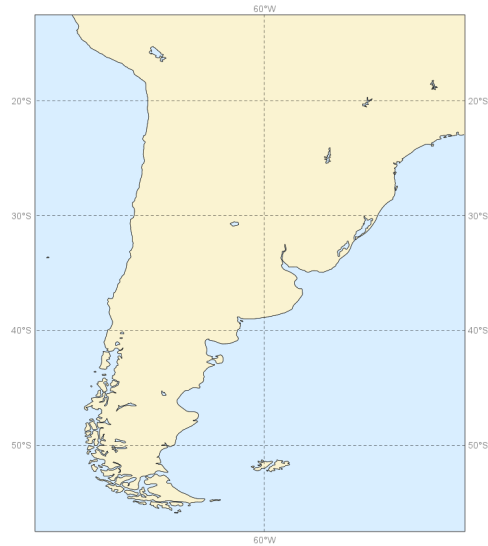
**Gulf of Mexico.** Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

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)



**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).