

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.

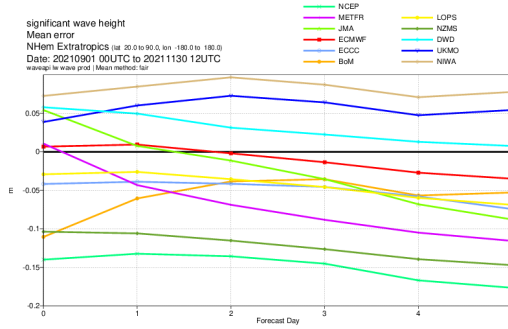
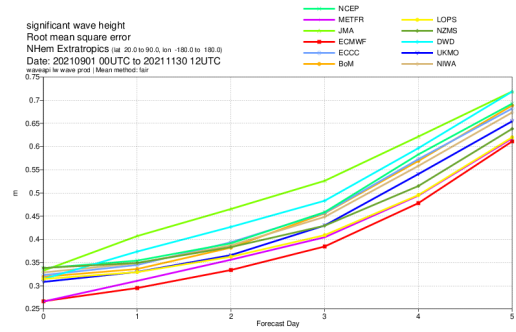
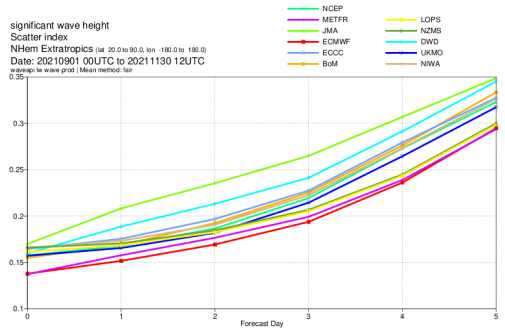
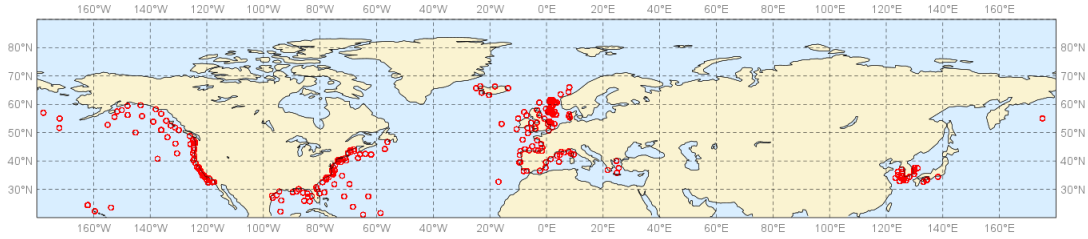
00 and 12 UTC runs

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

December 13, 2021

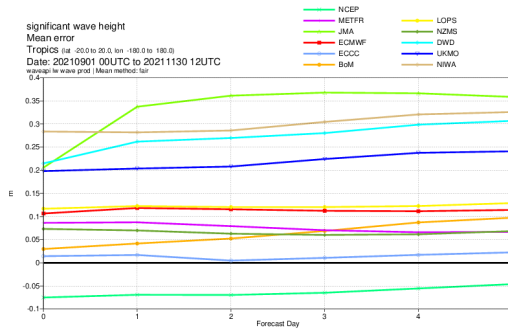
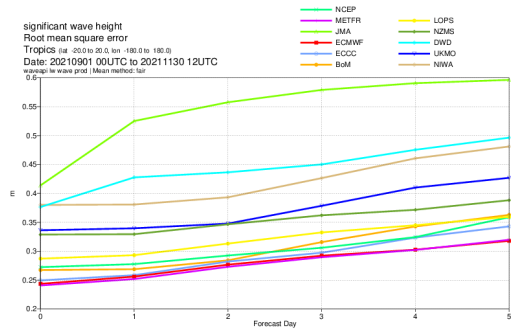
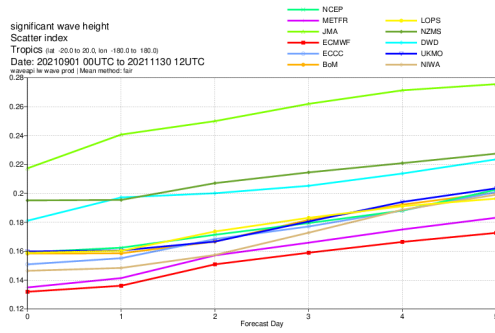
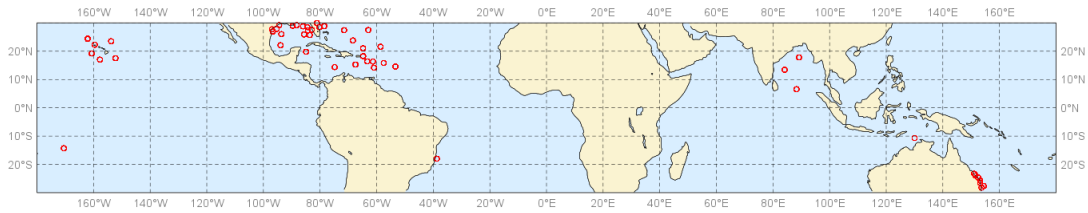
PART I: significant wave height (SWH)

Buoys observations - from 20210901 to 20211130 - (swH)



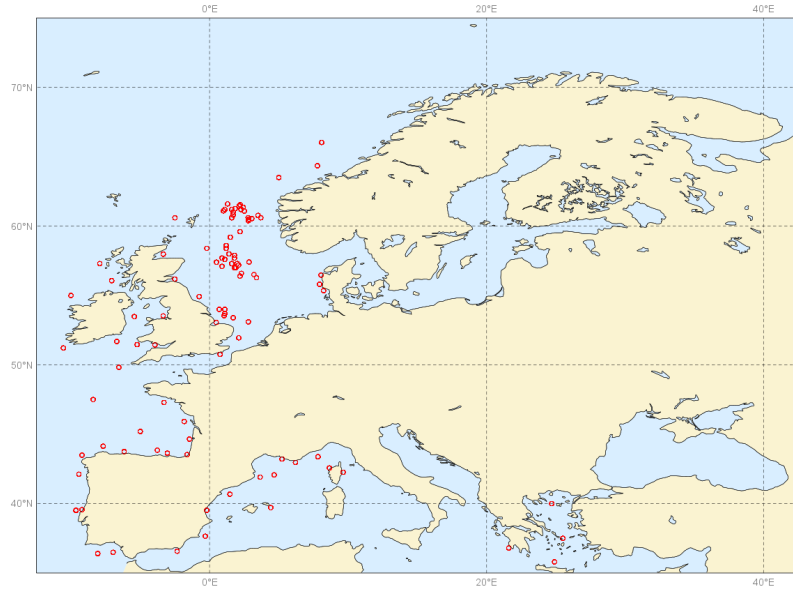
Northern Hemisphere. Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

Buoys observations - from 20210901 to 20211130 - (swh)

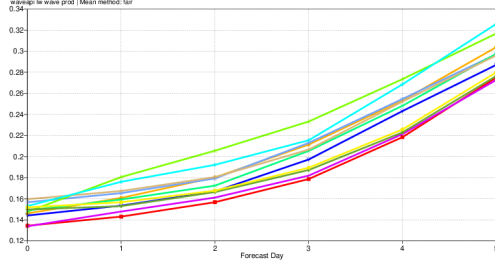


Tropics. Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

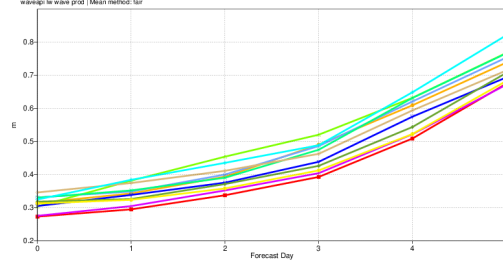
Buoys observations - from 20210901 to 20211130 - (swh)



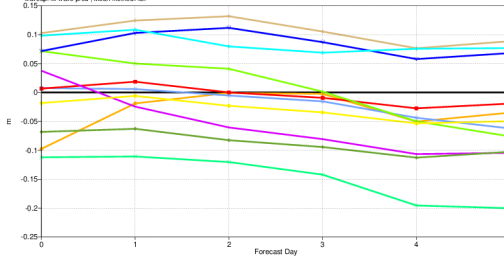
significant wave height
Scatter index
Europe (lat: 35.0 to 75.0, lon: -12.5 to 42.5)
Date: 20210901 00UTC to 20211130 12UTC
Average for wave grid (Mean method: last)



significant wave height
Root mean square error
Europe (lat: 35.0 to 75.0, lon: -12.5 to 42.5)
Date: 20210901 00UTC to 20211130 12UTC
Average for wave grid (Mean method: last)

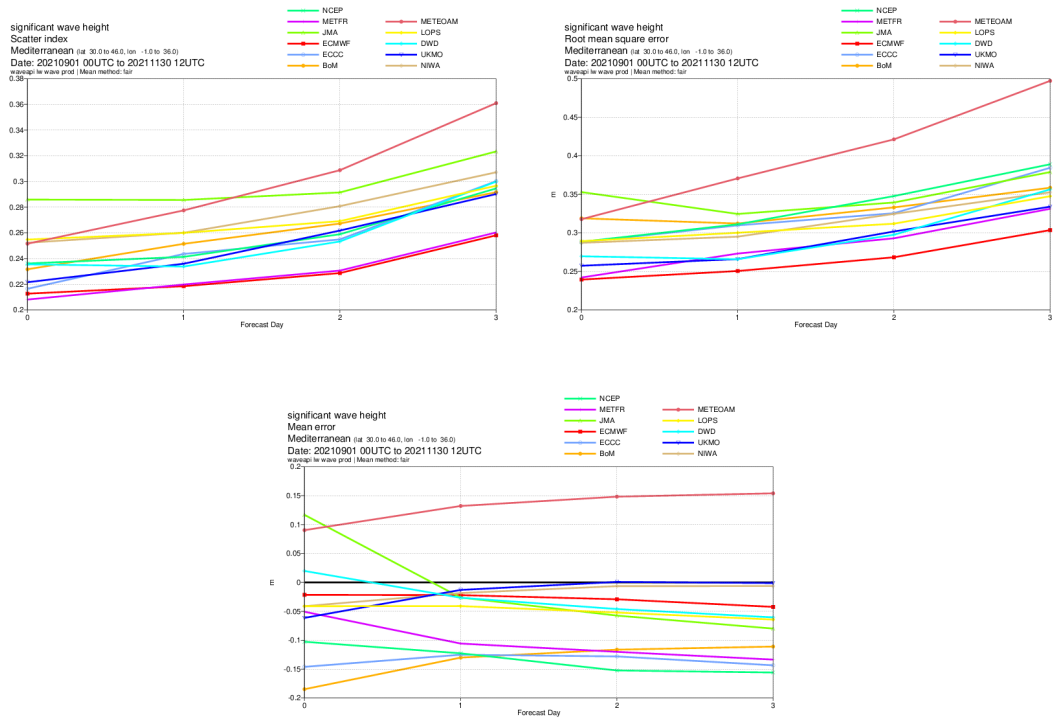
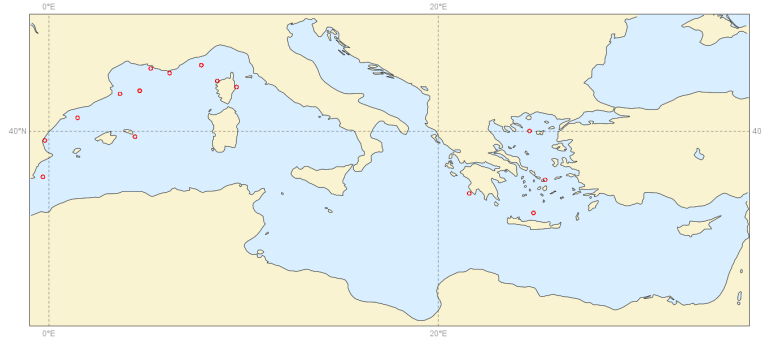


significant wave height
Mean error
Europe (lat: 35.0 to 75.0, lon: -12.5 to 42.5)
Date: 20210901 00UTC to 20211130 12UTC
Average for wave grid (Mean method: last)



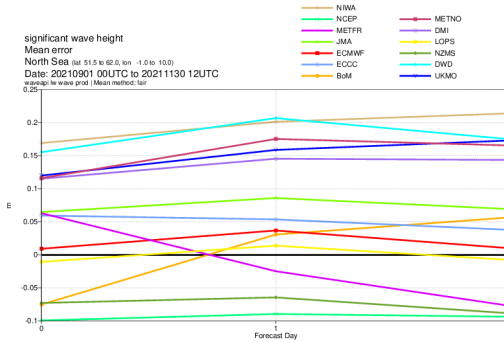
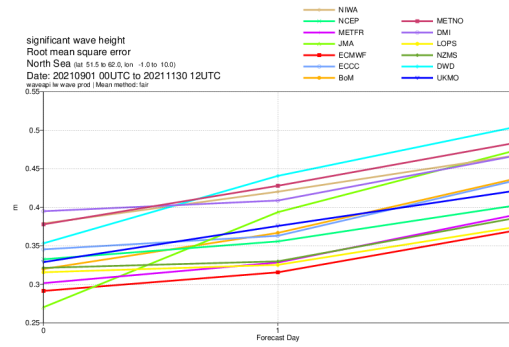
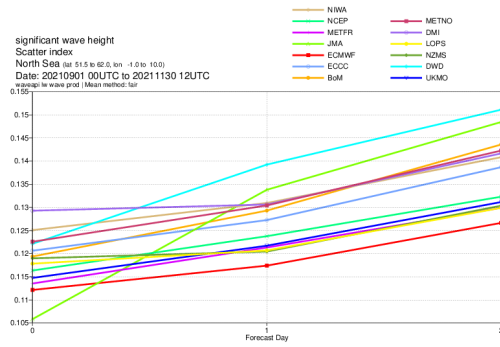
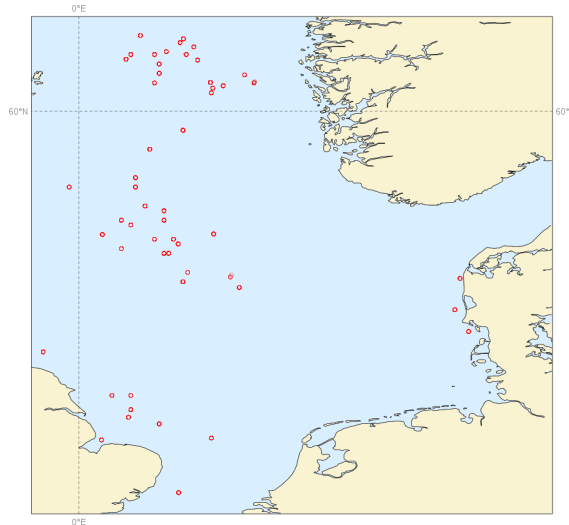
Europe. Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

Buoys observations - from 20210901 to 20211130 - (swh)



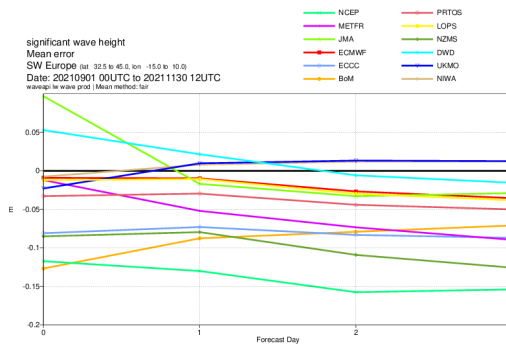
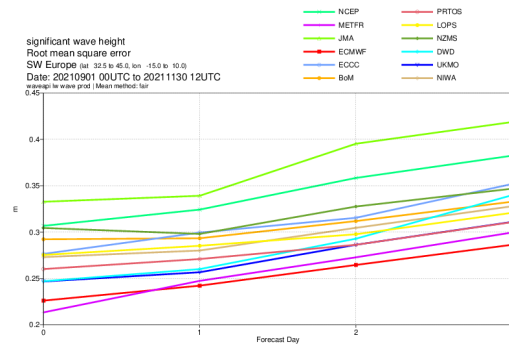
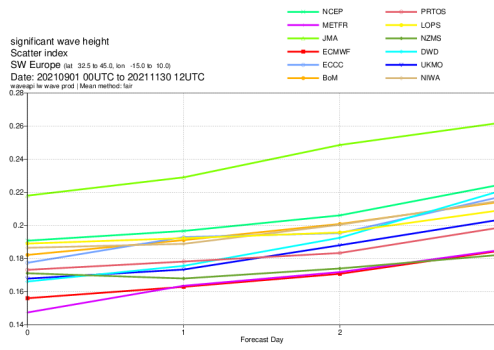
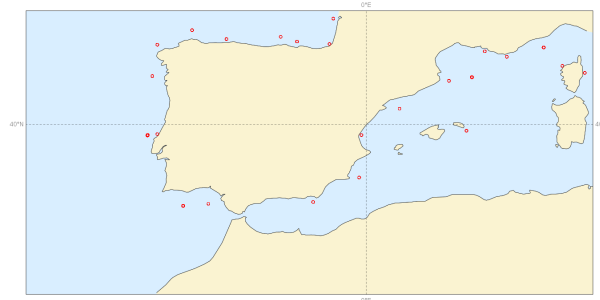
Mediterranean Sea. Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

Buoys observations - from 20210901 to 20211130 - (swh)



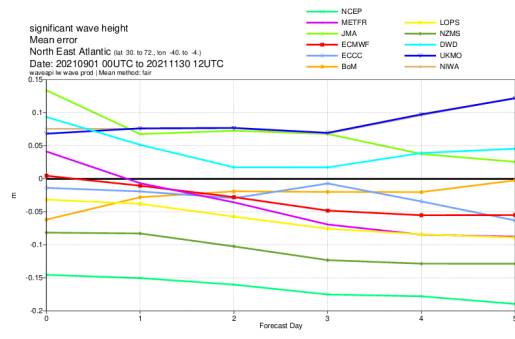
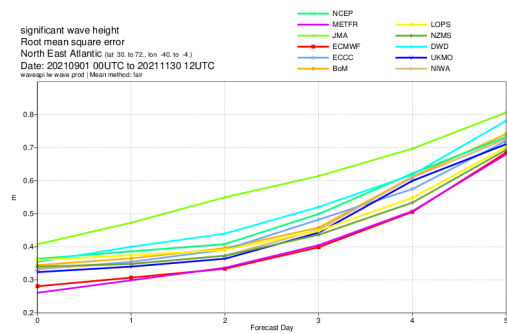
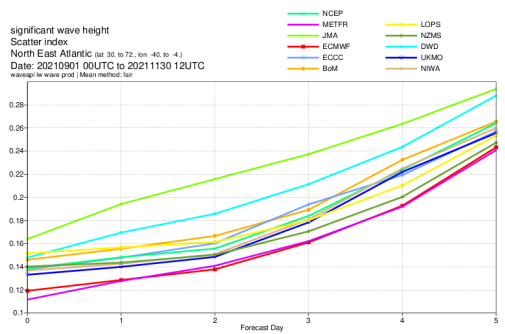
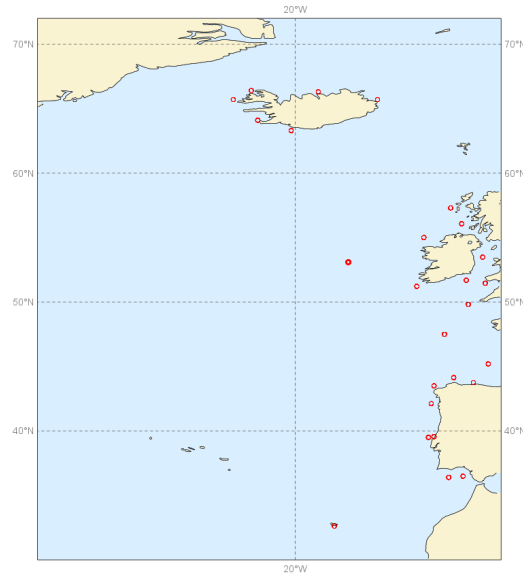
North Sea. Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

Buoys observations - from 20210901 to 20211130 - (swh)



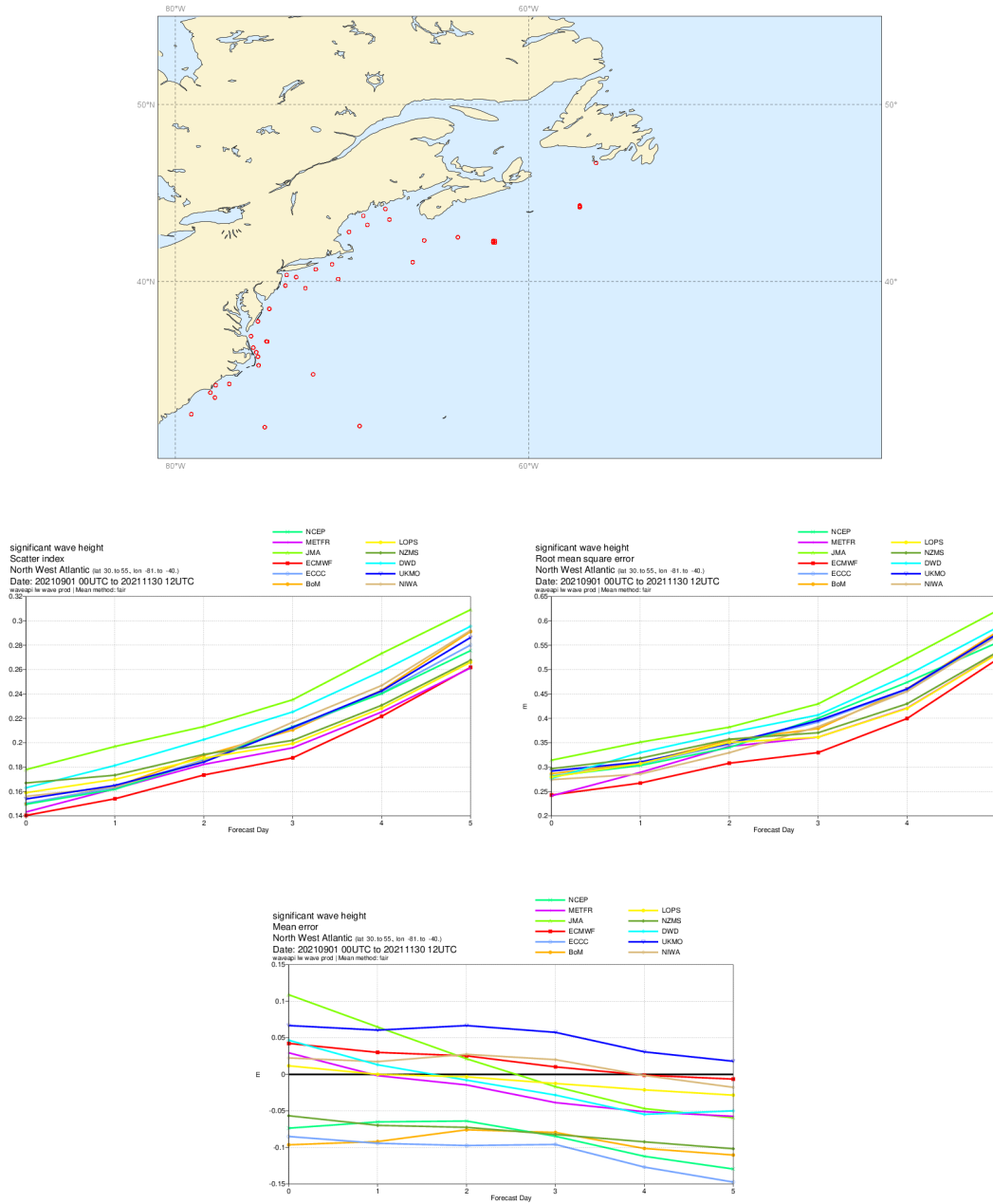
South West Europe. Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

Buoys observations - from 20210901 to 20211130 - (swh)



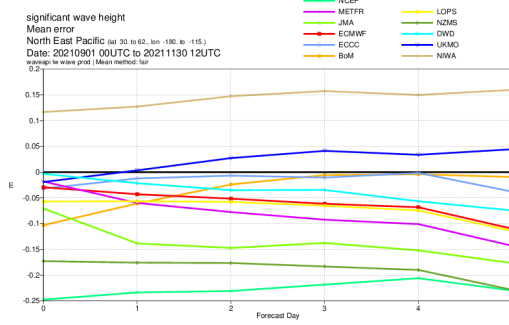
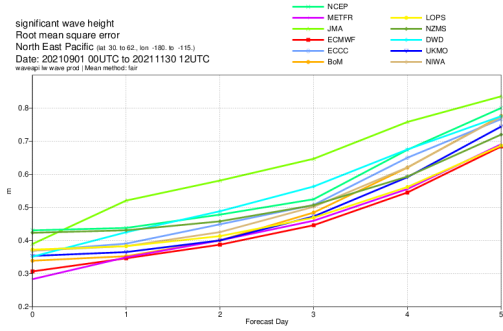
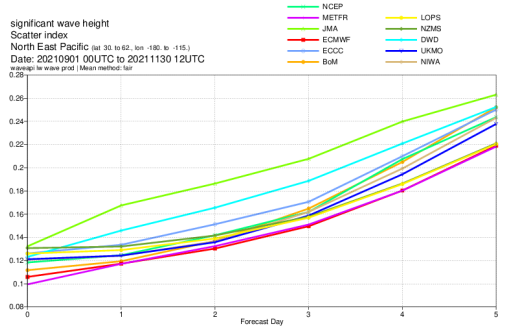
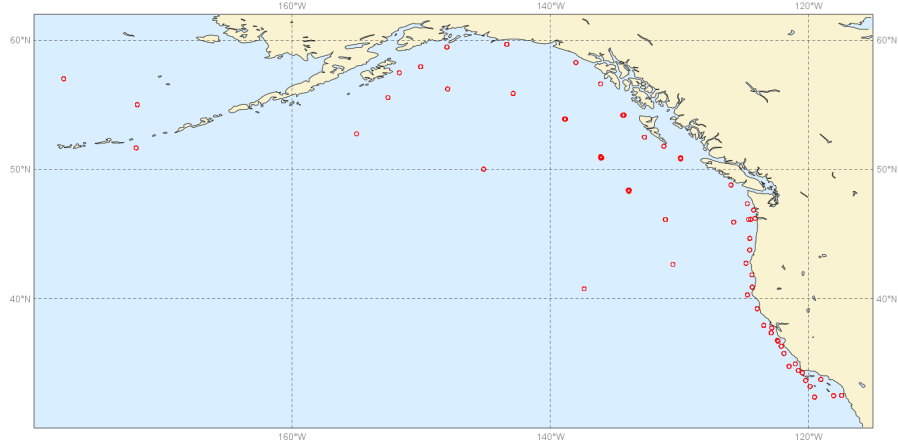
North East Atlantic. Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

Buoys observations - from 20210901 to 20211130 - (swh)



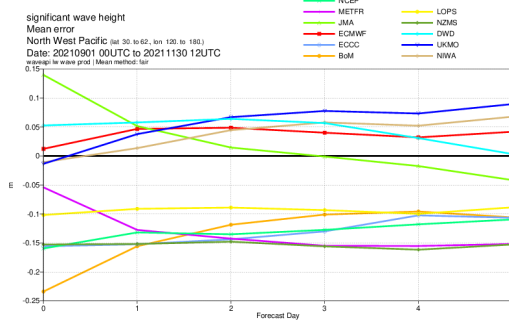
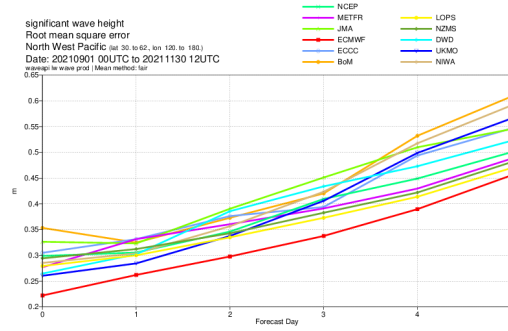
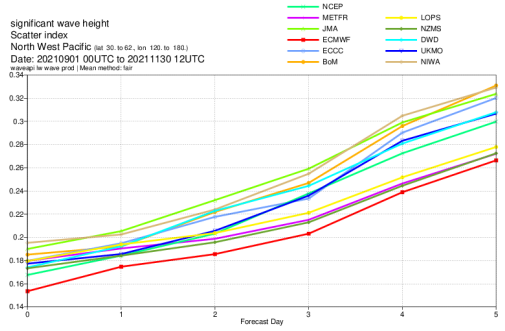
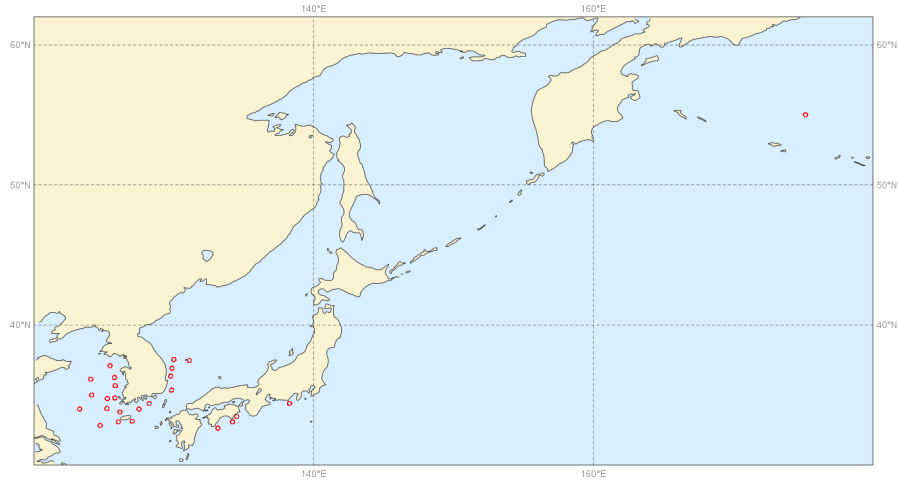
North West Atlantic. Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

Buoys observations - from 20210901 to 20211130 - (swh)



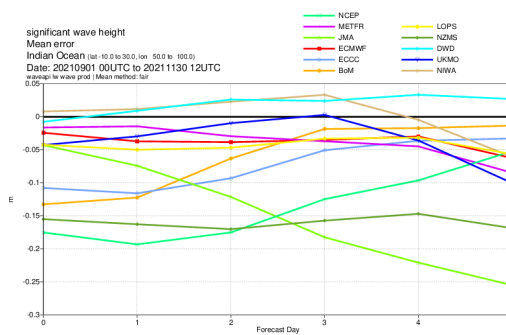
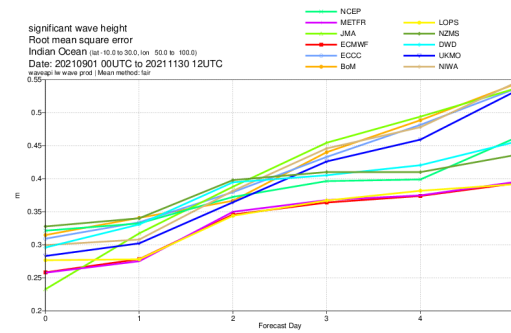
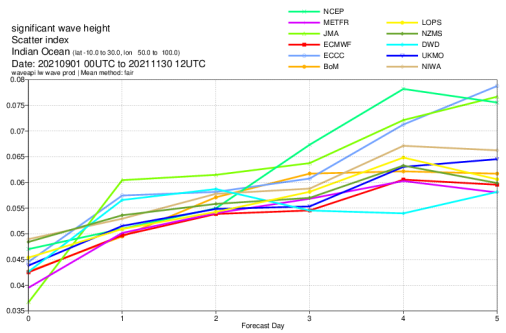
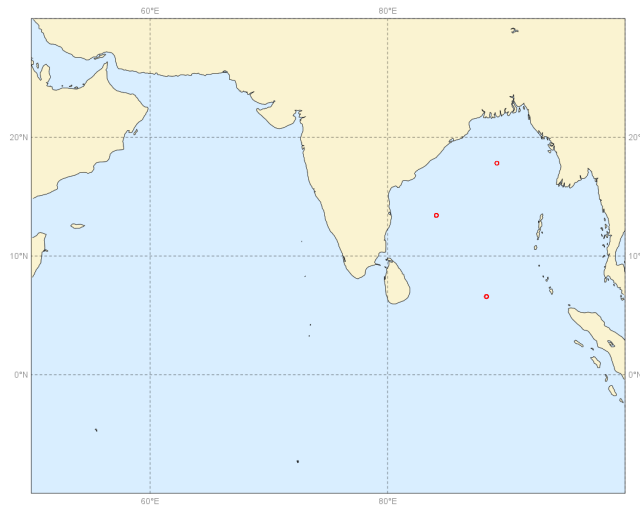
North East Pacific. Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

Buoys observations - from 20210901 to 20211130 - (swh)



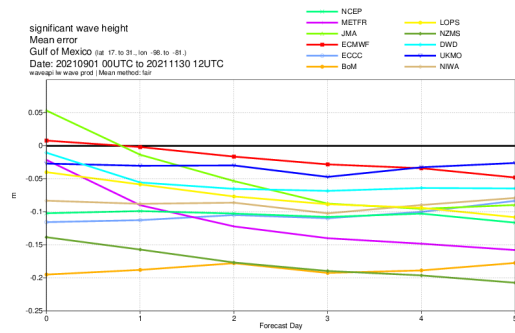
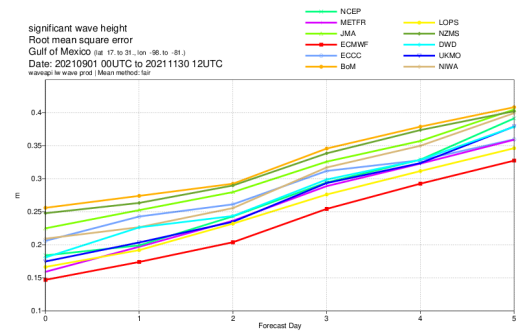
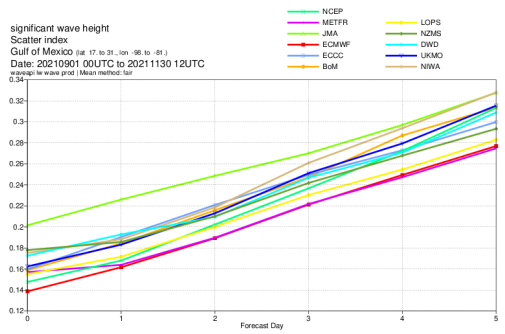
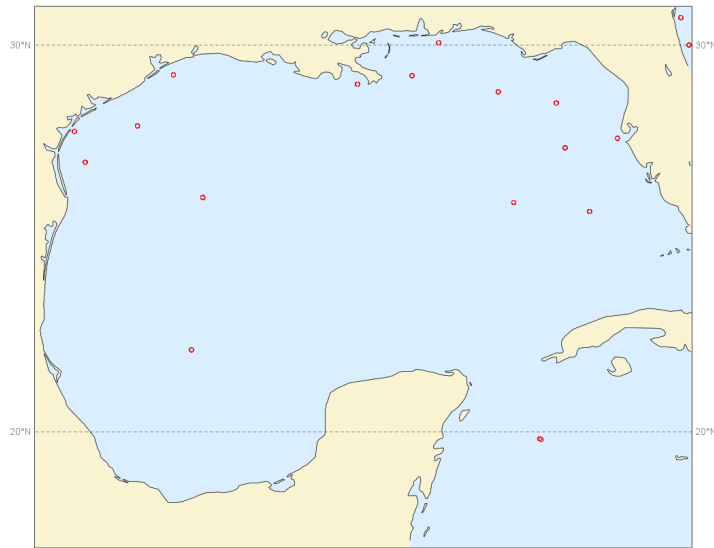
North West Pacific. Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

Buoys observations - from 20210901 to 20211130 - (swh)



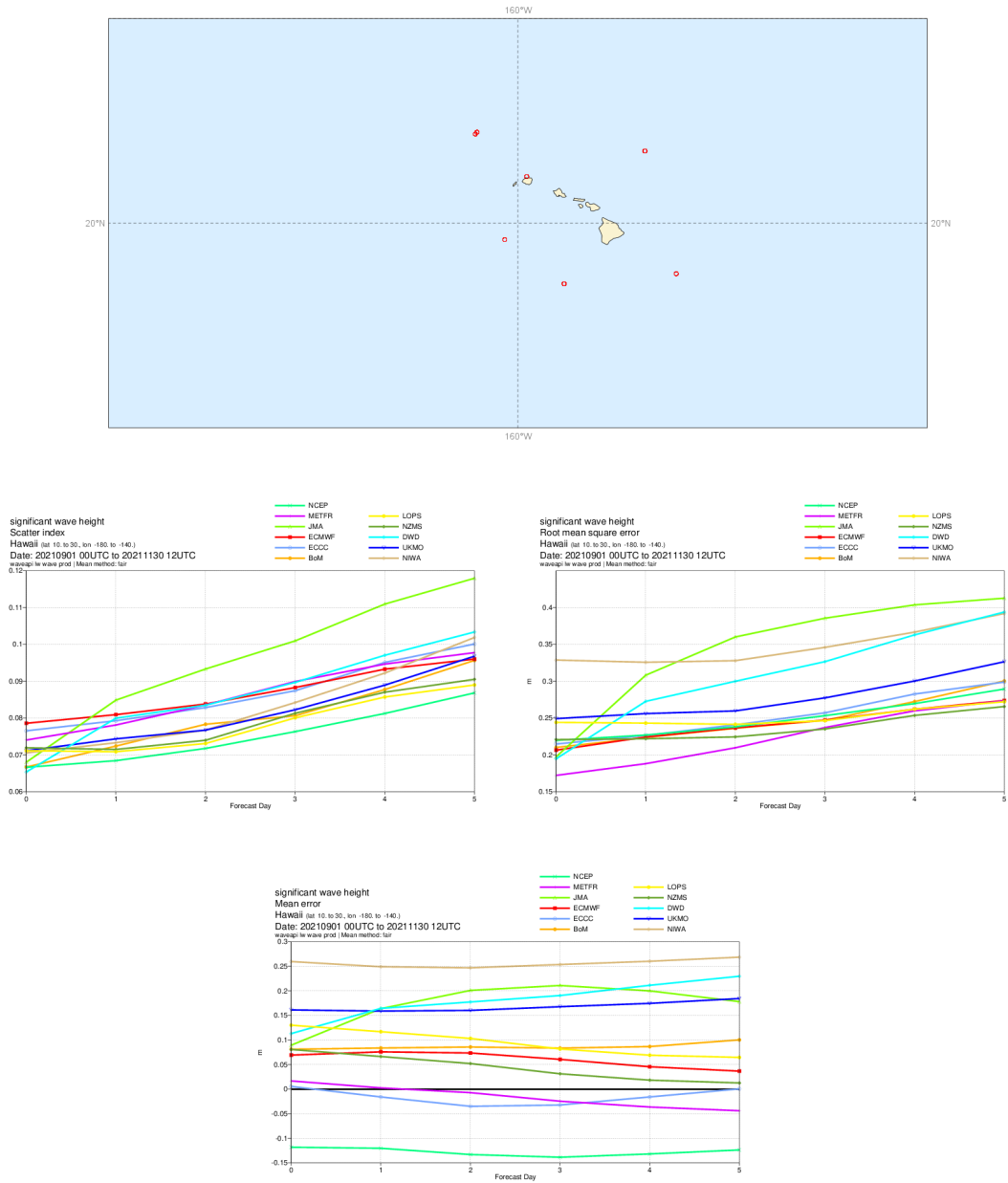
Indian Ocean. Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

Buoys observations - from 20210901 to 20211130 - (swh)



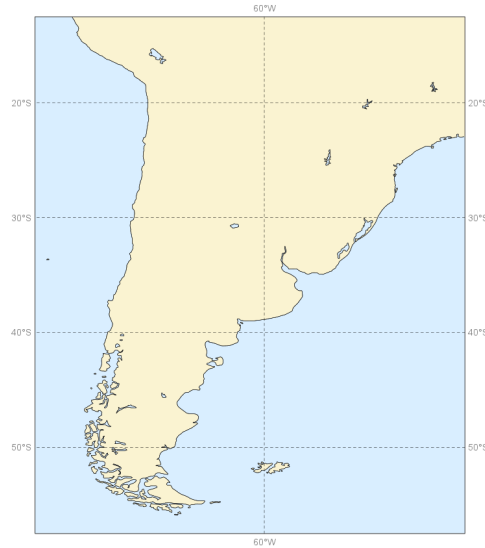
Gulf of Mexico. Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

Buoys observations - from 20210901 to 20211130 - (swH)

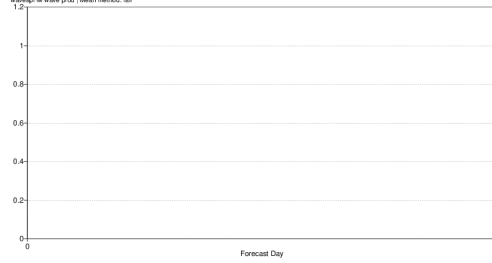


Hawaii. Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

Buoys observations - from 20210901 to 20211130 - (swh)



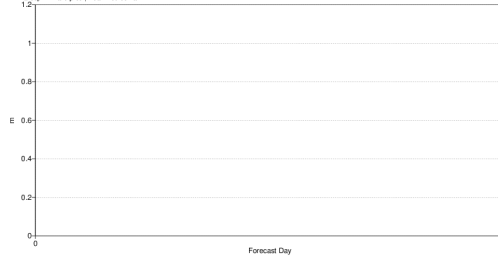
significant wave height
Scatter index
S America (south) (lat: 57.5 to 12.5, lon: -80.0 to -42.5)
Date: 20210901 00UTC to 20211130 12UTC
Average for wave grid (Mean method, lat)



significant wave height
Root mean square error
S America (south) (lat: 57.5 to 12.5, lon: -80.0 to -42.5)
Date: 20210901 00UTC to 20211130 12UTC
Average for wave grid (Mean method, lat)

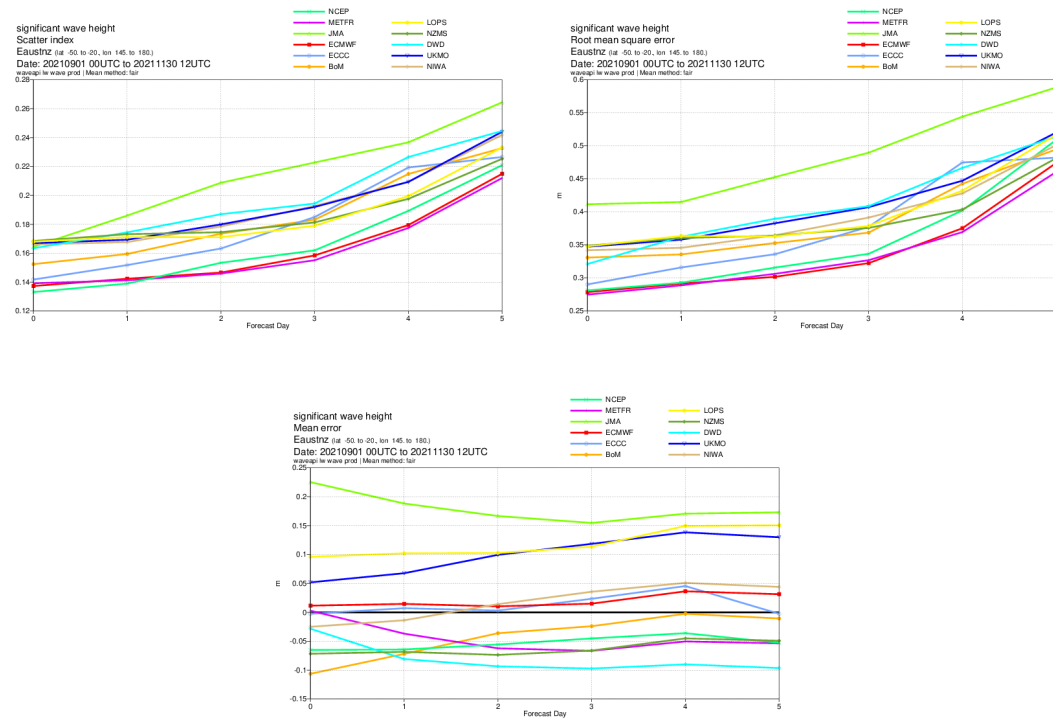
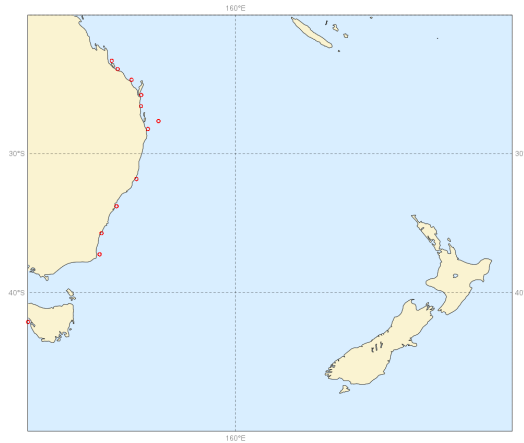


significant wave height
Mean error
S America (south) (lat: 57.5 to 12.5, lon: -80.0 to -42.5)
Date: 20210901 00UTC to 20211130 12UTC
Average for wave grid (Mean method, lat)



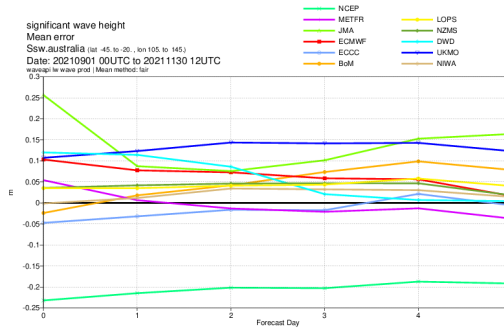
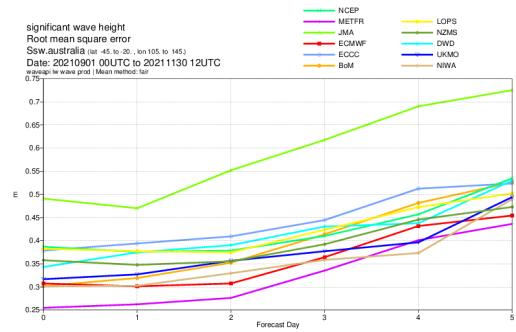
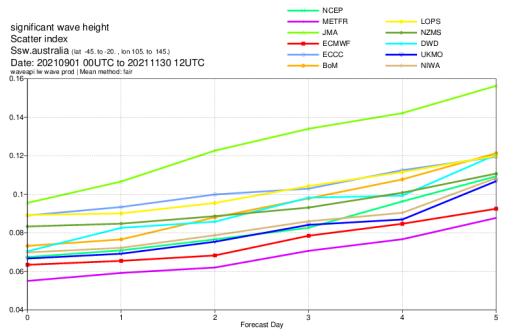
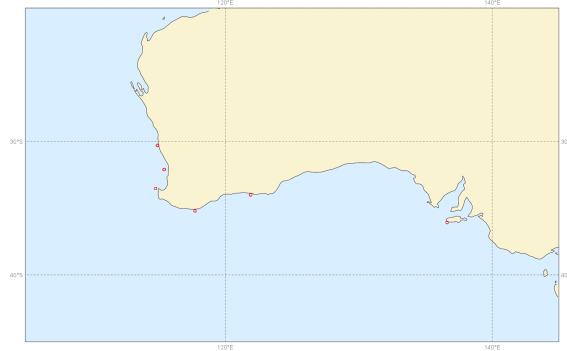
South of South America. Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

Buoys observations - from 20210901 to 20211130 - (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 20210901 to 20211130 - (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).