

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

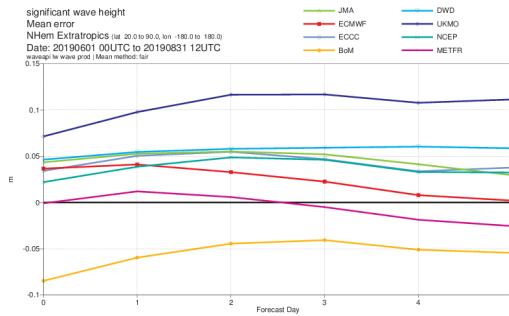
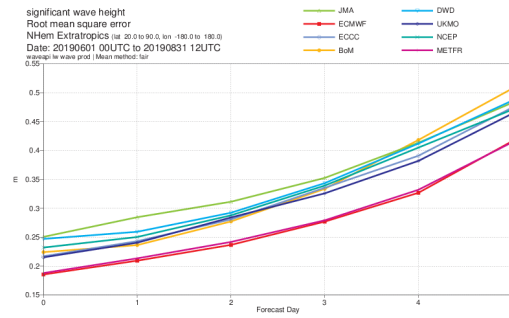
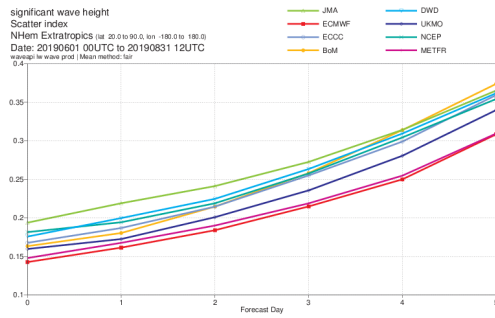
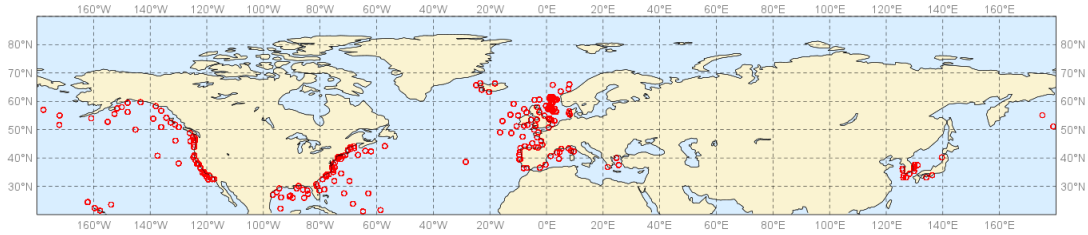
00 and 12 UTC runs

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

September 24, 2019

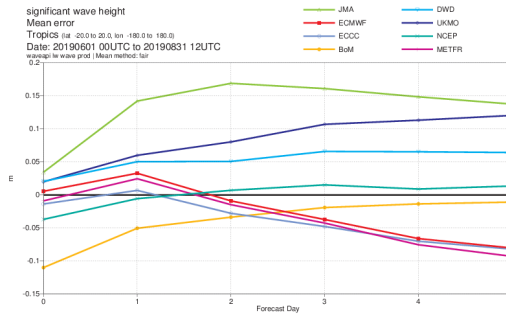
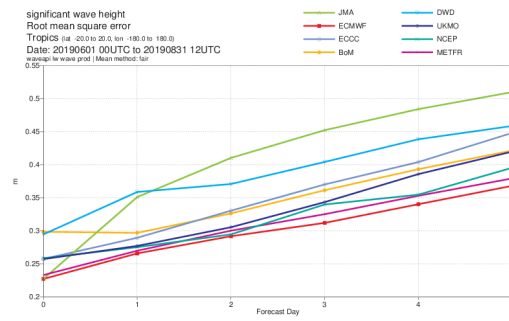
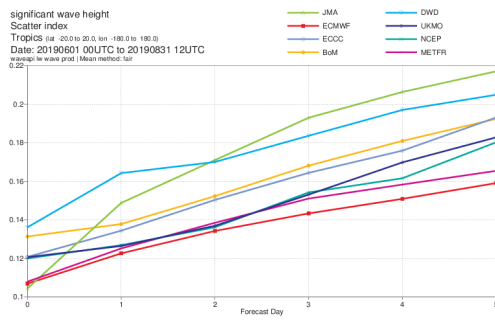
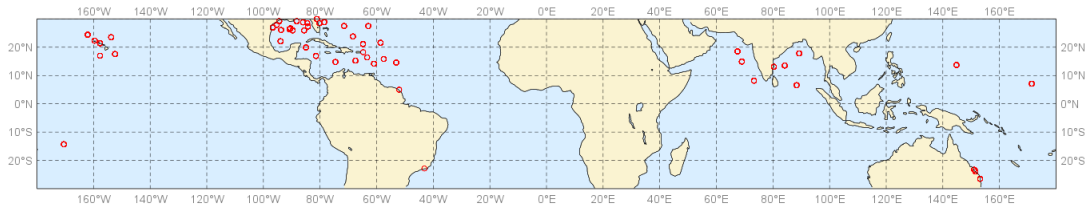
PART I: significant wave height (SWH)

Buoys observations - from 20190601 to 20190831 - (swH)



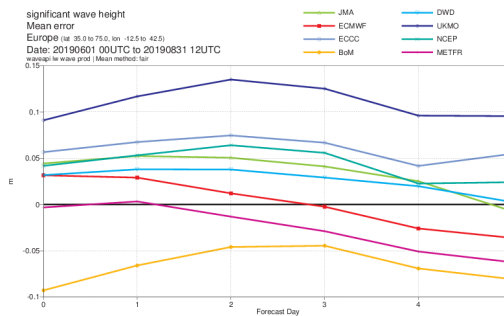
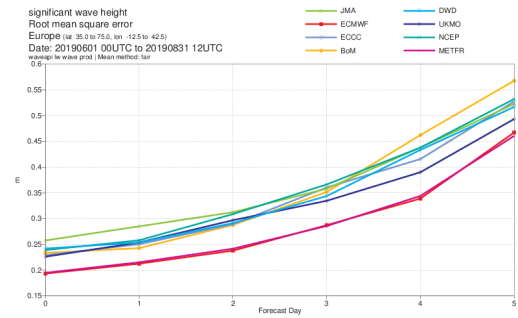
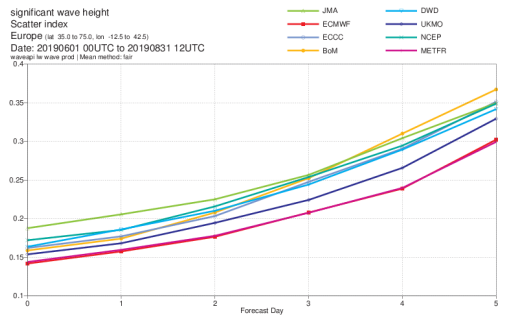
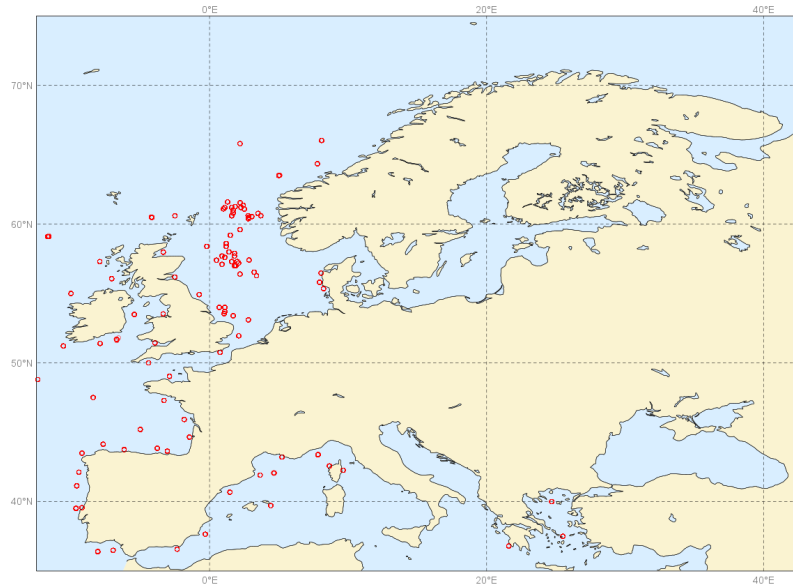
Northern Hemisphere. Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

Buoys observations - from 20190601 to 20190831 - (swh)



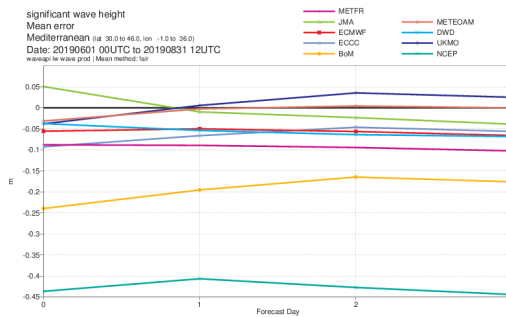
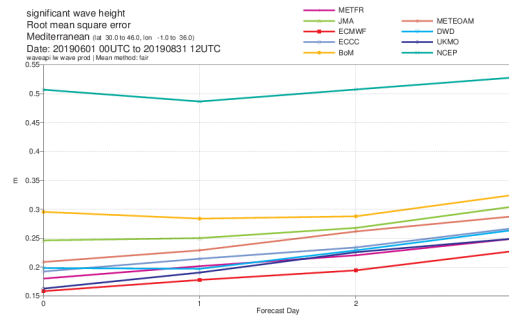
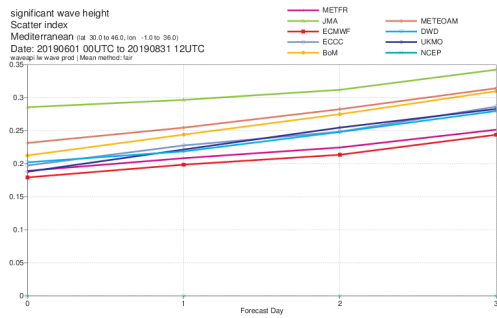
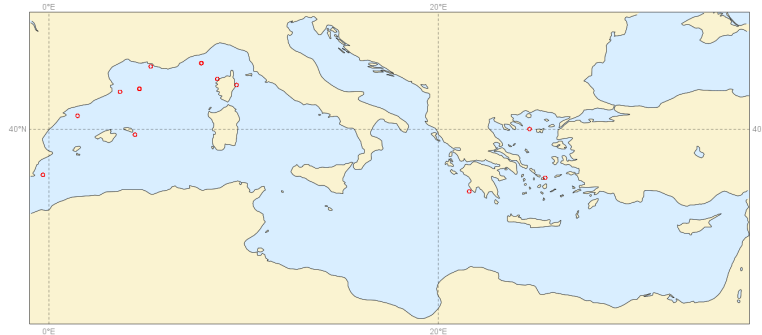
Tropics. Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

Buoys observations - from 20190601 to 20190831 - (swH)



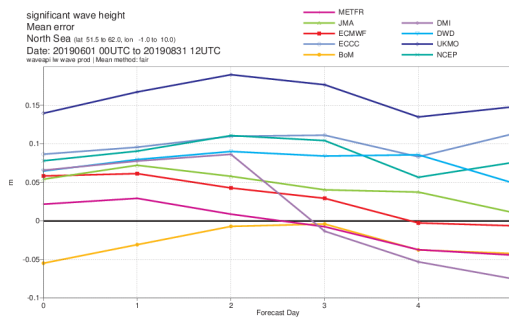
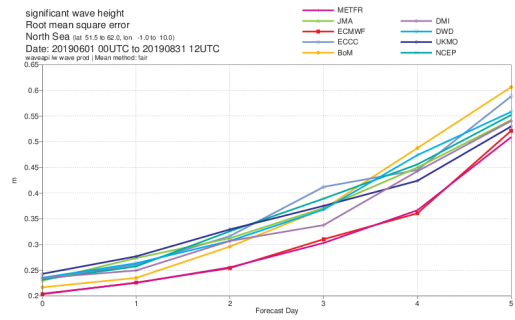
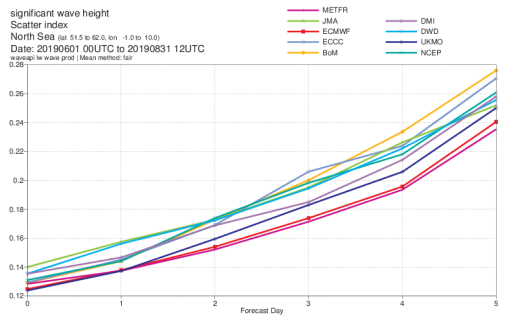
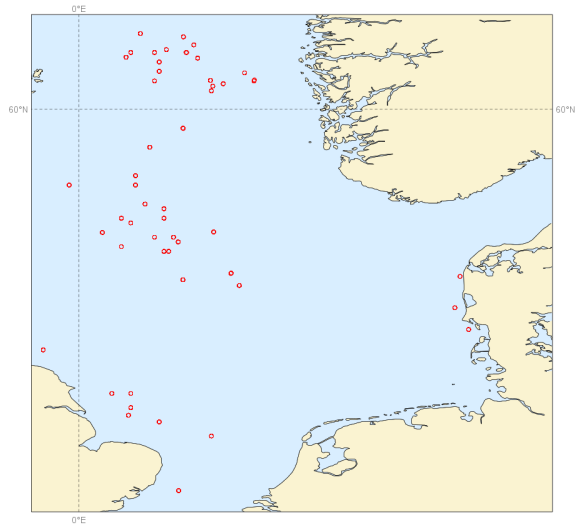
Europe. Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

Buoys observations - from 20190601 to 20190831 - (swh)



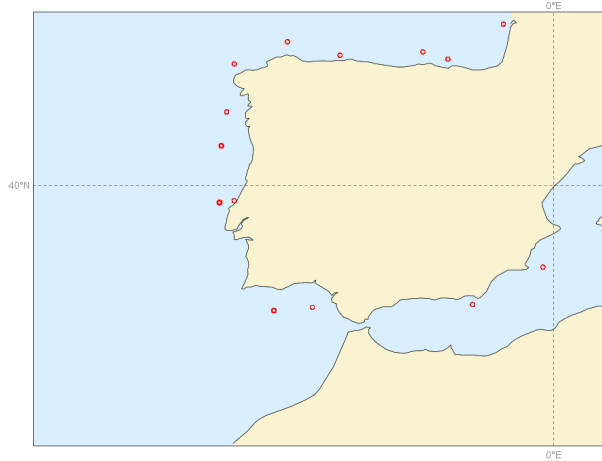
Mediterranean Sea. Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

Buoys observations - from 20190601 to 20190831 - (swh)

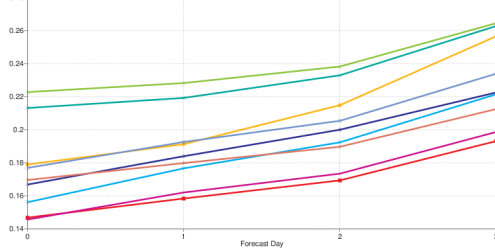


North Sea. Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

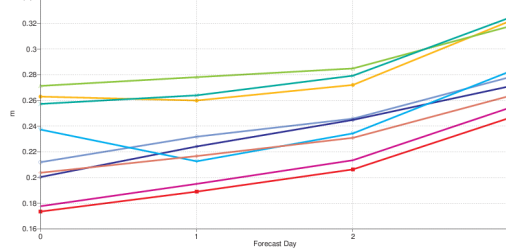
Buoys observations - from 20190601 to 20190831



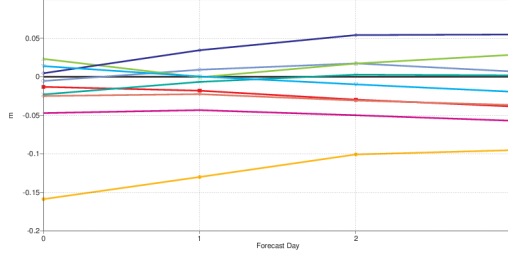
significant wave height
Scatter index
SW Europe (lat: 32.5 to 45.0, lon: -15.0 to 10.0)
Date: 20190601 00UTC to 20190831 12UTC
wavenp: 10 wave grid (Mean method: lat)



significant wave height
Root mean square error
SW Europe (lat: 32.5 to 45.0, lon: -15.0 to 10.0)
Date: 20190601 00UTC to 20190831 12UTC
wavenp: 10 wave grid (Mean method: lat)

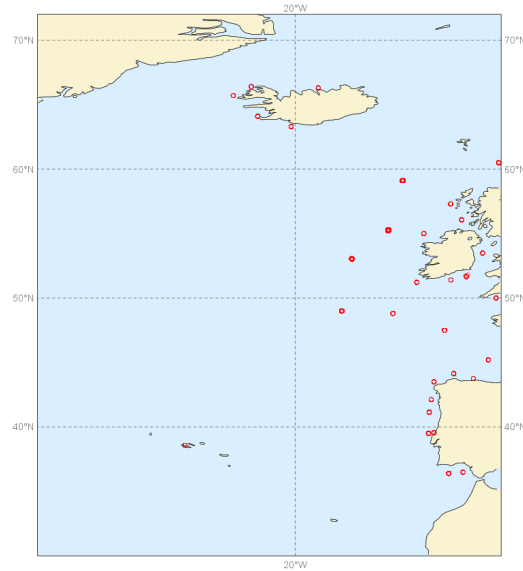


significant wave height
Mean error
SW Europe (lat: 32.5 to 45.0, lon: -15.0 to 10.0)
Date: 20190601 00UTC to 20190831 12UTC
wavenp: 10 wave grid (Mean method: lat)

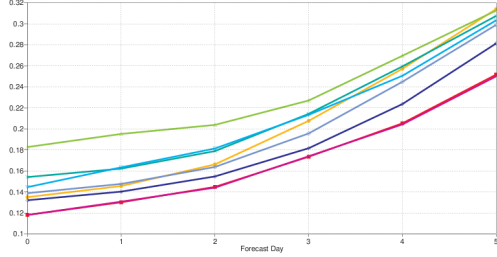


South West Europe. Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

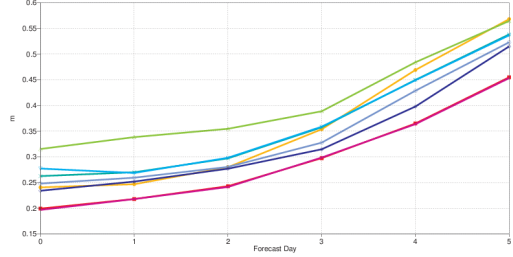
Buoys observations - from 20190601 to 20190831 - (swh)



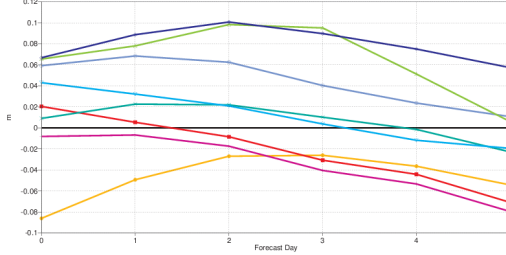
significant wave height
Scatter index
North East Atlantic (lat 30 to 72, lon -40 to -4)
Date: 20190601 00UTC to 20190831 12UTC
average for wave prod. Mean method: last



significant wave height
Root mean square error
North East Atlantic (lat 30 to 72, lon -40 to -4)
Date: 20190601 00UTC to 20190831 12UTC
average for wave prod. Mean method: last

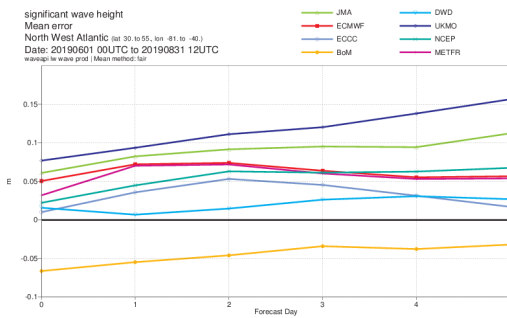
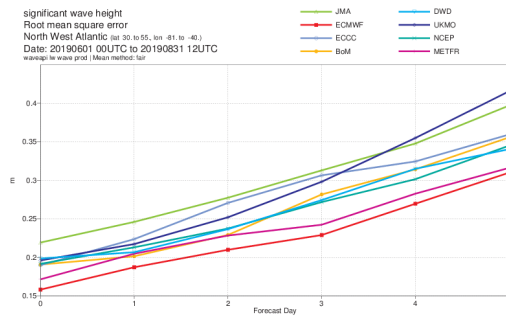
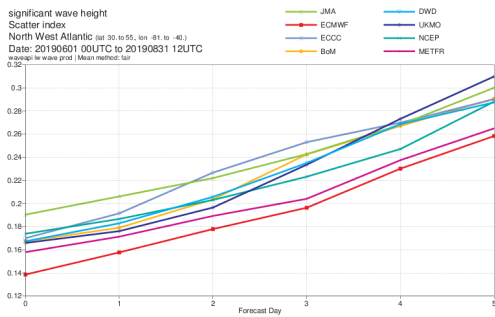
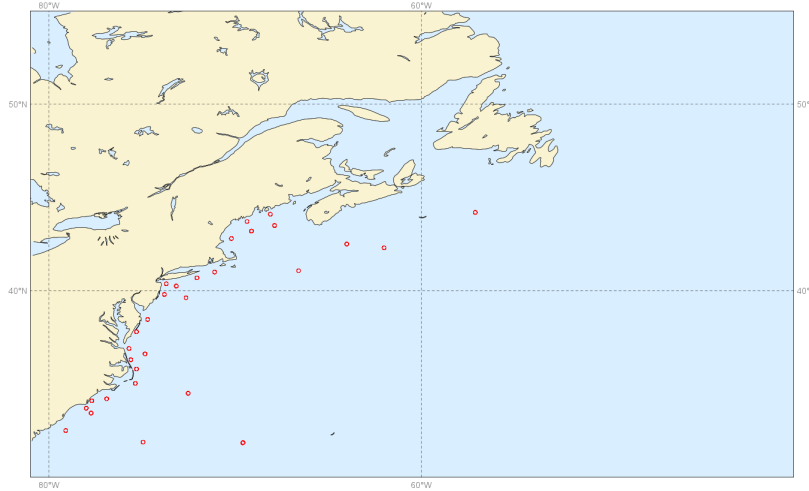


significant wave height
Mean error
North East Atlantic (lat 30 to 72, lon -40 to -4)
Date: 20190601 00UTC to 20190831 12UTC
average for wave prod. Mean method: last



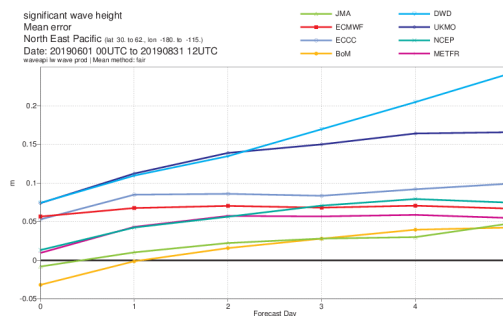
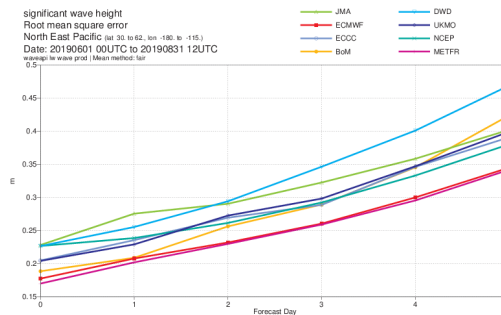
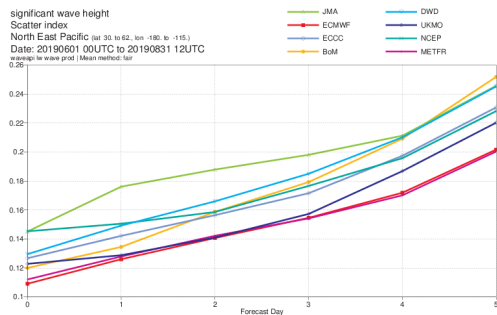
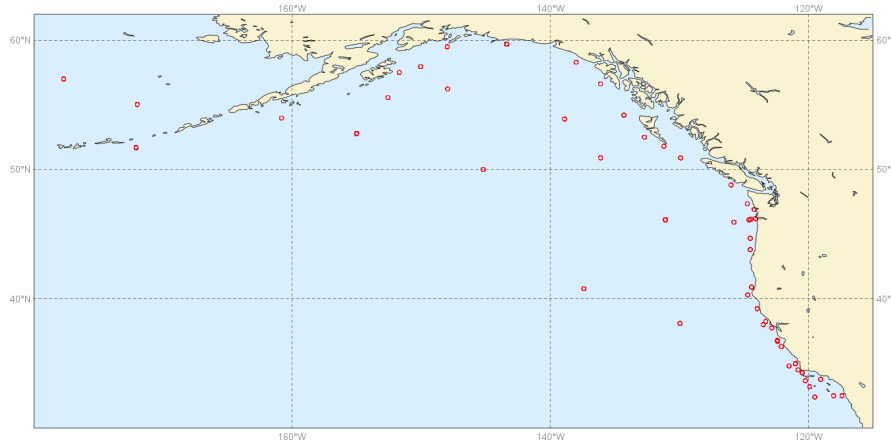
North East Atlantic. Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

Buoys observations - from 20190601 to 20190831 - (swh)



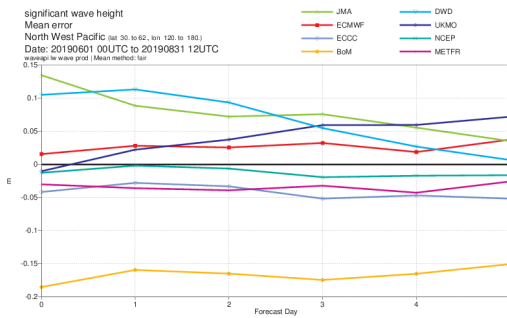
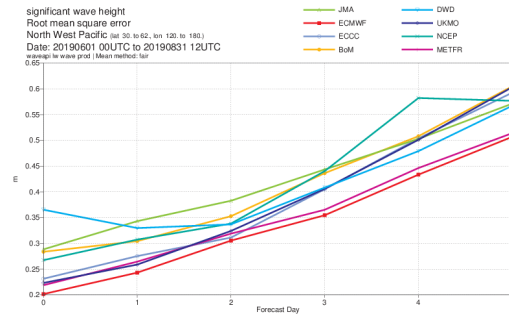
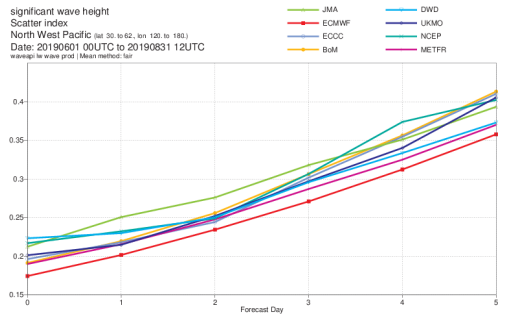
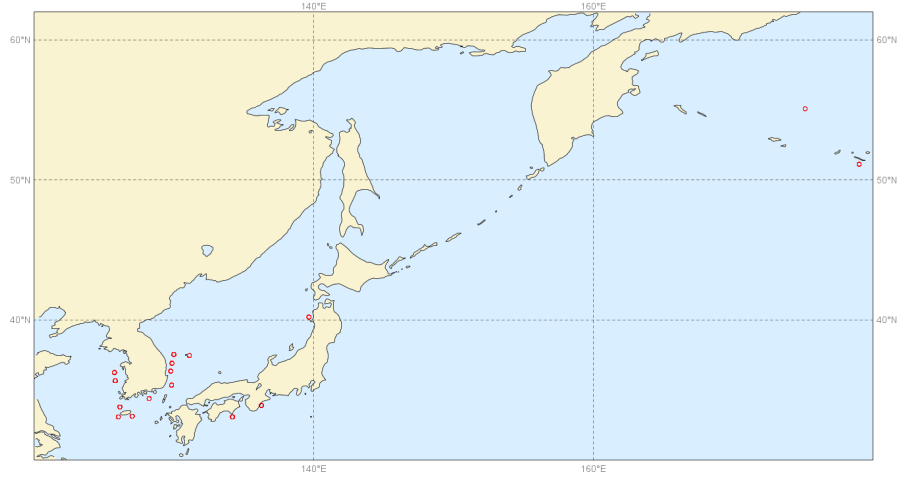
North West Atlantic. Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

Buoys observations - from 20190601 to 20190831 - (swh)



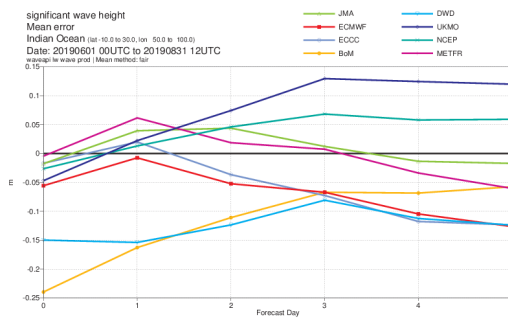
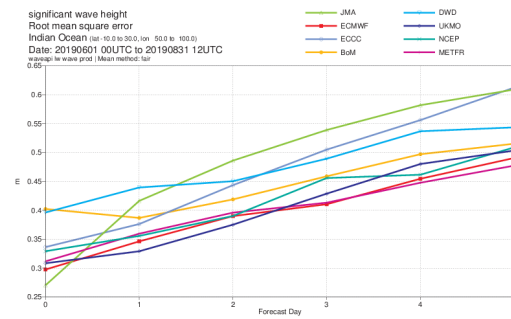
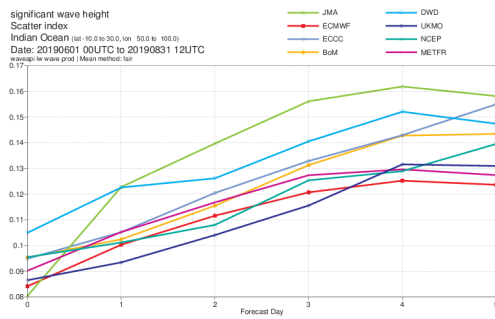
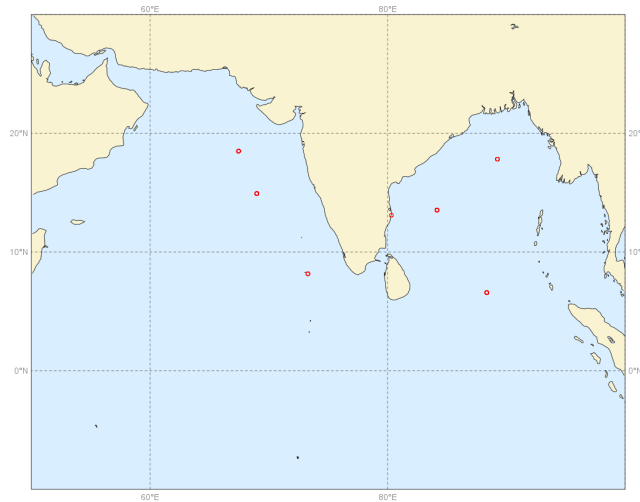
North East Pacific. Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

Buoys observations - from 20190601 to 20190831 - (swh)



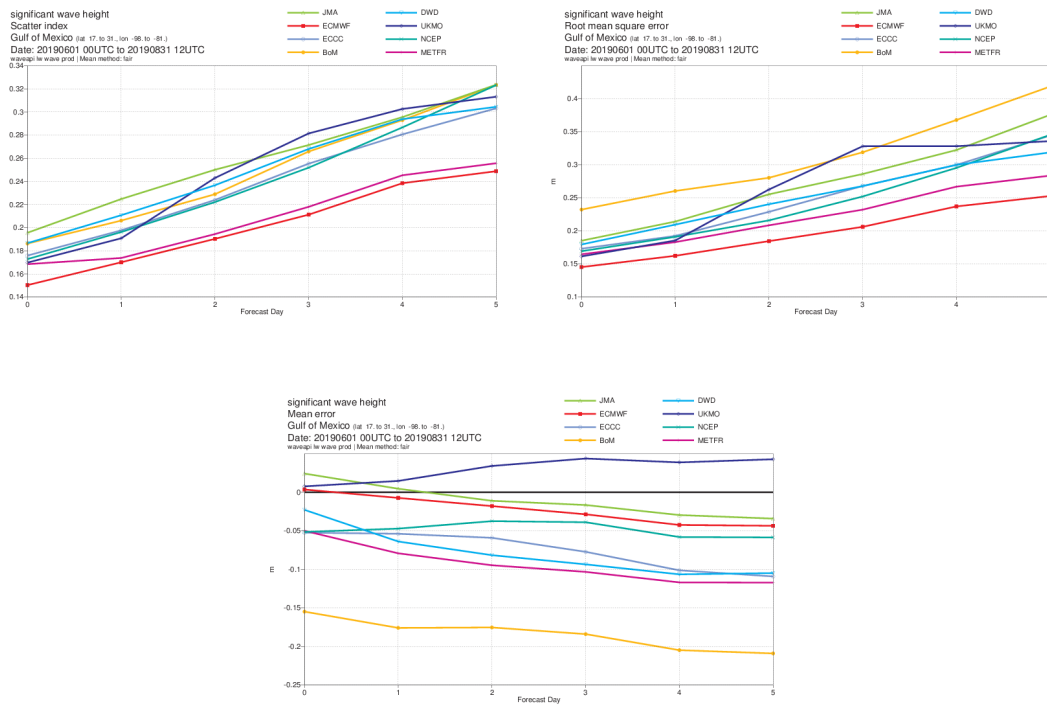
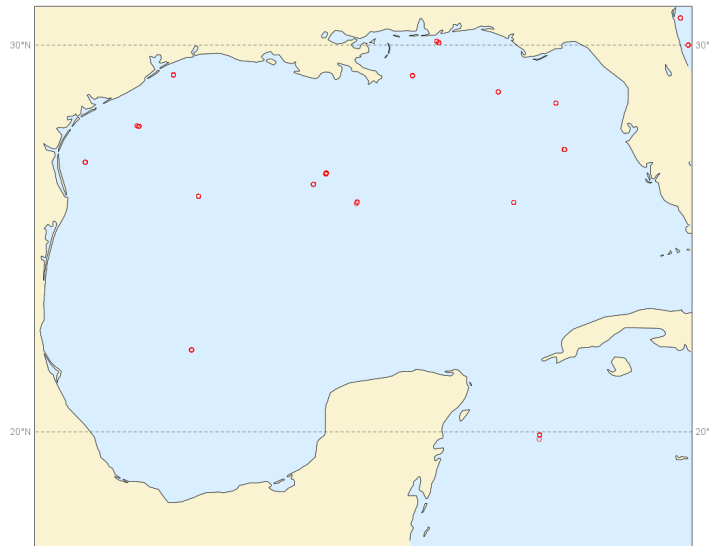
North West Pacific. Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

Buoys observations - from 20190601 to 20190831 - (swh)



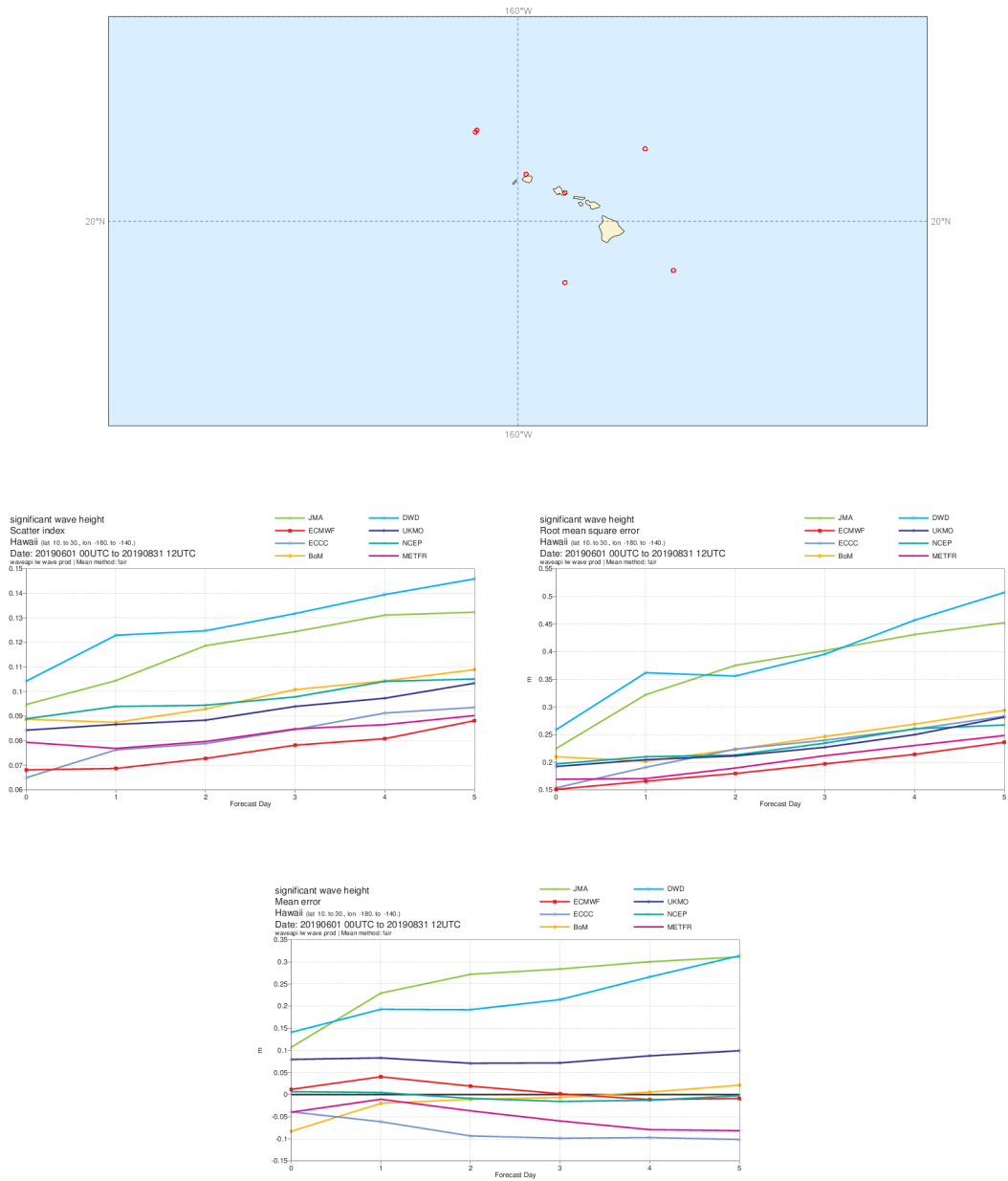
Indian Ocean. Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

Buoys observations - from 20190601 to 20190831 - (swH)



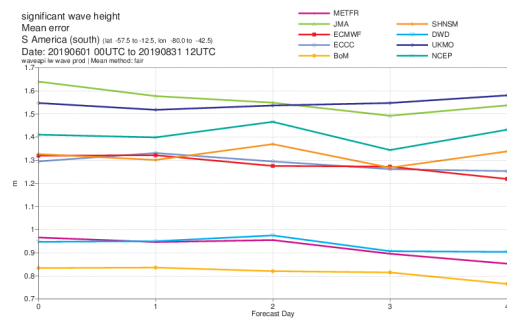
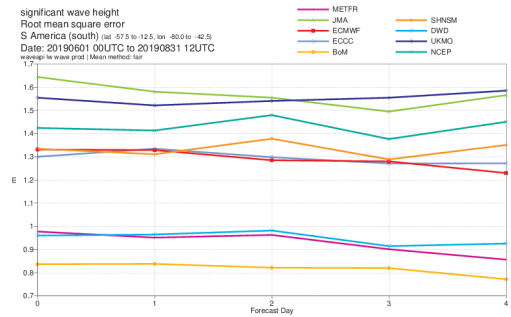
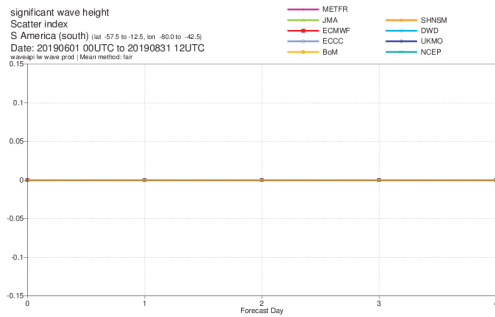
Gulf of Mexico. Top panel: observation distribution. Middle left panel: Forecast scatter index (standard deviation of the difference normalised by the mean of the observations). Middle right panel: Forecast root mean square error (RMSE). Bottom panel: forecast mean error (bias).

Buoys observations - from 20190601 to 20190831 - (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 20190601 to 20190831 - (swh)



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).