201809 - Tropical Cyclone - Mangkhut

Status: Finalised Material from: Linus

1. Impact

The super-typhoon Mangkhut made landfall on the Philippines on 14 September and hit China on 15 September.

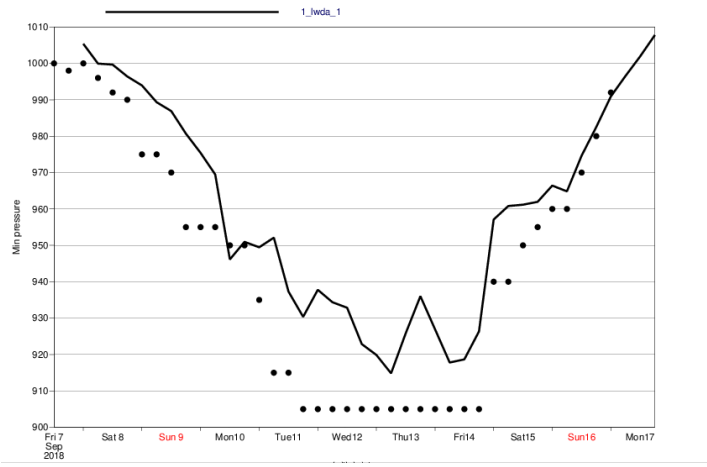
https://www.bbc.co.uk/news/world-asia-45543664

2. Description of the event

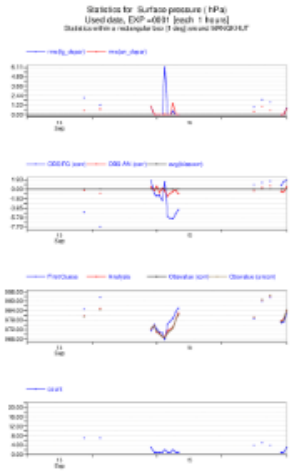
3. Predictability

3.1 Data assimilation

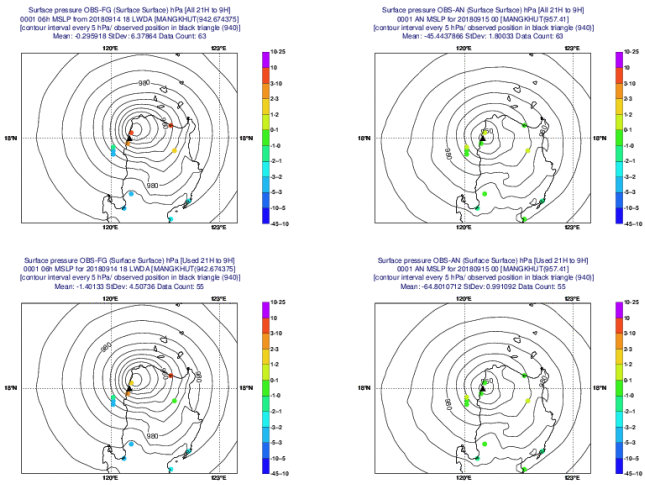
The plot below shows the evolution of central pressure in Best Track (dots) and LWDA analysis (solid line). The result shows that the analysis on 15 September 00UTC filled up the cyclone too much after the passage of Luzon.



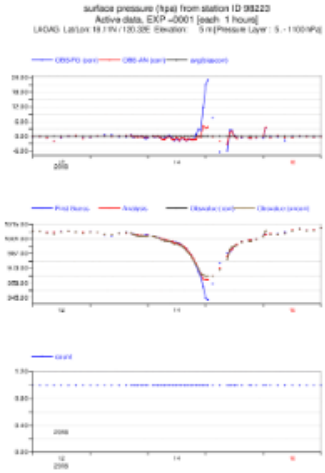
The plot below shows the observation statistics for surface pressure observations within 1 degree box following the cyclone. Along the tracks, the cyclone did not pass many observations. On the 15 September 00UTC the first guess departures were large, indicating a too strong cyclone in the short forecast but the analysis fit the observations better.



The plots below show the observation minus first guess (left) and observation minus analysis (right) for all observations (top) and used (bottom) for surface pressure. The plot is for 15 September 00UTC. It shows the the analysis has a weaker cyclone (black contours) than the first guess.

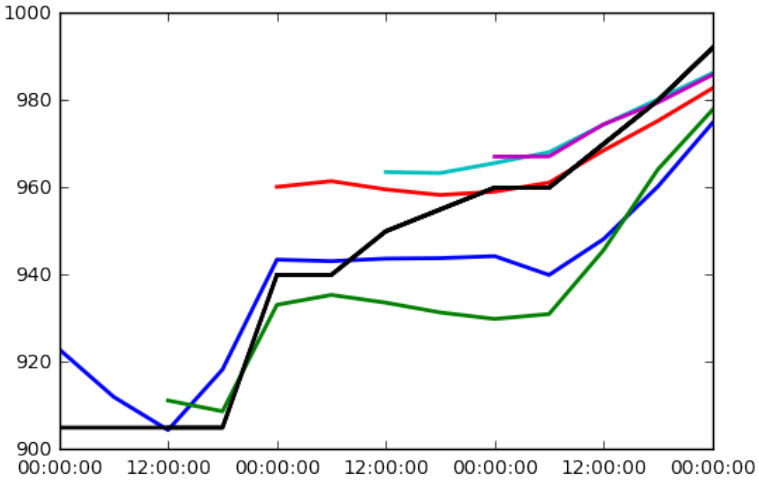


The plot below shows the observation statistics for Laoag on north-western Luzon, wher the cyclone seems to have passed over. It is clear that the first guess had much lower pressure than the observation and the analysis has a better fit.



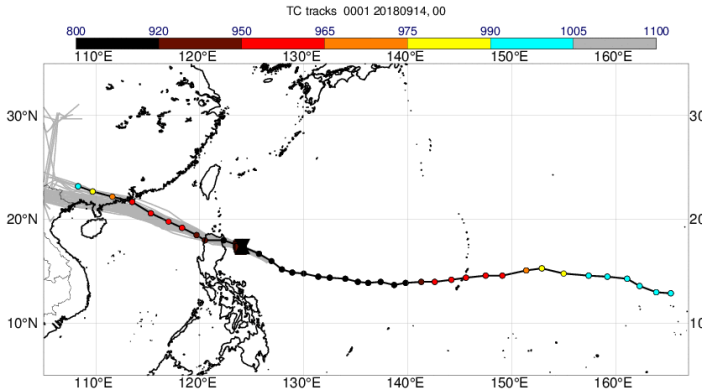
3.2 HRES

The plot below shows the central pressure in HRES (coloured lines) and BestTrack (black). The plot starts at 14 September 00UTC. The forecast from 15 September 00UTC had much higher pressure than the previous forecasts, in accordance with the increment discussed in the previous section.



3.3 ENS

The plots below show the tracks (ensemble -grey, best track - black), position and intensity on 14 September 12UTC (ensemble - squares, best track - hourglass) in forecasts from 13 September (first plot) to 4 September (last plot). Early forecasts (up to 8 September) predicted a more northerly path . Later forecasts were more correct but still a northerly shift at the longitude of the Philippines. The forecast from 12 September had a plume centred on the landfall point, but instead got a southerly shift of the China landfall.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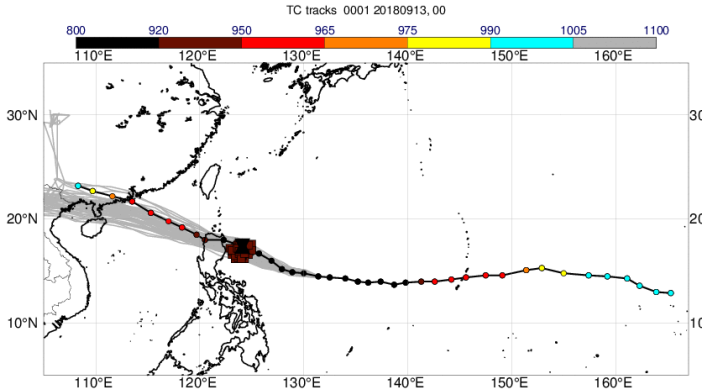
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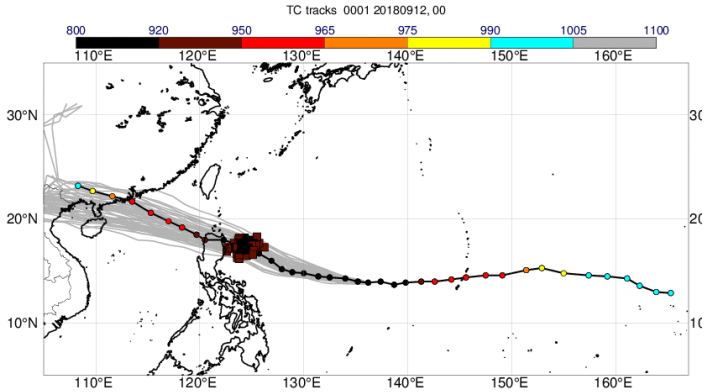
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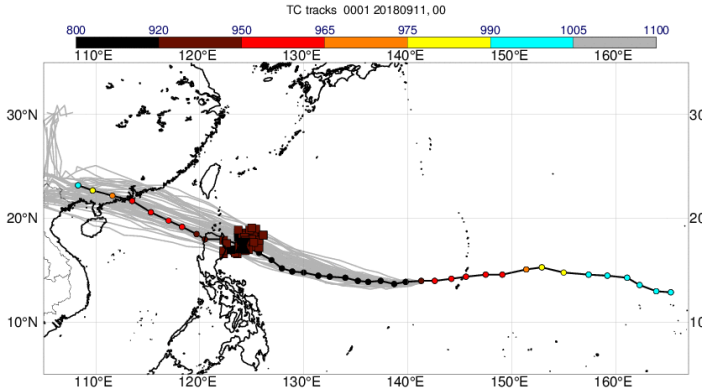
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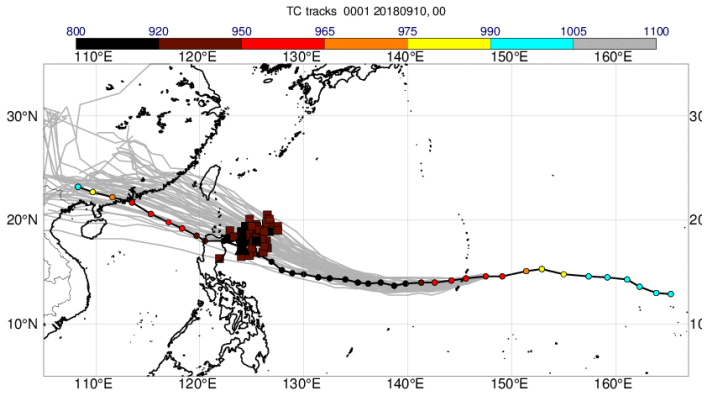
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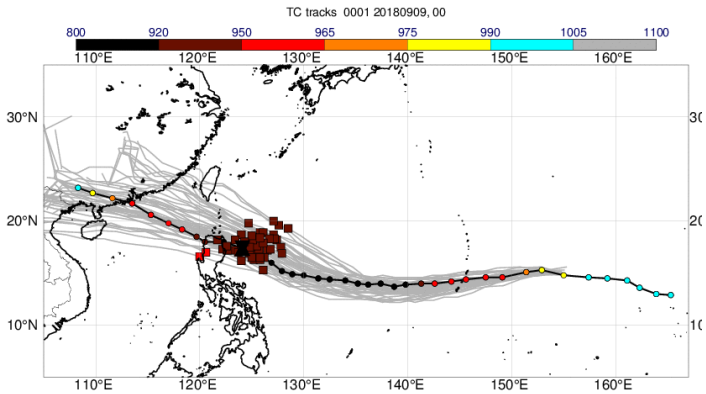
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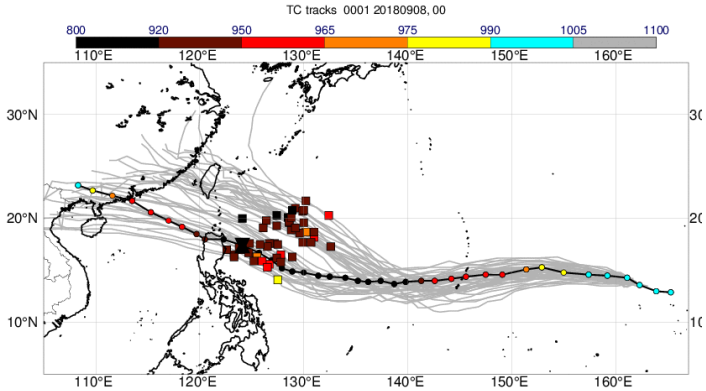
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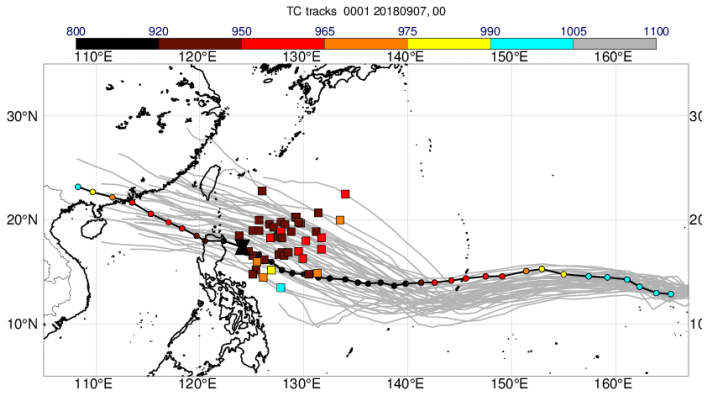
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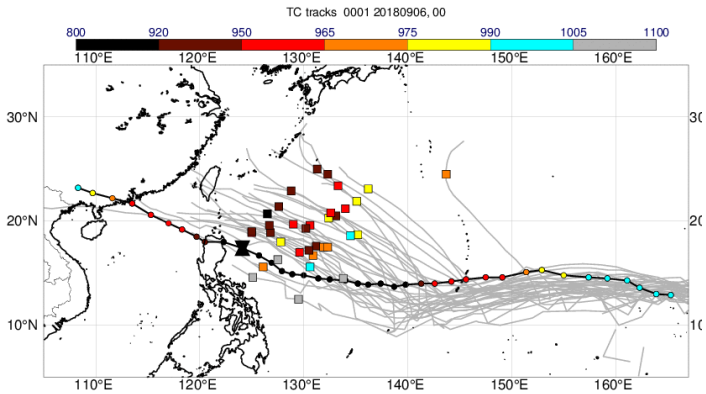
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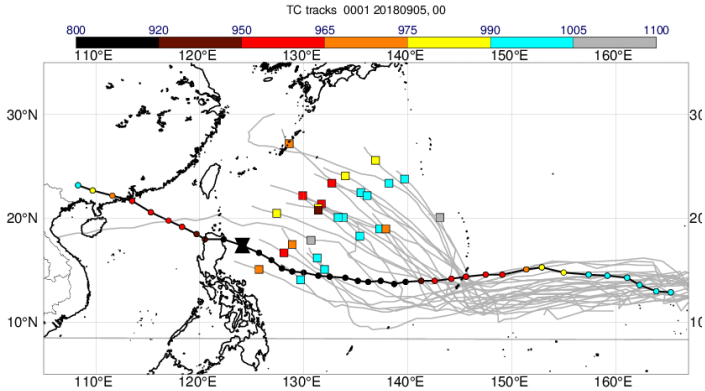
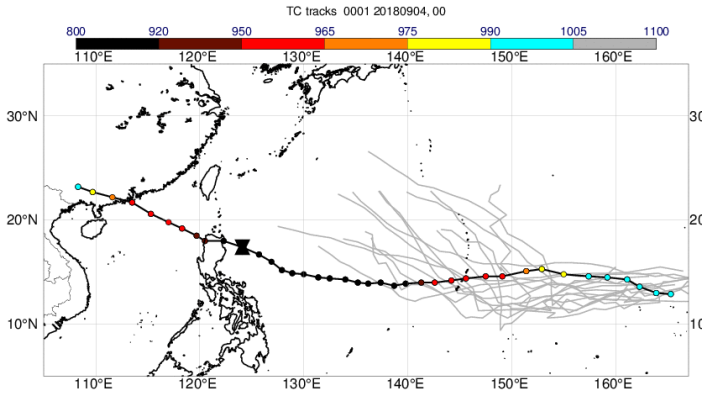
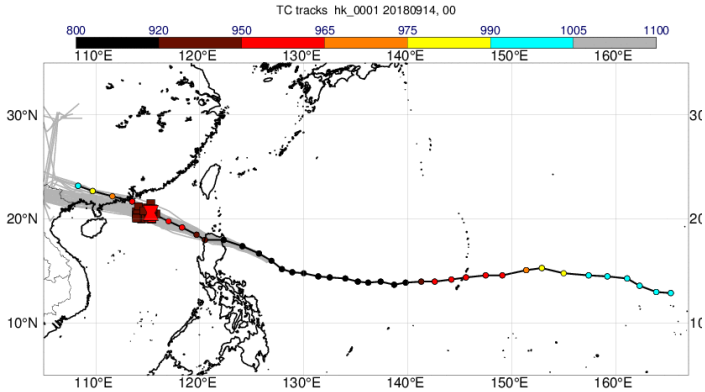
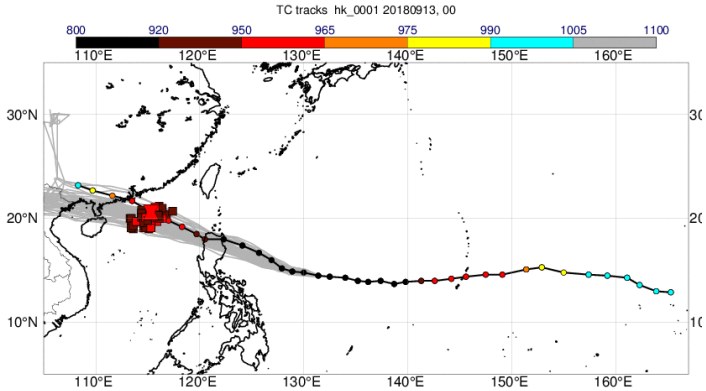




The series of plot shows the same as above but with the symbols representing the position and intensity on 16 September 00UTC, just before the landfall on China.

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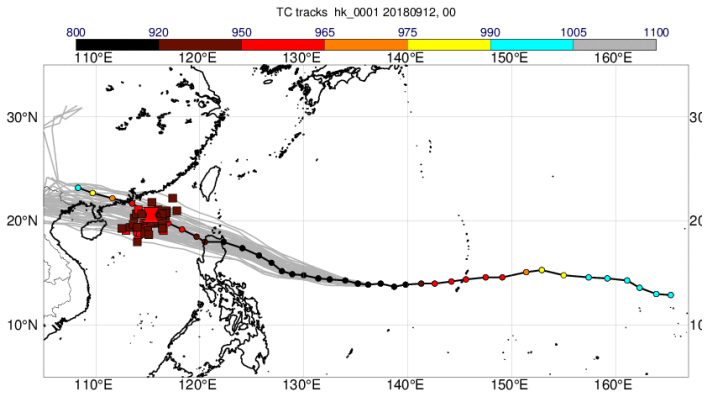
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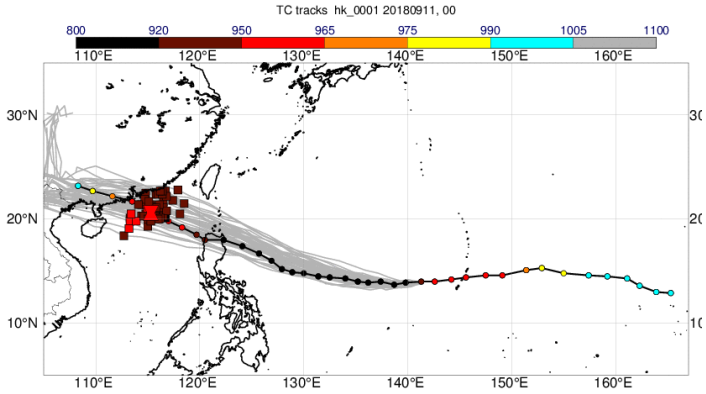
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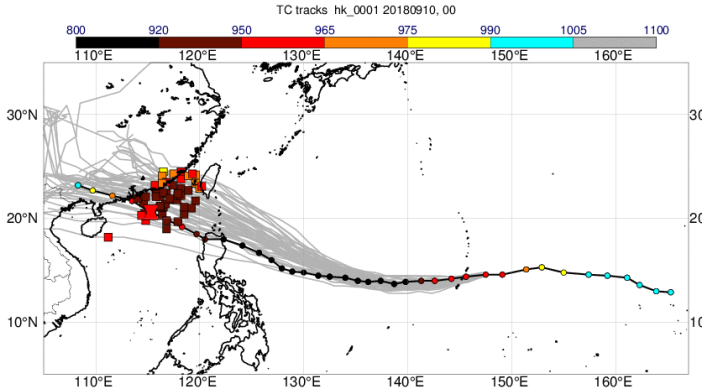
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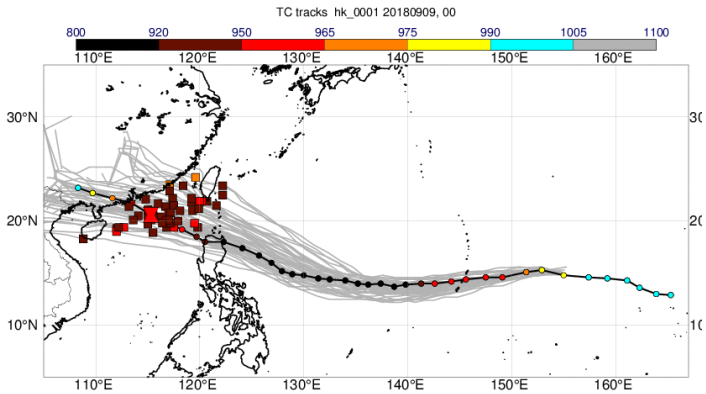
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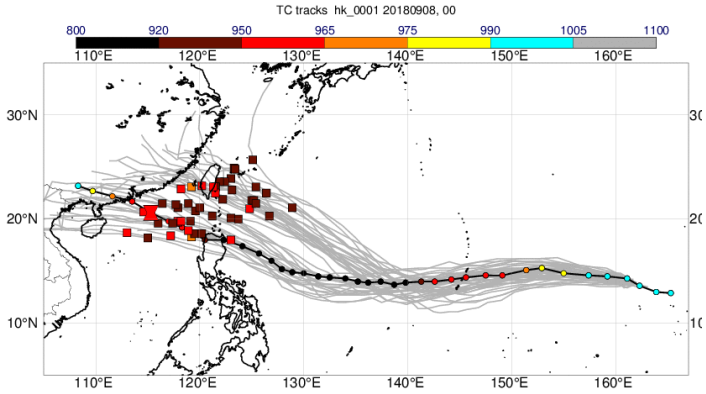
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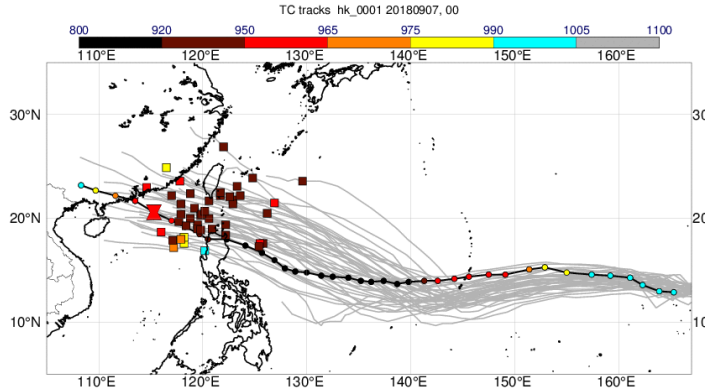
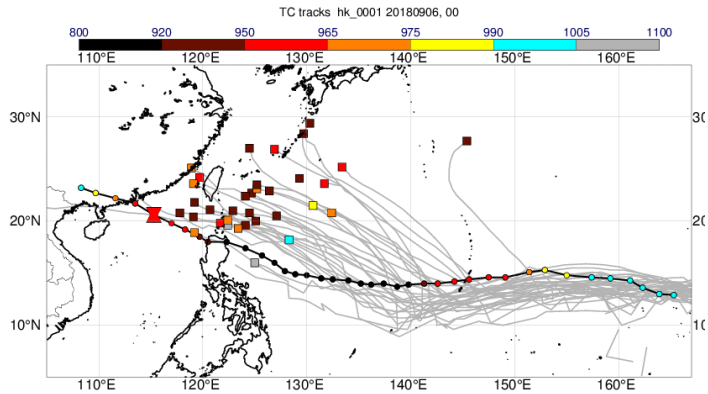
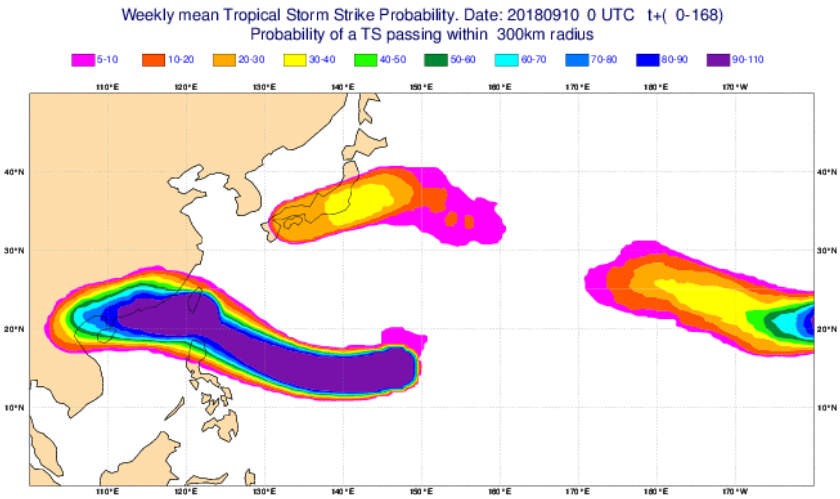
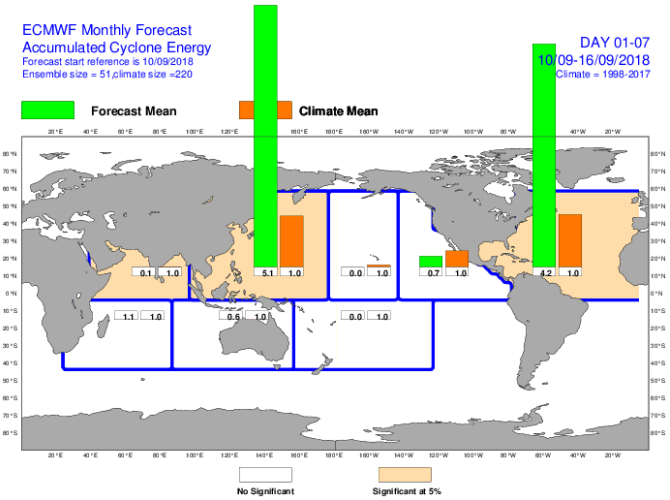




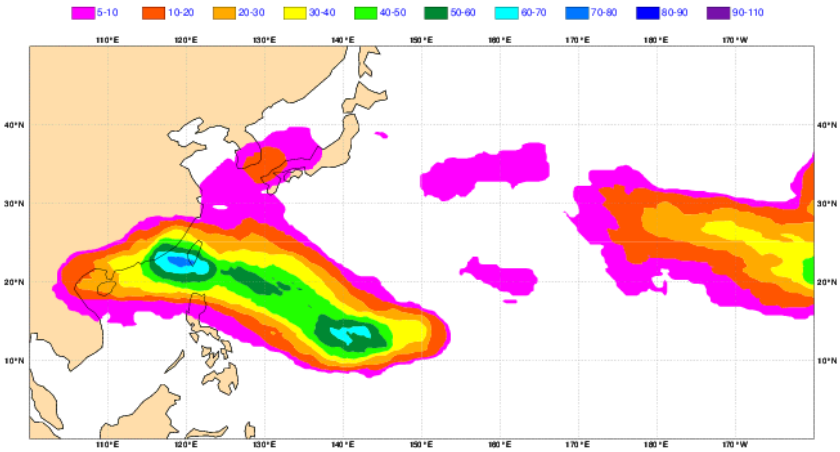
3.4 Monthly forecasts

The plots below show weekly strike probability (left) and normalised accumulated cyclone energy from extended-range forecasts, valid for 10-16 September.The forecast from 30 August did not capture the increased activity in the West Pacific, but rather predicted lower than normal.


Weekly mean Tropical Storm Strike Probability. Date: 20180910 0 UTC t+(0-168)
Probability of a TS passing within 300km radius
5-10
10-20
20-30
30-40
40-50
50-60
60-70
70-80
80-90
90-110

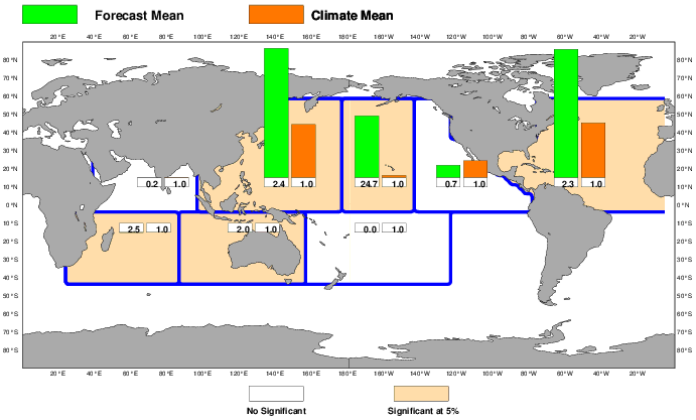

ECMWF Monthly Forecast
Accumulated Cyclone Energy
Forecast start reference is 10/09/2018
Ensemble size = 51,climate size =220
Forecast Mean
Climate Mean
DAY 01-07
10/09-16/09/2018
Climate = 1998-2017
0.1
1.0
5.1
1.0
0.0
1.0
0.7
1.0
4.2
1.0
1.1
1.0
0.6
1.0
0.0
1.0
No Significant
Significant at 5%

Weekly mean Tropical Storm Strike Probability. Date: 20180906 0 UTC t+(96-264)
Probability of a TS passing within 300km radius

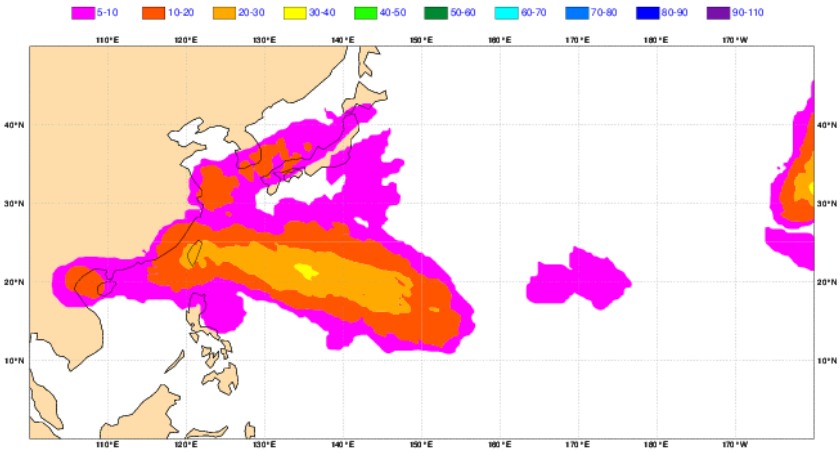


ECMWF Monthly Forecast
Accumulated Cyclone Energy
Forecast start reference is 06/09/2018
Ensemble size = 51,climate size =220

DAY 05-11
10/09-16/09/2018
Climate = 1998-2017

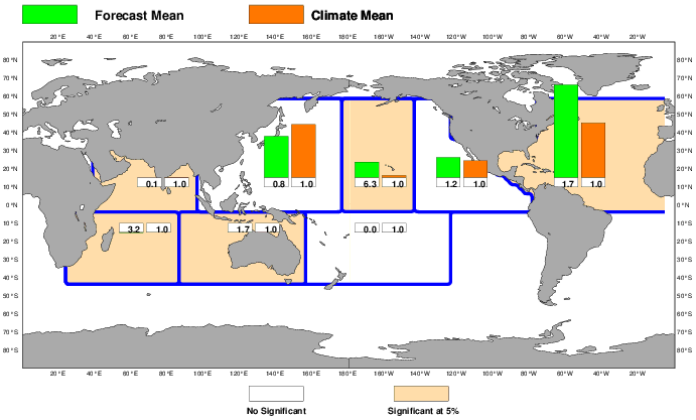


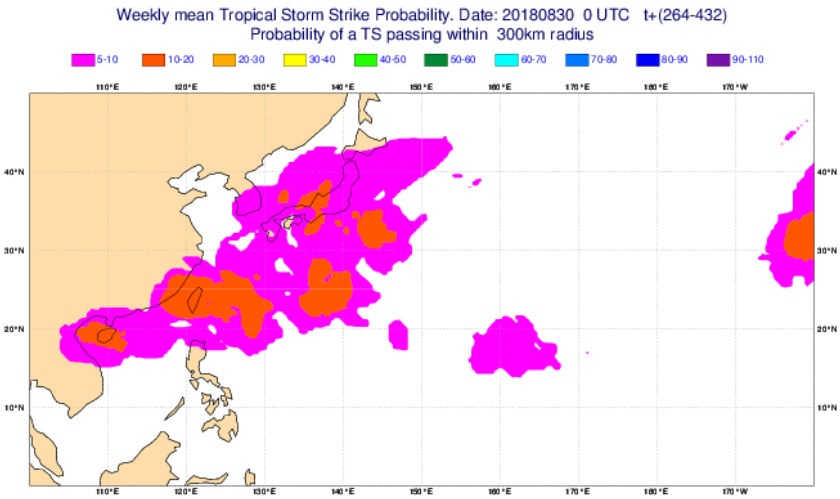
Weekly mean Tropical Storm Strike Probability. Date: 20180903 0 UTC t+(168-336)
Probability of a TS passing within 300km radius

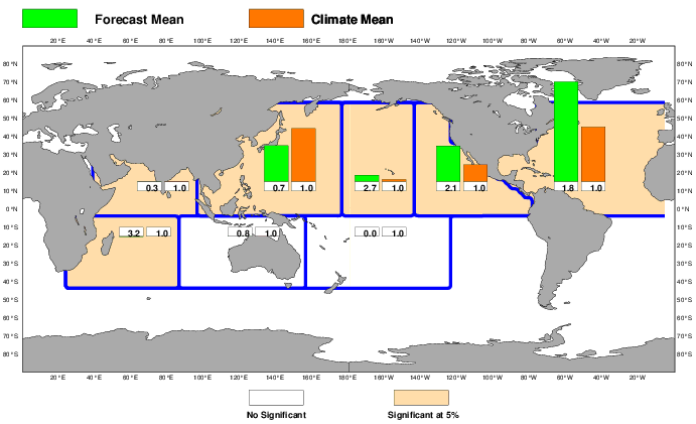


ECMWF Monthly Forecast
Accumulated Cyclone Energy
Forecast start reference is 03/09/2018
Ensemble size = 51,climate size =220

DAY 08-14
10/09-16/09/2018
Climate = 1998-2017







3.5 Comparison with other centres

4. Experience from general performance/other cases

5. Good and bad aspects of the forecasts for the event

- **No signal in extended-range**
- **First a northerly error and later a southerly error for the China landfall**

6. Additional material