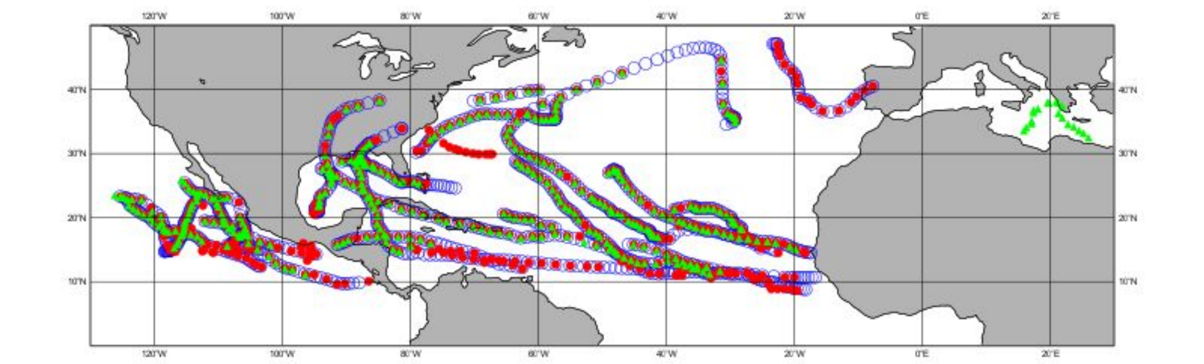
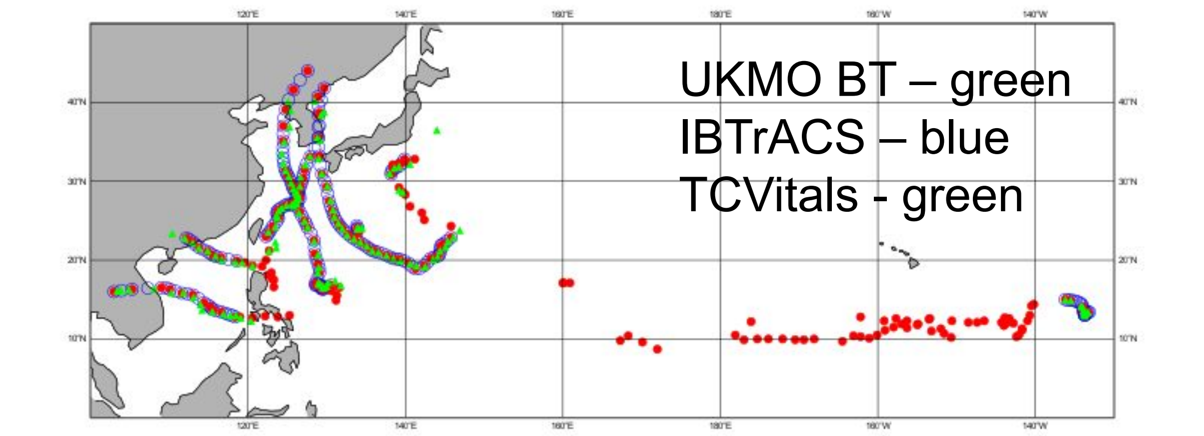
Observation impact in ECMWF data assimilation

Linus Magnusson and Mohamed Dahoui

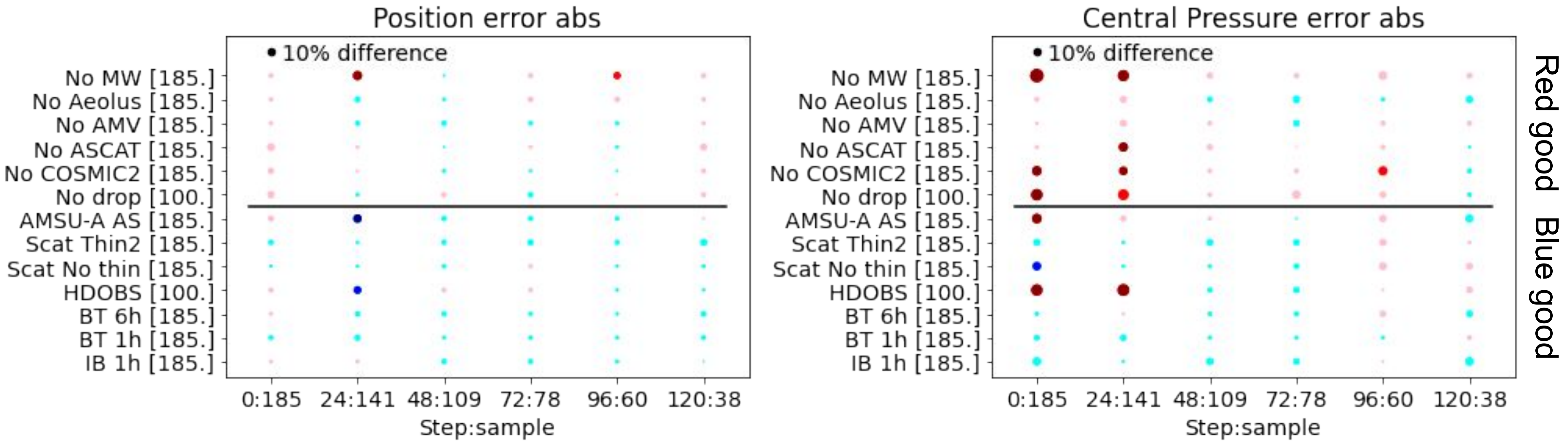
Experiment setup

- 15 August – 21 September
- Operational (9km) resolution
- 12-h 4d-var windows (not 6h as in operations)
- Most of the results in ECMWF Tech Memo 888
- Journal article under preparation





Observation impact experiments for a range of platforms

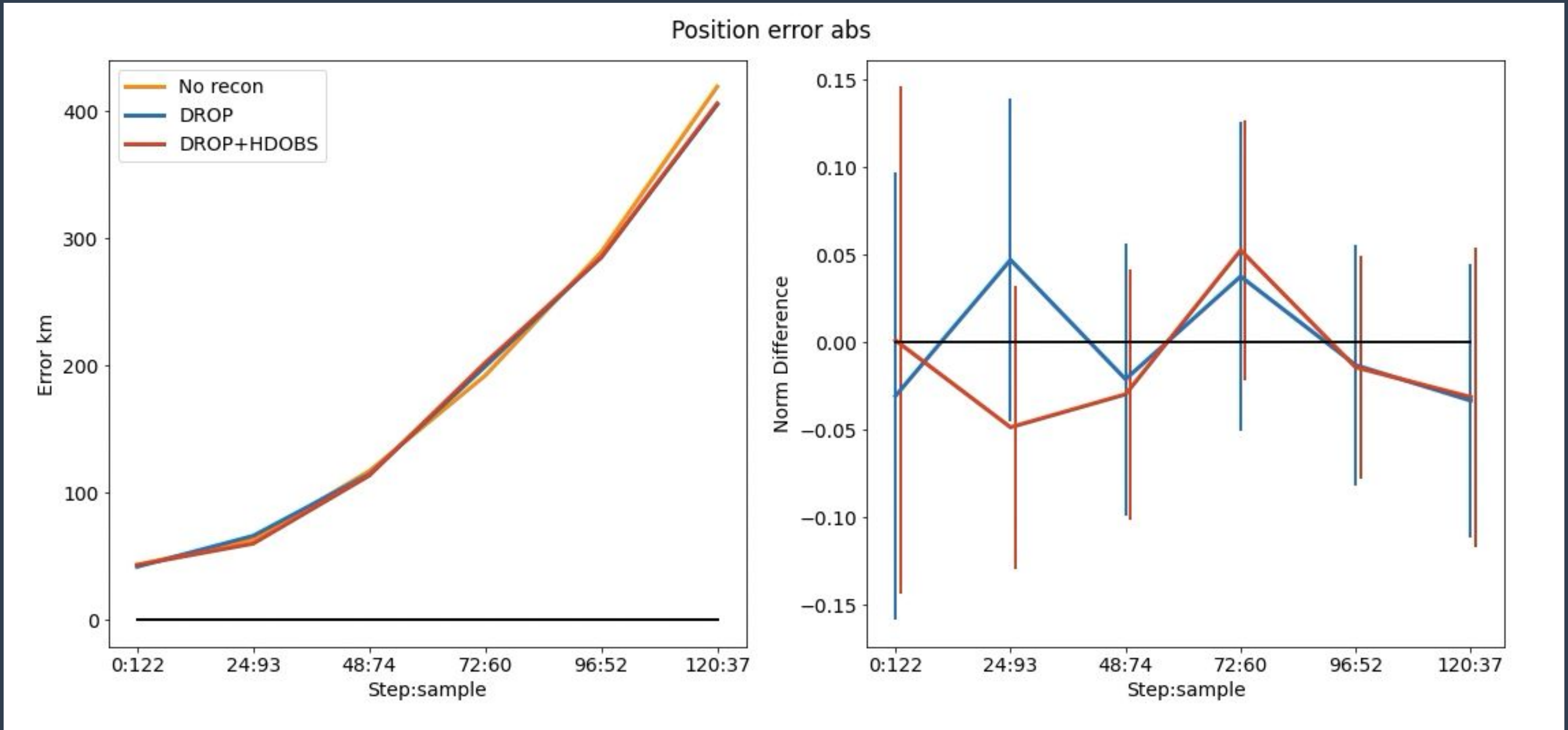


Dark-red/dark-blue indicate 95% significance, red/blue 90% and pink/cyan not significant

Treatment of recon observations

- No special treatment (e.g blacklist near cyclone)
  - Leave the work to VarQC
- Update of position if available in BUFR
- Similar observation error estimate as NCEP for U and V, but lower for T and RH
- HDOBS assimilated as aircraft (Observation error around 3 m/s for U and V)

All storms – position error (Atlantic storms)

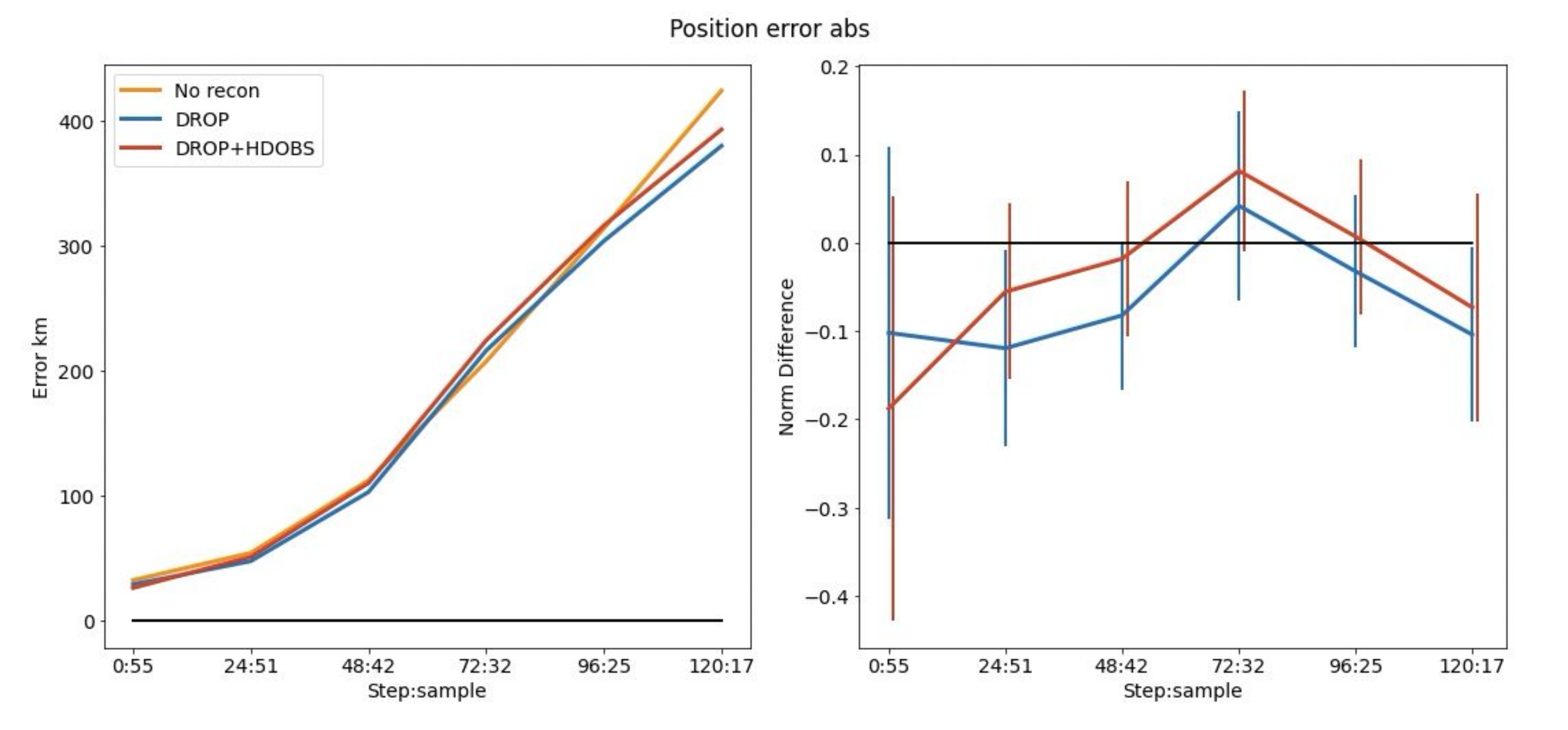


Positive impact

Error bars for 95% limits

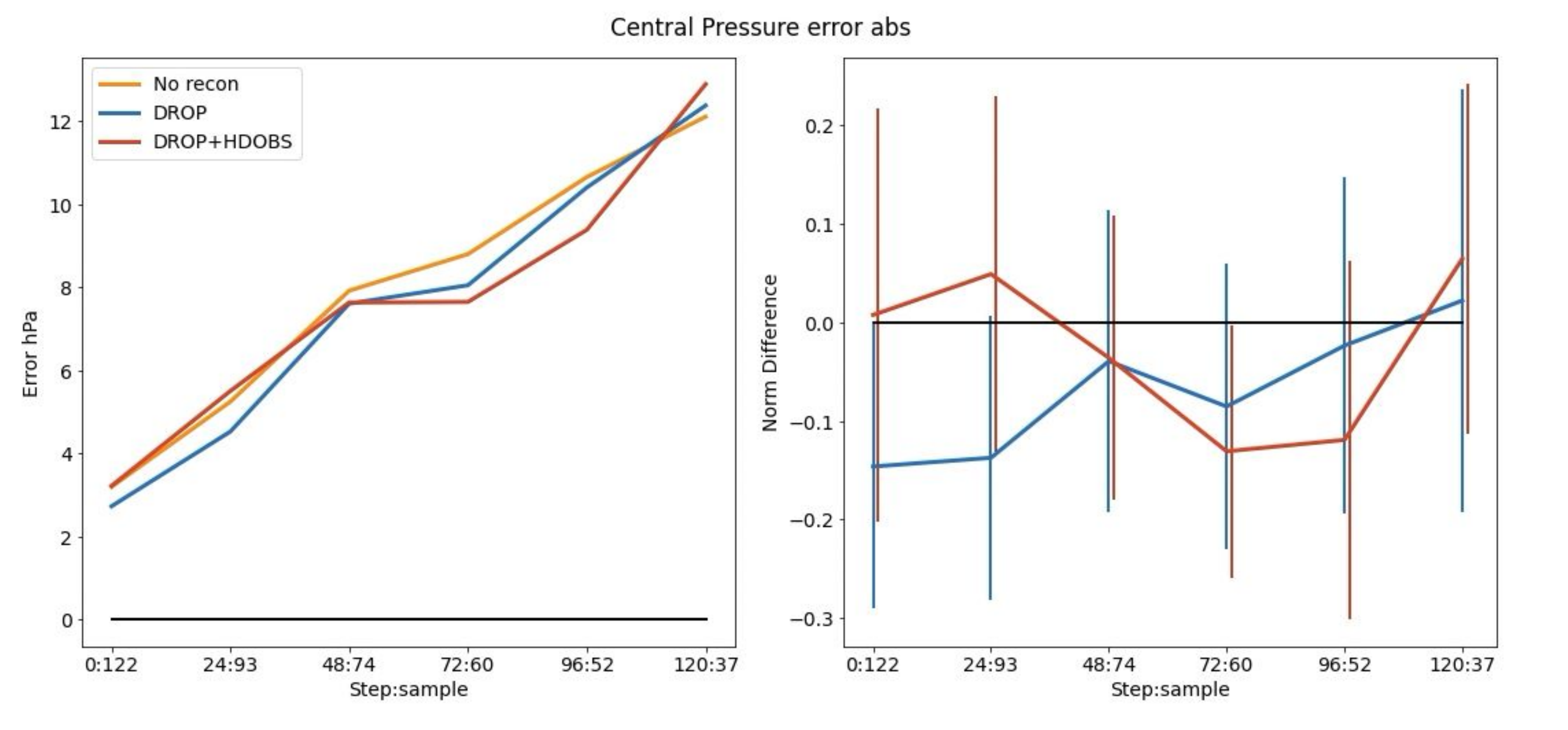
Mainly neutral

Strong storms (above 24 m/s) – position error



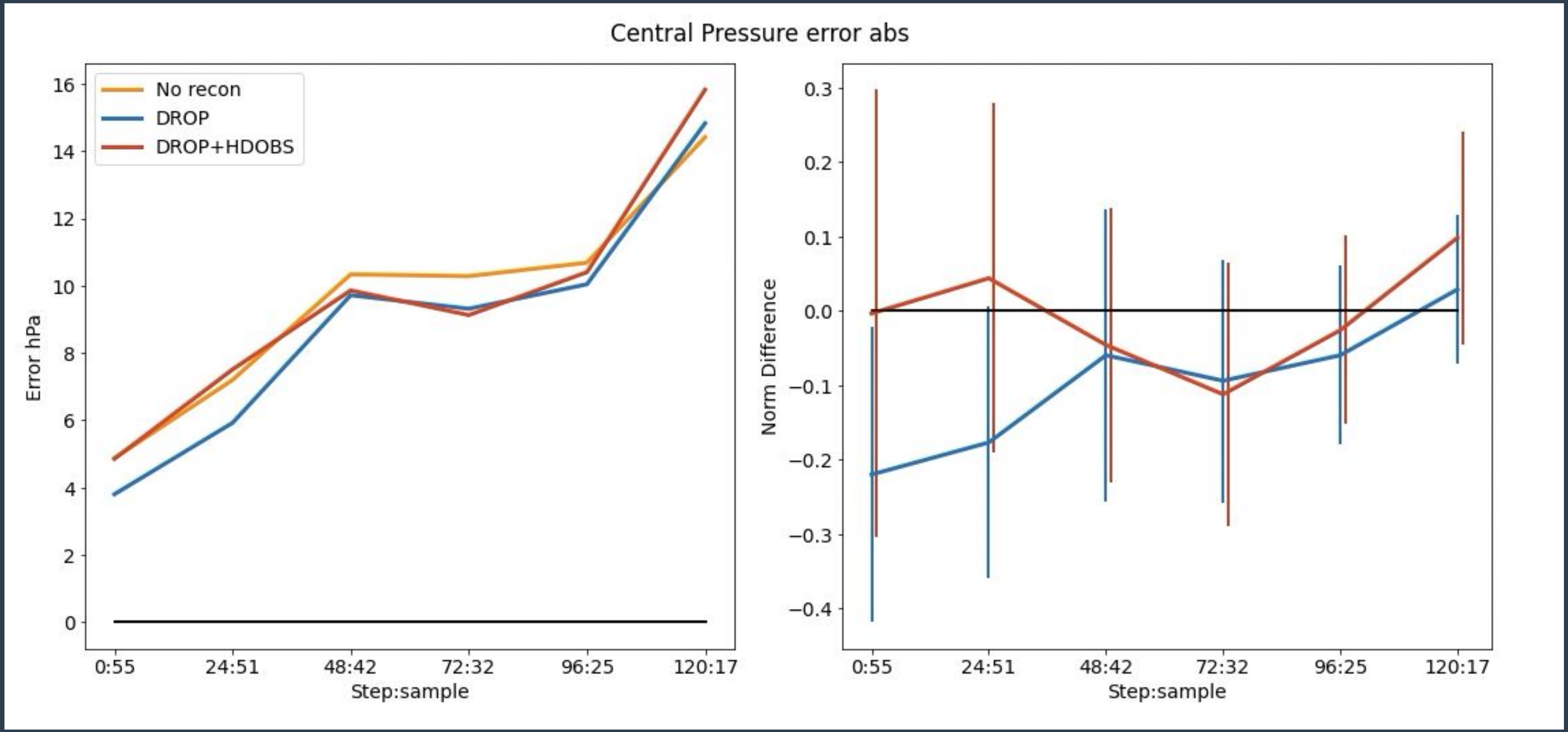
Dropsondes improve the position error

All storms - central pressure error



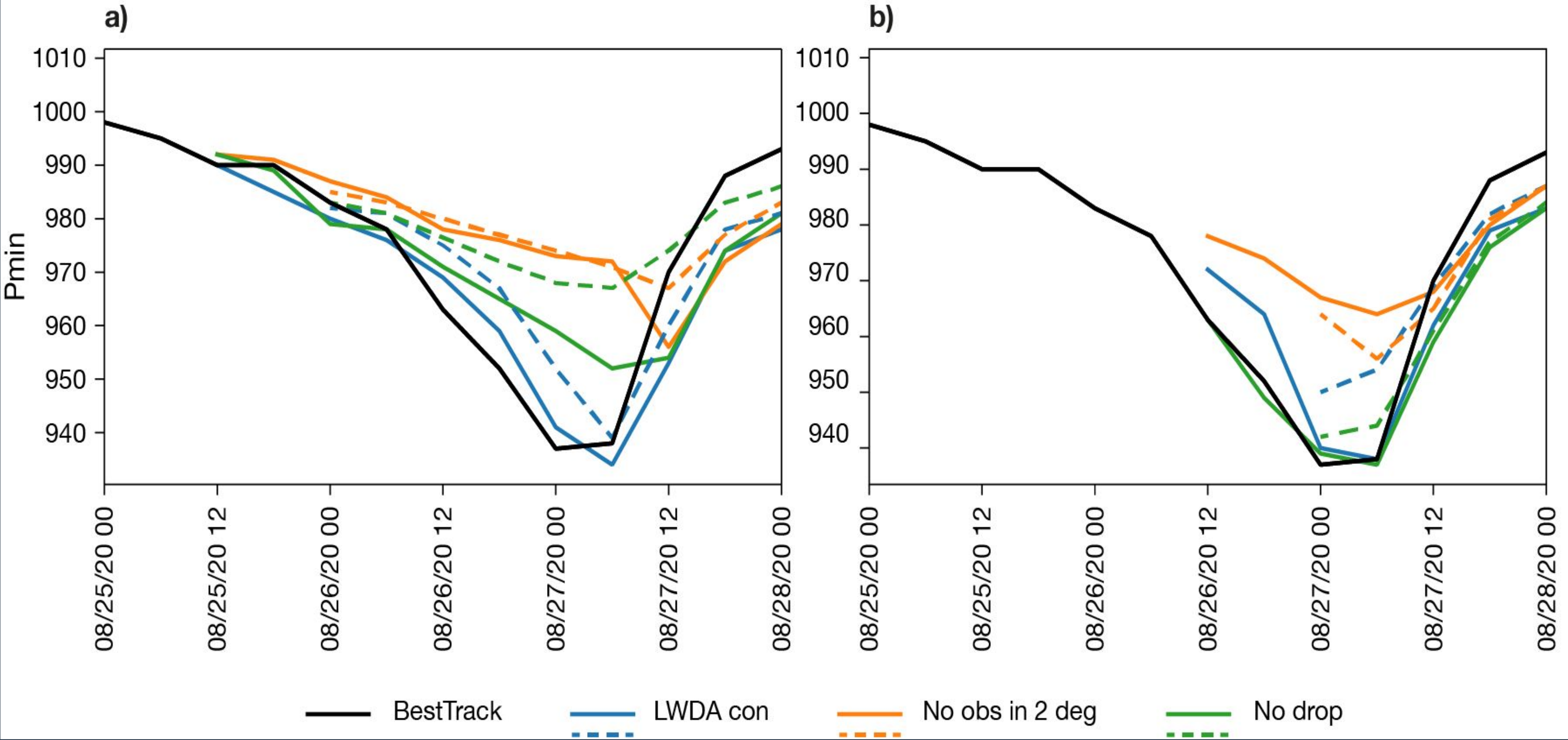
Dropsondes improve, HDOBS degrade

Strong storms (above 24 m/s) - central pressure error



Dropsondes improve, HDOBS degrade

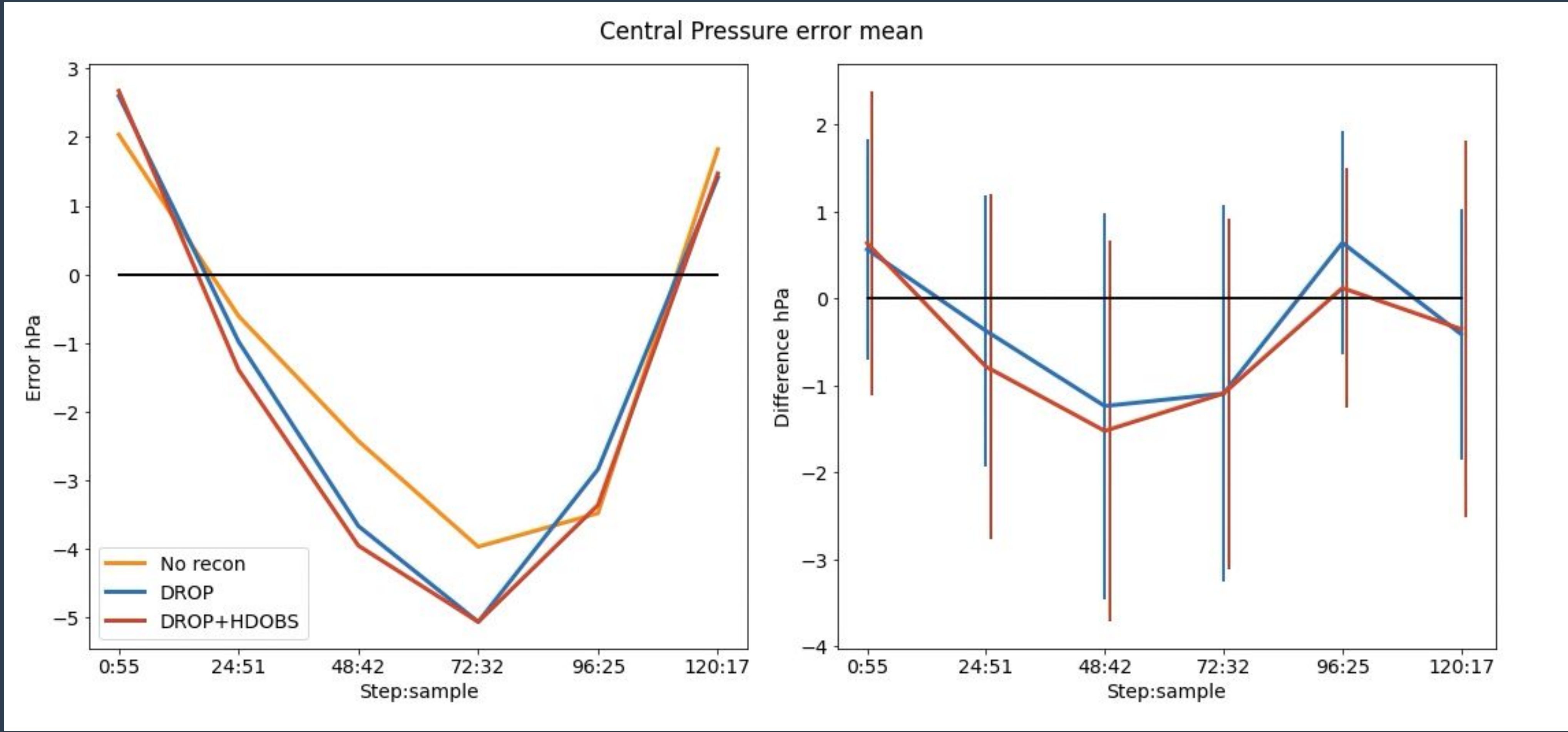
Example for dropsonde impact during TC Laura



Summary

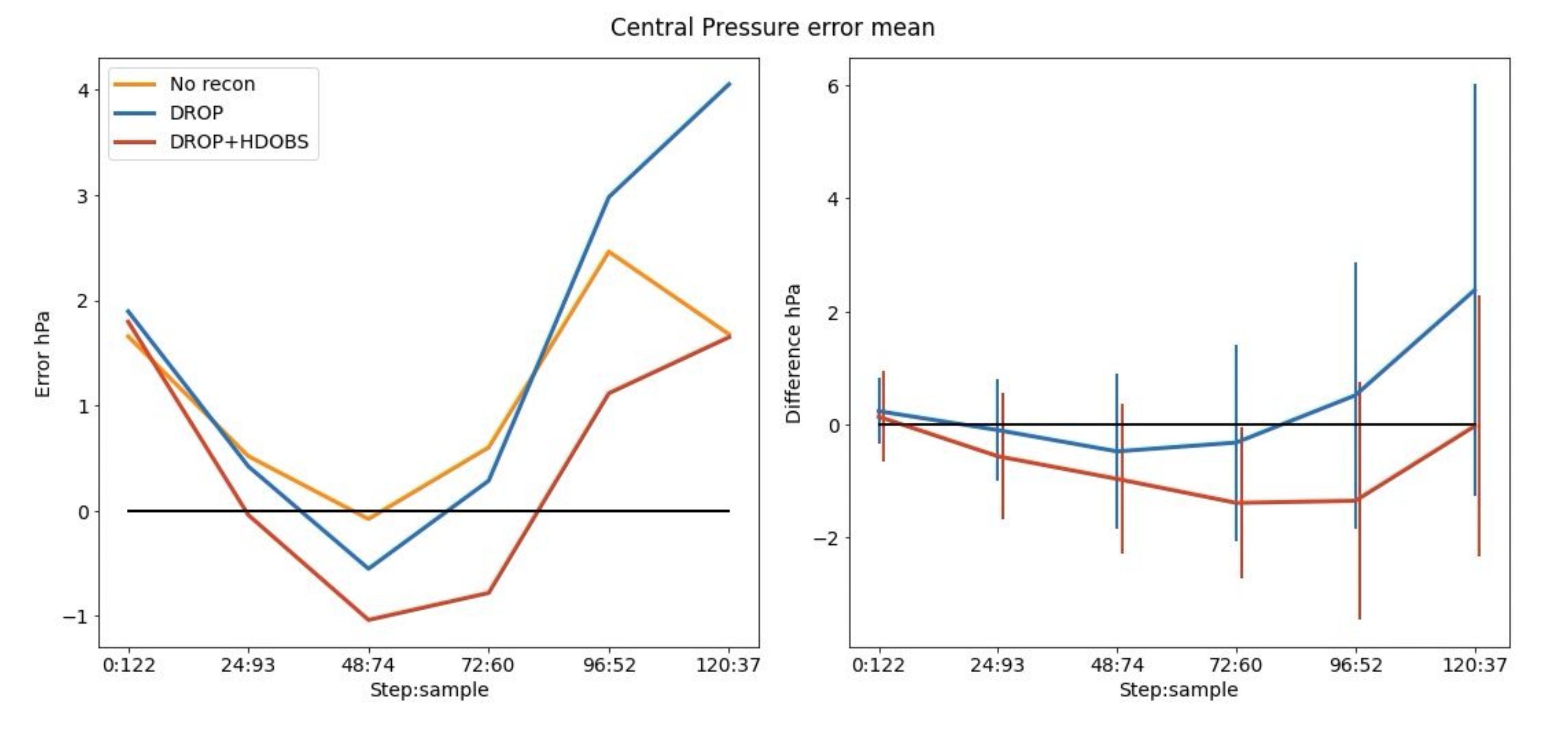
- Very difficult to draw clear conclusions from observation experiments – especially for position errors
- Positive impact on central pressure from dropsondes
- Negative impact on central pressure from HDOBS

Strong storms (above 24 m/s) - central pressure bias

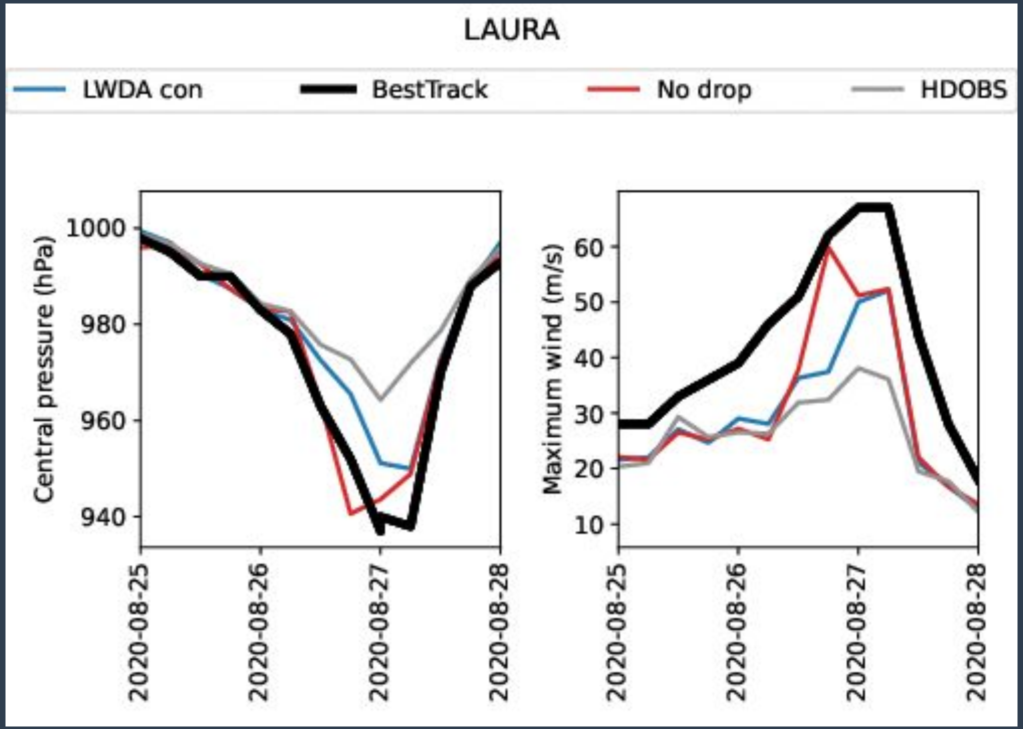


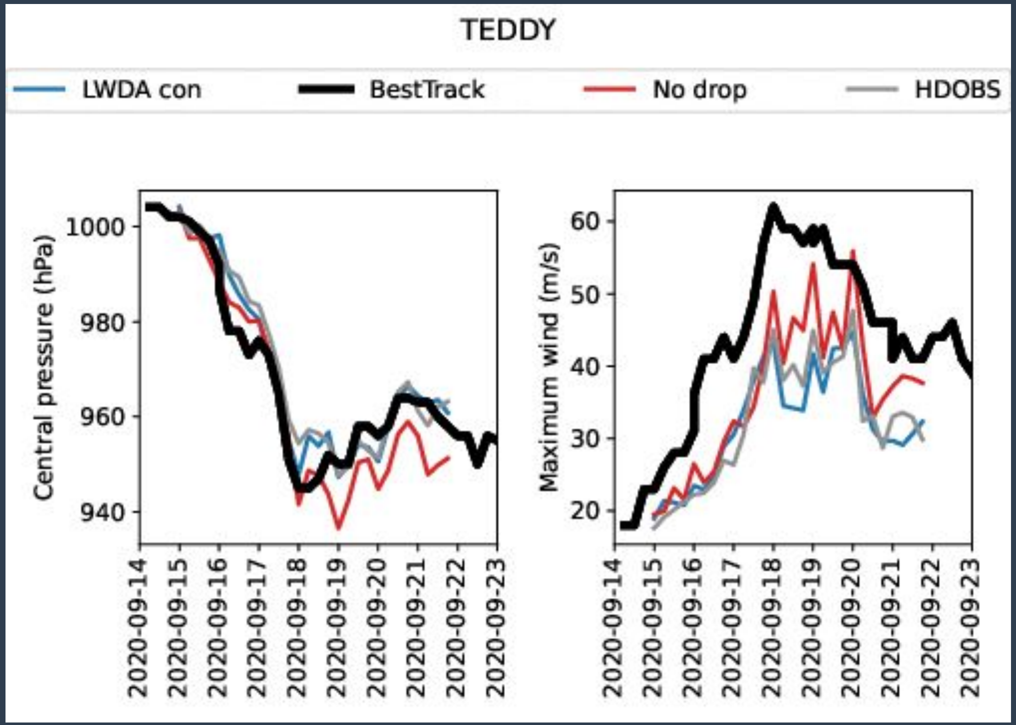
Weaker storms initially with recon data but stronger 2-3 days into the forecasts

All storms – central pressure bias



HDOBS gives stronger storms 2-3 days into the forecasts


LAURA
LWDA con
BestTrack
No drop
HDOBS
Central pressure (hPa)
Maximum wind (m/s)
1000
980
960
940
60
50
40
30
20
10
2020-08-25
2020-08-26
2020-08-27
2020-08-28


TEDDY
LWDA con
BestTrack
No drop
HDOBS
Central pressure (hPa)
Maximum wind (m/s)
1000
980
960
940
60
50
40
30
20
2020-09-14
2020-09-15
2020-09-16
2020-09-17
2020-09-18
2020-09-19
2020-09-20
2020-09-21
2020-09-22
2020-09-23