NWP METEOROLOGICAL TEST SUITE

V5.06 (HINDCAST) STATUS

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ECMWF Special Projects

(former COSMO Priority Task PT NWP Meteorological Test Suite and continuation):

- "COSMO NWP Meteorological Test Suite" (2016 - 2017)
- "NWP Meteorological Test Suite" (2013 - 2015)

"Testbed for the Evaluation of COSMO Model Versions" (2018 – 2020)

2019 B.U.

Allocated: **5 000 000.00**

Used until now: **4 073 739.44 (81.5%)**

More resources need this year, for ICON Test Suite

==> **Request for additional resources to be drafted**

MODEL OUTPUT VERIFICATION

- **MEC+Rfdbk verification procedure**
  - ➔ conversion of observations (**bufr2netcdf)** – previously done by ARPAE colleagues
  - ➔ pre-processing of model output in grib format for ingestion in MEC
  - ➔ processing model output and corresponding observations to obtain feedback files
    - ✓ MEC-1.57
  - ➔ execution of verification procedures (Rfdbk)
    - ✓ R 3.5.2 version
  - ➔ New R scripts by Felix
  - ➔ Mimic VERSUS capability Station list from VERSUS (adapted for Rfdbk)

RESULTS available on the COSMO shiny server

(complete overview of statistical analysis/graphs/numbers)

REPORT IS DRAFTED, will be available soon if it is not already!

- Model runs in hindcast mode (previous talk by INES)

ADAPTATION OF MODEL OUTPUT FOR MEC

➢ Model output
- 1 daily hindcast file / day,
- 1 forecast each 3 hours,
- lead-times from 0 to 21 (in total 62 daily files)

➢ **hindcast files were remapped for MEC ingestion**

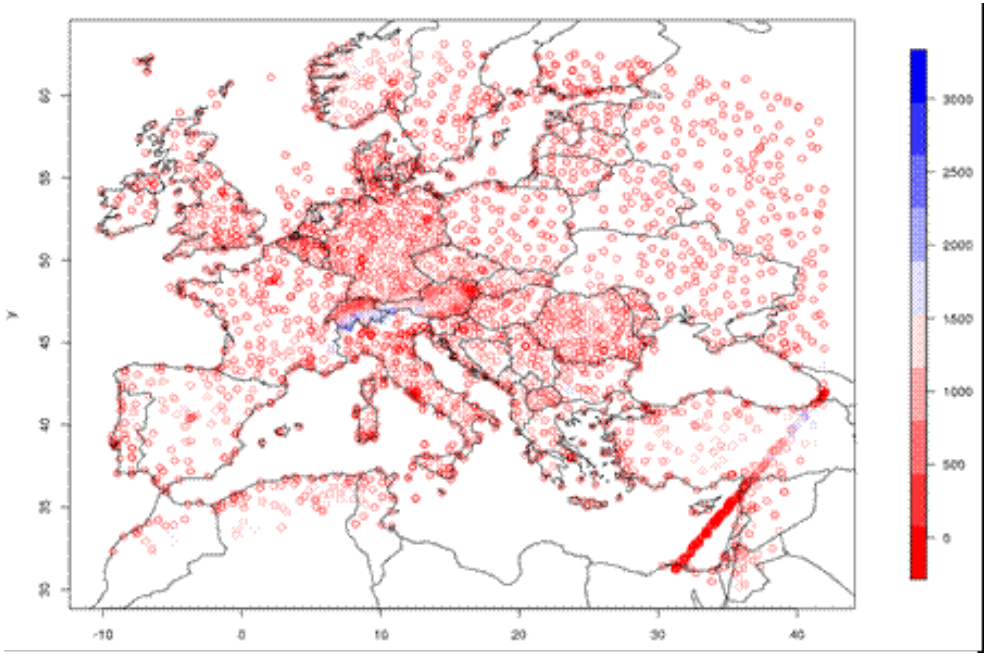
Change of **timeRangeIndicator** using grib_set from

1 (Initialized analysis product for reference time (P1=0) (grib1/5.table))
To
0 (Forecast product valid at reference time + P1 (P1>0))

Will be done during archiving procedures for ECFS for next runs

ADAPTATION OF MODEL OUTPUT FOR MEC (cont'd)

- **Files for 00 UTC** are additionally remapped with grib_set and used twice
  - ➔ analysis for one day (to process step 3), step 0
  - ➔ forecast from the previous day with step 24 (to use observations from 00UTC).



MODEL OUTPUT VERIFICATION

- **surface continuous parameters**
  - ➔ T2M, TD2M, FF, N, PS
  - ➔ BIAS (ME), RMSE, SD, R^2, TCC (tendency correlation), LEN (# of observations used), OMEAN and FMEAN (observed and forecast mean);
- **upper air verification** (TEMP based)
  - ➔ T, TD, RH, FF and DD for selected pressure levels (250., 500., 700., 850., 925., 1000.)
  - ➔ BIAS, MAE, RMSE. SD, etc.
- **precipitation verification** (6h, 12h)
  - ➔ for selected thresholds (greater than 0.2, 0.4, 0.6, 0.8, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 14, 16, 18, 20, 25, 30)
  - ➔ ETS, FBI, Performance diagrams, etc.

MODEL OUTPUT VERIFICATION

➢ **precipitation verification** (6h, 12h) for selected thresholds (greater than 0.2, 0.4, 0.6, 0.8, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 12, 14, 16, 18, 20, 25, 30): ETS, FBI, Performance diagrams, etc. – up to 72 hours forecast horizon;

Verification of precipitation not yet performed

because of technical reasons since the implementation of hindcast mode

Problems with processing PRECIPITATION with MEC

Missing in feedback files (=0)

SUGGESTIONS?

RESULTS

- **Verification modules**:
  - ➔ V5.05 against v5.06 (7 km, DP, hindcast)
  - ➔ V5.05 against v5.06 (2.8 km, DP, hindcast)
  - ➔ V5.06 DP against SP (7km, hindcast)
  - ➔ V5.05 against v5.06 (7km, SP, hindcast)

V5.05 against v5.06 (7 km, DP, hindcast)

- **Surface:**

  ➔T2m, N and FF no significant difference

  ➔TD2m almost no significant difference

  ➔MSLP overall small improvement with v5.06

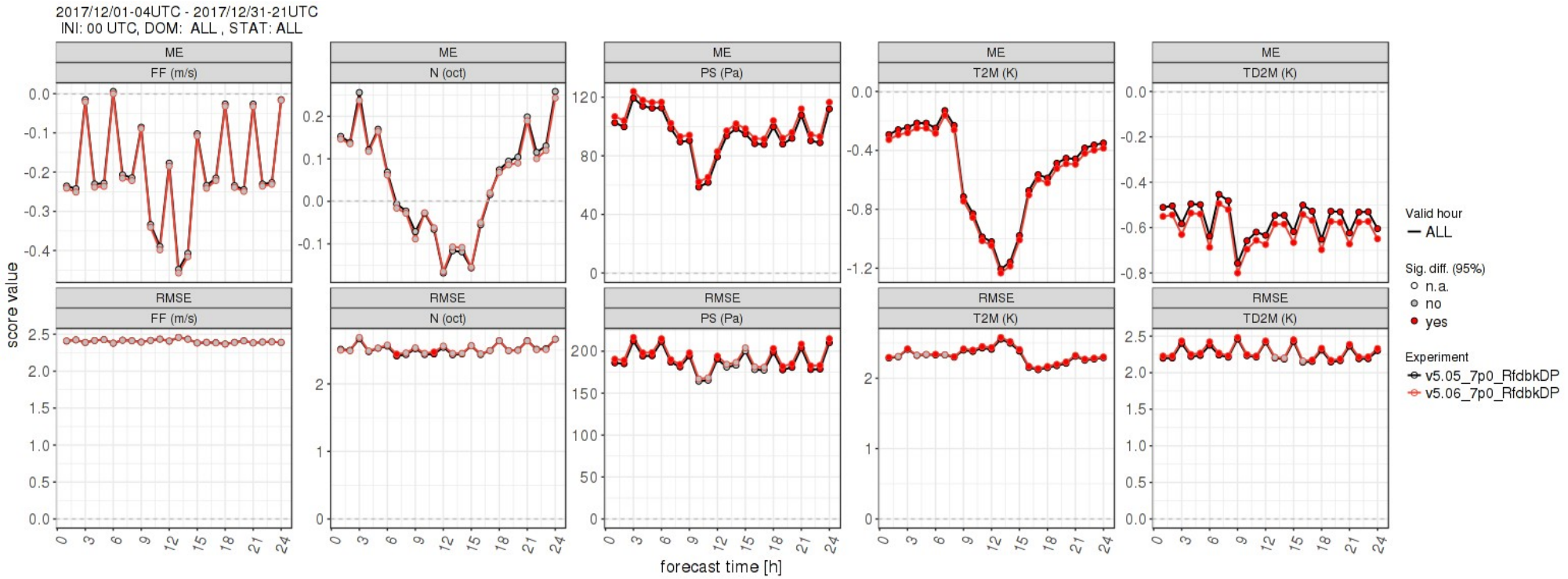
- **Upper air** parameters

  ➔RH - RMSE values overall no significant difference, slight improvements for ME

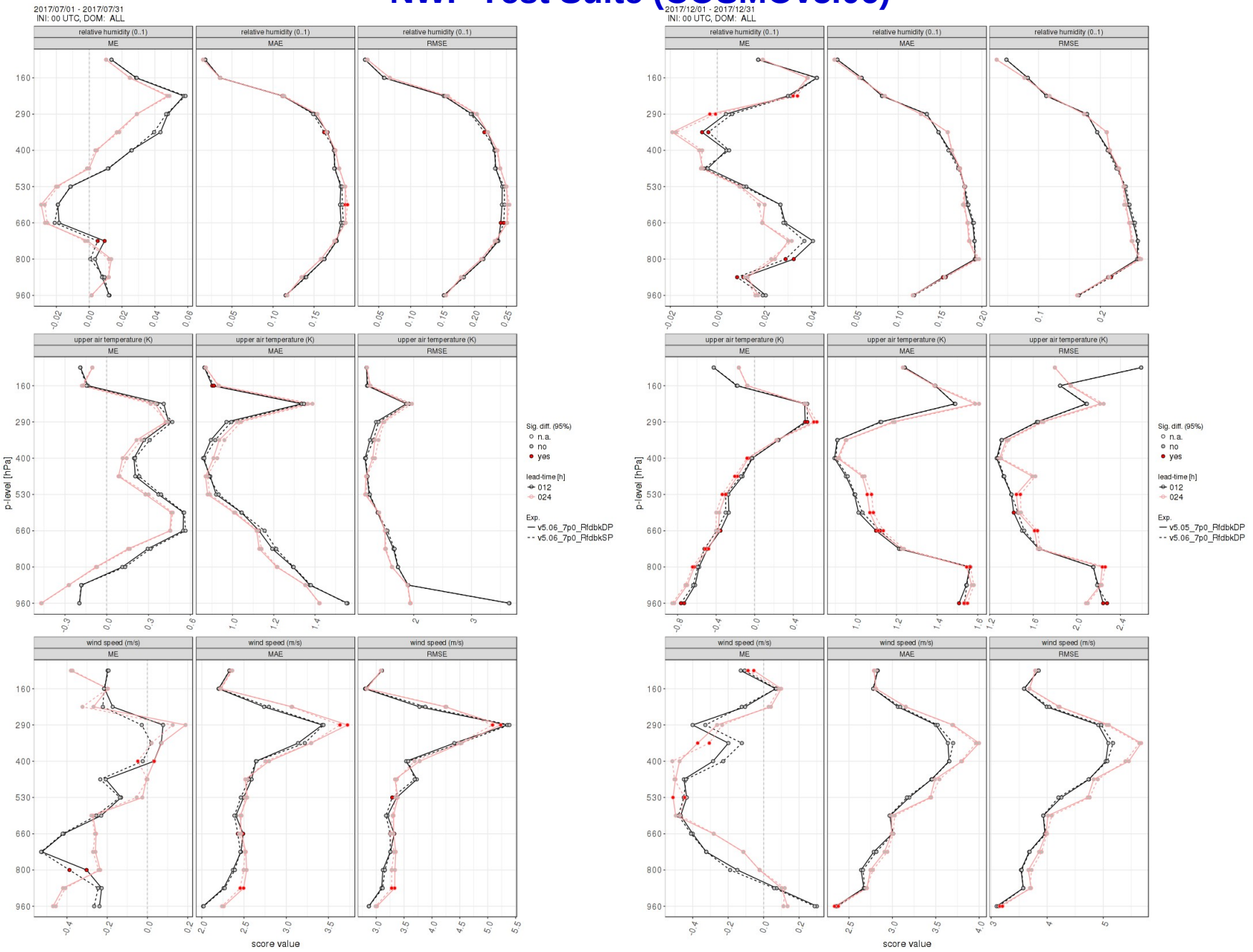
  ➔T no significant differences in most cases.

  ➔Wind Speed no strong trend in the impact in the performance.

V5.05 against v5.06 (7 km, DP, hindcast)



NWP Test Suite (COSMOv5.06)



V5.06 DP against SP (7 km, hindcast)

- **Surface:**

  ➔ almost identical for all parameters examined between the two precision schemes

  ➔ **MSLP** very small increase during summer (all hours) for SP

- **Upper air:**

  ➔ Small changes for **RH** (middle atmosphere), no specific tendency in the error

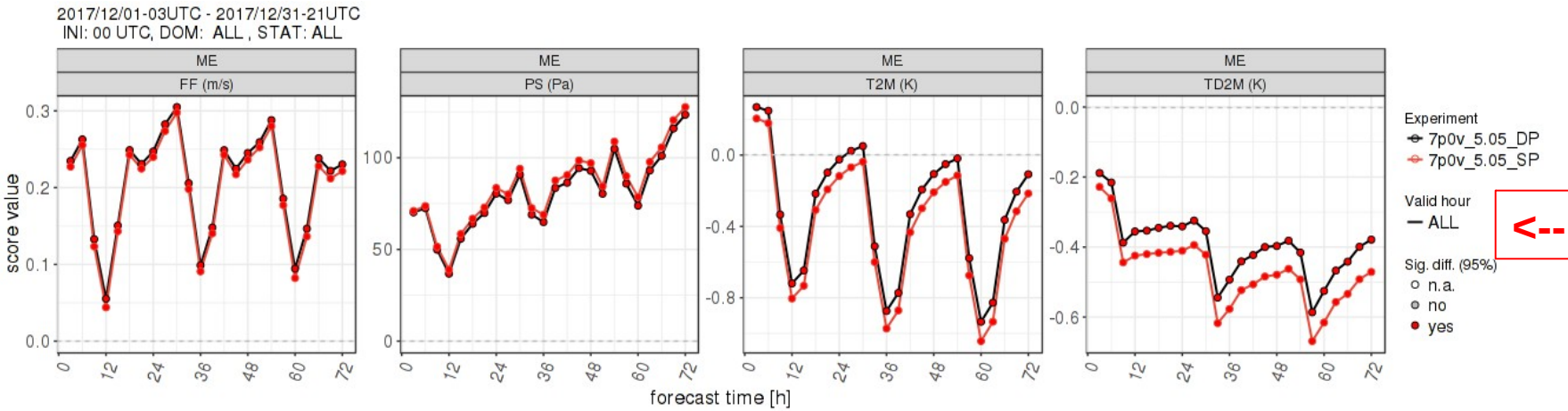
  ➔ **T** differences in the upper atmospheric levels, small reduction during summer

  ➔ more noticeable with **WS** during winter (ME values, upper atmosphere)

HOWEVER

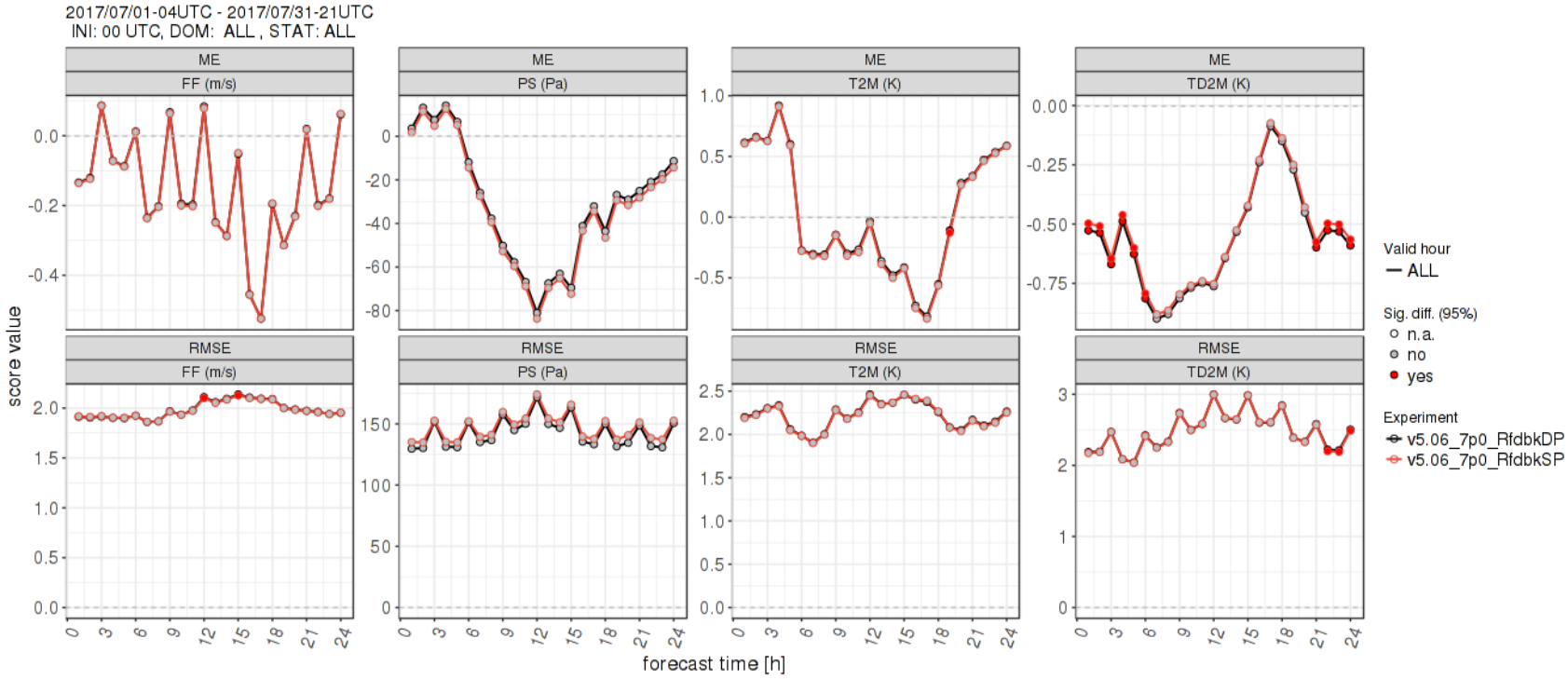
difference in comparison between DP and SP for v5.06 almost in all cases SMALLER than that between model versions when the latter existed!

NWP Test Suite (COSMOv5.06)



<-- BEFORE :(

NOW :D -->



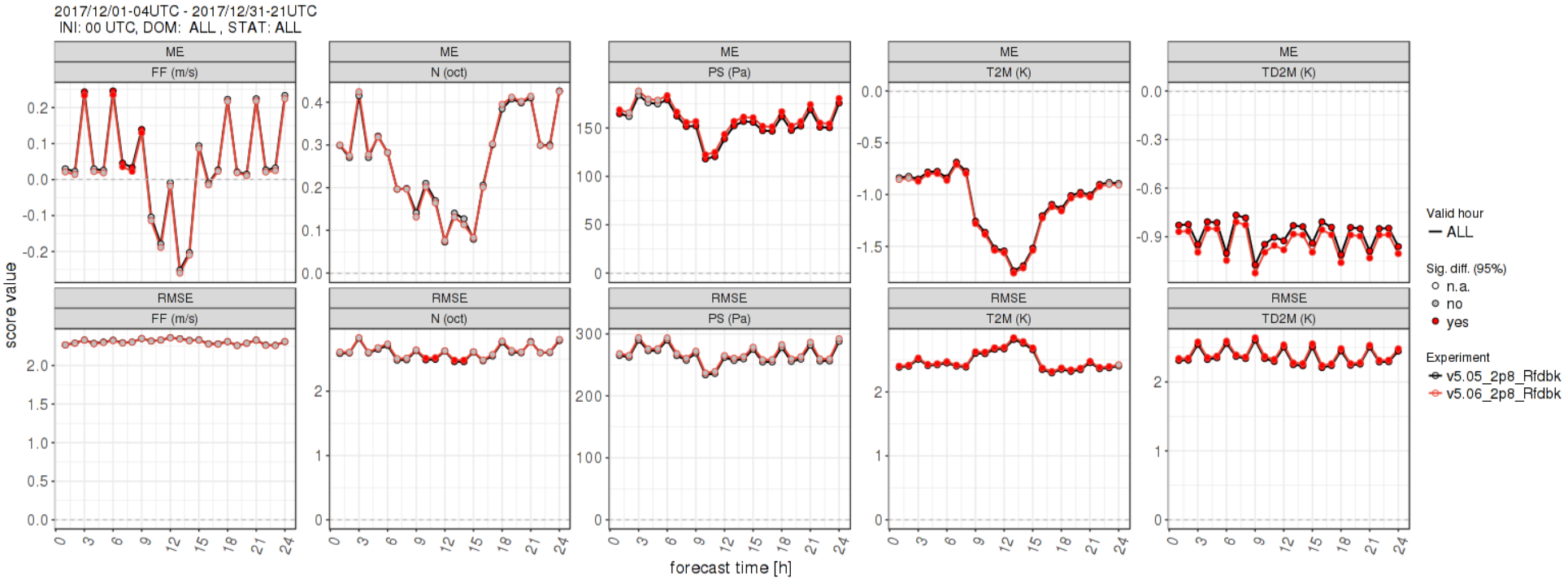
Evaluation of v5.06 (hindcast mode) against v5.05_1

- ***Results***

V5.05 against v5.06 (2.8 km, DP, hindcast)

Surface:

NWP Test Suite (COSMOv5.06)



NEXT STEPS/SUGGESTIONS

- **further investigate & solve problem with precipitation**

- **switch** to MEC-2.00 or MEC-2.01
- **run 2 days more** (previous to the period start) to avoid exclusion of 00 from day 1?

- More consistency with the amount of stations included in the sample for each timestep
- hourly results are spiky (some countries report only 3hrly => data density different from hour to hour)

=> new feature to show only 3hly scores and alleviate the data density issue (Felix)

- **VERSUS quality filter** seems not strict enough for wind
(station reporting unrealistically that is not filtered)

- introduce a **namelist setting** for the levels used in upper air verification (Felix)

- modify the **visualization** to allow loading 2/ more score files simultaneously (Felix)

Thank you for your attention!

Questions?