Upgraded PREPACQC QC Module: Status and Resulting Changes

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Why are we doing this?

- Currently, NCEP has:
  - PREPACQC for non-MDCRS aircraft data (AMDAR, AIREP, PIREP, etc)
  - PREPACARSQC for MDCRS/ACARS data.
- Naval Research Laboratory (NRL) aircraft data QC program:
  - is more comprehensive then either of the above programs.
  - QC's all aircraft data types (one stop shopping… only have to maintain one QC module).
- NRL code obtained from Dr. Pat Pauley, who also has provided help with getting it integrated into the NCEP processing stream.
- As part of the new aircraft data QC package, a "mini-PREPBUFR" file containing aircraft profiles (ascents and descents) can be output for verification use.

Changes to /nwprod for this Implementation

- Removal of ACARSQC QC module
  - replaced by new, upgraded version of PREPACQC, which QCs all aircraft data
- New, faster dump processing
- Upgrade of PREPACQC itself

Removal of ACARSQC

(replaced by new, upgraded PREPACQC module)

- New PREPACQC QCs all data from aircraft, including MDCRS/ACARS, AMDAR, TAMDAR, AIREP, etc.
  - ACARSQC module is now redundant and can be deleted from the PREP processing.

- Jobs in which ACARSQC variables are eliminated (in /nwprod/jobs):
  - JCDAS_PREP1.sms.prod
  - JCDAS_PREP2.sms.prod
  - JGDAS_PREP.sms.prod
  - JGFS_PREP.sms.prod
  - JNAM_PREP.sms.prod
  - JNDAS_PREP.sms.prod
  - JRTMA_PREP.sms.prod
  - JRUC2A_PREP.sms.prod
  - JNAM_PCPN_ANAL.sms.prod
  - JCDC_CDAS_PREP2.sms.prod
  - JCDC_CDAS_PREP3.sms.prod

- Scripts, parm cards, and codes that can be deleted:
  - /nwprod/ush/prepobs_acarsqc.sh
  - /nwprod/parm/prepobs_acarsqc.*.parm (where *=cdas, cdc, gdas, gfs, nam, ruc)
  - /nwprod/sorc/preobs_acarsqc.fd/*

Upgraded Dump Processing

- The new PREPACQC runs more slowly than the current one because it does more checks on the data.

    – Needed to gain the time back via faster dump processing.

    – Streamlining and rearranging the dump processing helped us to gain the time back.

    – Dumps were split into 2 dump jobs for each network (global, NAM, RUC networks)
        - "Regular dumps" = dumps of data needed for PREPBUFR processing.
        - Non-PREPBUFR dumps were moved into "DUMP2" dump jobs.
            – The PREP step does not need to wait on the "DUMP2" jobs to finish.

Upgraded Dump Processing (cont.)

- Affected jobs:
  - JGDAS_DUMP.sms.prod
  - JGDAS_DUMP2.sms.prod

  - JGFS_DUMP.sms.prod
  - JGFS_DUMP2.sms.prod

  - JCDAS_DUMP.sms.prod

  - JNDAS_DUMP.sms.prod
  - JNDAS_DUMP2.sms.prod

  - JNAM_DUMP.sms.prod
  - NAM_DUMP2.sms.prod

  - JRUC2A_DUMP.sms.prod
  - JRUC2A_DUMP2.sms.prod

- Affected scripts:
  - /nwprod/scripts/exglobal_dump.sh.sms

  - /nwprod/scripts/exnam_dump.sh.sms

  - /nwprod/scripts/exruc2_dump.sh.sms

  - /nwprod/ush/bufr_dump_obs.sh
    - Changes made in bufr_dump_obs.sh to speed up the construction of the dump "status" file, which lists data counts.

Upgrade of PREPACQC

- Core QC code came from Pat Pauley at the Naval Research Lab (NRL)

- EMC Obs/QC Working group wrote wrapper codes to allow the core QC code to run in an NCEP environment.

- Benefits of integrating these codes into NCEP Ops:
  - More thorough QC of meteorological data from aircraft
    - more types of checks, especially more detailed track and position checking
  - Codes were also written by Obs/QC working group to generate "raob-lookalike" profiles
    - Will be used by air quality and verification groups in EMC.

Upgrade of PREPACQC (cont.)

- Jobs affected: None

- Scripts affected:
  - /nwprod/scripts/exglobal_makeprepbufr.sh.sms
  - /nwprod/scripts/exnam_makeprepbufr.sh.sms
  - /nwprod/scripts/exruc2_prep.sh.sms
  - /nwprod/ush/prepobs_prepacqc.sh
  - /nwprod/ush/prepobs_makeprepbufr.sh

- Fix files affected
  - /nwprod/fix/prepobs_prep.bufrtable

- Parm files affected
  - /nwprod/parm/prepobs_prepacqc.*.parm (where * = cdas, cdc, nam, gfs, gdas, ruc)

- Source affected:
  - /nwprod/sorc/prepobs_prepacqc.fd

A couple of quick examples...

- Observations with incorrect positions and/or time tags
- Erroneous due north or south winds

# Example #1: Incorrect positions and/or time tags

Cycle Time: 2006032200
Flight: NDXAOHKA Tail Number: SRIEC5RA
LAT/LON: 25.74 / 279.60 IDT: -1610 Z: 6171.00 P: 806.80 T: 287.46 Q: -9999.00 S: 14.36 D: 264.81
LAT/LON: 25.71 / 279.61 IDT: -1590 Z: 7192.00 P: 776.20 T: 286.26 Q: -9999.00 S: 14.37 D: 253.84
LAT/LON: 25.69 / 279.62 IDT: -1570 Z: 8199.00 P: 746.90 T: 284.26 Q: -9999.00 S: 10.26 D: 259.90
LAT/LON: 25.67 / 279.65 IDT: -1550 Z: 9180.00 P: 719.30 T: 282.26 Q: -9999.00 S: 12.28 D: 246.99
LAT/LON: 25.67 / 279.85 IDT: -1530 Z: 10112.00 P: 693.80 T: 280.26 Q: -9999.00 S: 13.37 D: 242.86
LAT/LON: 25.66 / 279.71 IDT: -1510 Z: 10630.00 P: 679.90 T: 279.46 Q: -9999.00 S: 10.74 D: 241.05
LAT/LON: 25.66 / 279.75 IDT: -1490 Z: 10899.00 P: 672.80 T: 278.96 Q: -9999.00 S: 11.31 D: 231.10
LAT/LON: 25.66 / 279.79 IDT: -1470 Z: 11490.00 P: 657.50 T: 277.76 Q: -9999.00 S: 10.75 D: 225.00

→ Temperature and winds from this report were marked as good (QM=1) by ACARSQC (current aircraft QC module for MDCRS aircraft data).
→ NRLACQC QC module marks the temperature and winds as bad (QM=13) because of the odd longitude.
  → Subroutine ordchek (track check code) marked this observation as bad

Example #1: Incorrect positions and/or time tags (cont.)
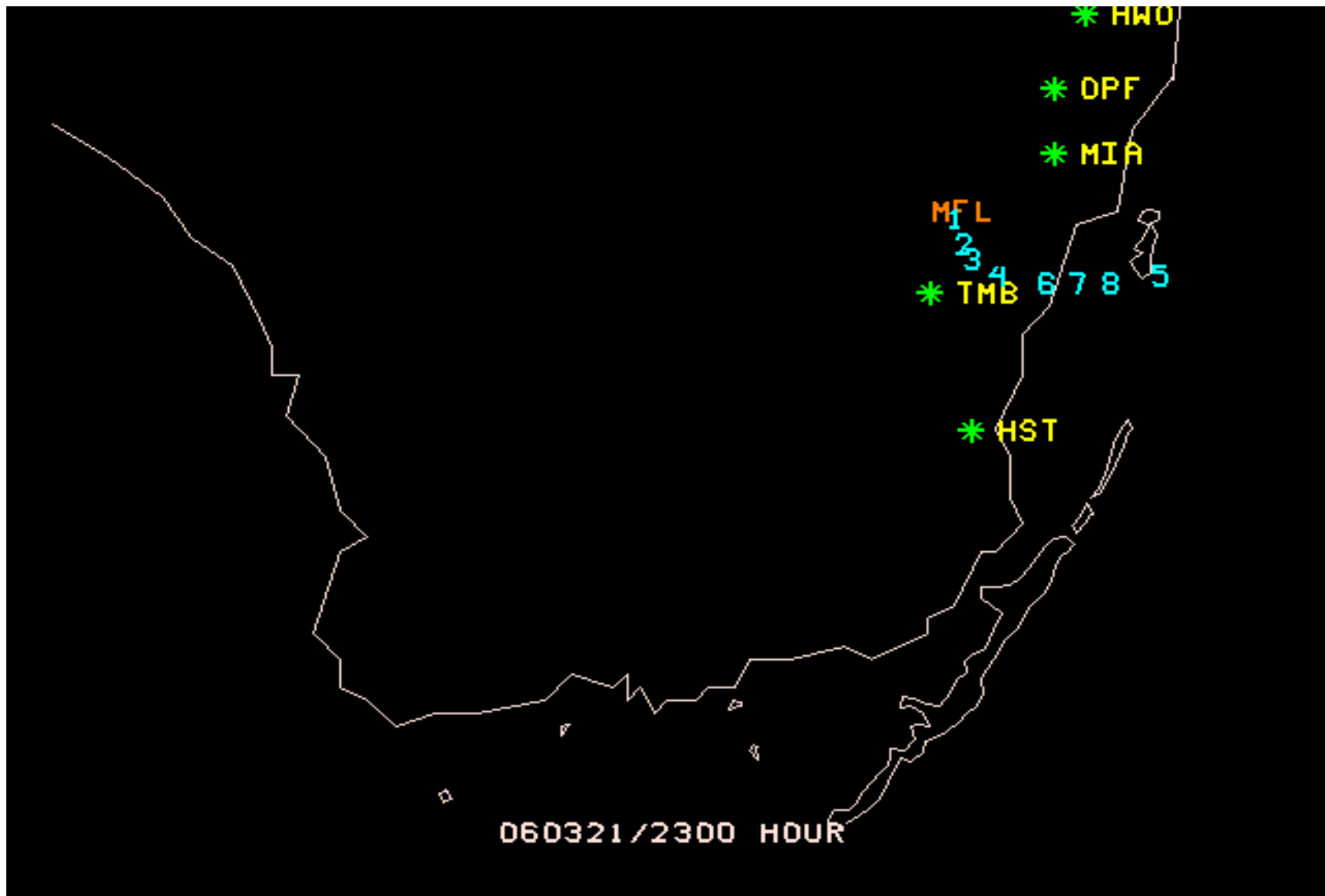
Example #2a: Erroneous due south winds

Cycle Time: 2006032212

Flight: F2OQUSJA Tail Number: DQZHL5RA

LAT/LON: 36.13 / 273.34 IDT: 2280 Z: 236.00 P: 1004.60 T: 272.96 Q: -9999.00 S: 2.06 D: 337.17

LAT/LON: 36.13 / 273.34 IDT: 2340 Z: 715.00 P: 987.30 T: 272.06 Q: -9999.00 S: 2.63 D: 351.25

LAT/LON: 36.14 / 273.34 IDT: 2340 Z: 1053.00 P: 975.20 T: 270.76 Q: -9999.00 S: 2.60 D: 180.00

LAT/LON: 36.14 / 273.35 IDT: 2340 Z: 1634.00 P: 954.80 T: 268.56 Q: -9999.00 S: 3.58 D: 22.99

LAT/LON: 36.15 / 273.35 IDT: 2340 Z: 1844.00 P: 947.50 T: 267.26 Q: -9999.00 S: 4.62 D: 355.03

LAT/LON: 36.15 / 273.36 IDT: 2340 Z: 2136.00 P: 937.40 T: 266.26 Q: -9999.00 S: 5.74 D: 7.00

→ Both temperature and winds were marked as good (QM=1) by PREPACARSQC (current aircraft QC module for MDCRS aircraft data).

→ NRLACQC QC module marks the wind in this observation as bad (QM=13) because of the incorrect due south wind. Temperature is marked as good (QM=1).

Example #2a: Erroneous due south winds (cont.)
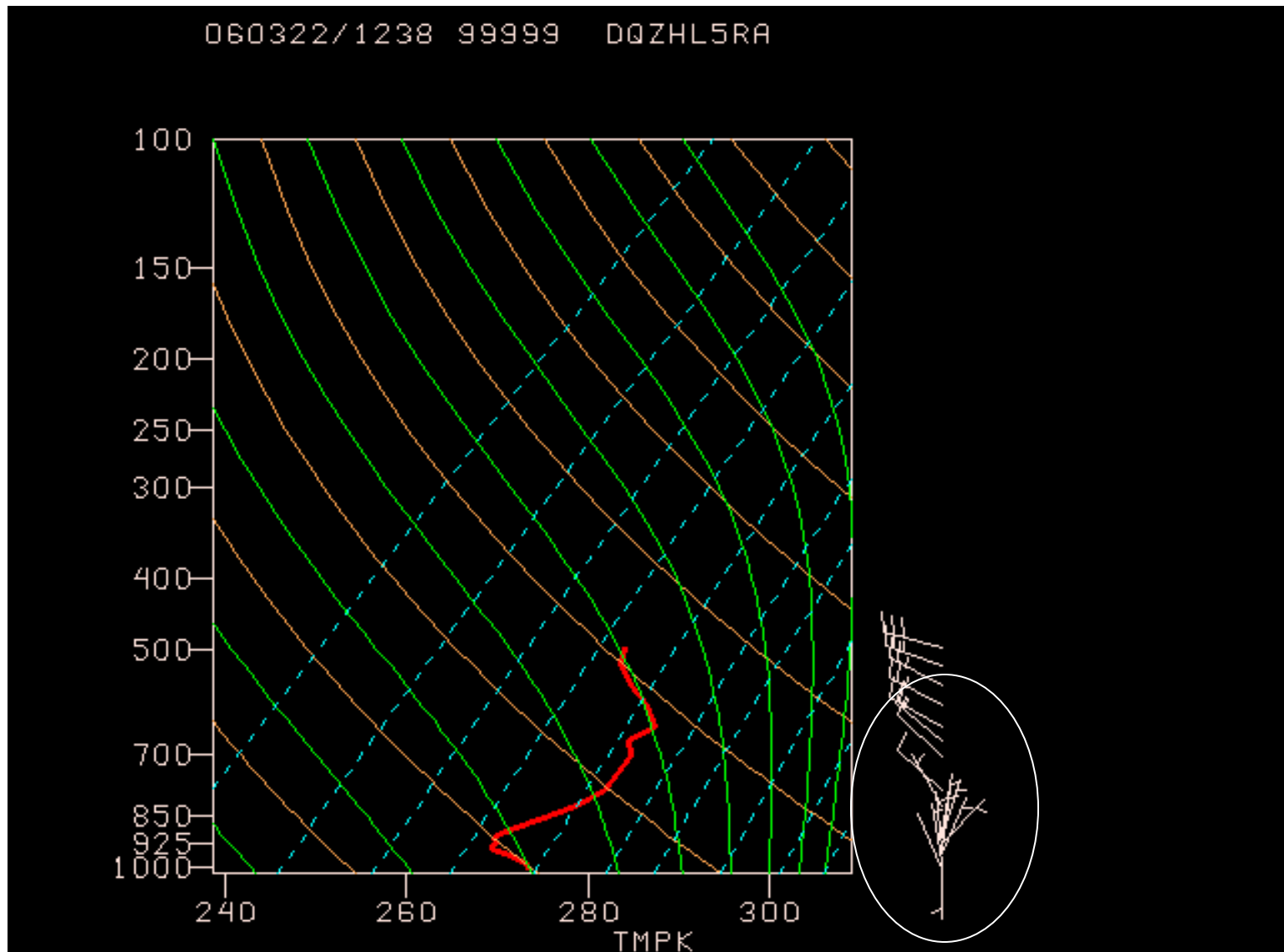
Example #2b: Erroneous due north winds (cont.)

Flight: EU2800 Tail Number: MISSING

LAT/LON: 48.79 / 9.22 IDT: -4140 Z: 2297.00 P: 931.90 T: 273.76 Q: -9999.00 S: .50 D: 360.00
LAT/LON: 48.79 / 9.22 IDT: -4140 Z: 2657.00 P: 919.70 T: 272.96 Q: -9999.00 S: 1.00 D: 360.00
LAT/LON: 48.79 / 9.22 IDT: -4140 Z: 3051.00 P: 906.40 T: 272.76 Q: -9999.00 S: 2.60 D: 360.00
LAT/LON: 48.79 / 9.21 IDT: -4140 Z: 3543.00 P: 890.10 T: 272.96 Q: -9999.00 S: 1.00 D: 360.00
LAT/LON: 48.79 / 9.21 IDT: -4140 Z: 4167.00 P: 869.70 T: 272.96 Q: -9999.00 S: 2.12 D: 289.29
LAT/LON: 48.81 / 9.21 IDT: -4080 Z: 4724.00 P: 851.80 T: 273.76 Q: -9999.00 S: 4.10 D: 268.60
LAT/LON: 48.81 / 9.19 IDT: -4080 Z: 5282.00 P: 834.20 T: 272.96 Q: -9999.00 S: 6.20 D: 269.08
LAT/LON: 48.82 / 9.19 IDT: -4080 Z: 5741.00 P: 819.90 T: 271.96 Q: -9999.00 S: 7.20 D: 269.21
LAT/LON: 48.82 / 9.19 IDT: -4080 Z: 6070.00 P: 809.90 T: 272.76 Q: -9999.00 S: 8.20 D: 269.30
LAT/LON: 48.82 / 9.19 IDT: -4080 Z: 6332.00 P: 801.90 T: 271.76 Q: -9999.00 S: 9.30 D: 268.77
LAT/LON: 48.82 / 9.19 IDT: -4080 Z: 6693.00 P: 791.00 T: 270.76 Q: -9999.00 S: 9.80 D: 268.83
LAT/LON: 48.82 / 9.19 IDT: -4020 Z: 7251.00 P: 774.40 T: 269.76 Q: -9999.00 S: 10.80 D: 268.94

→ Both temperature and winds were marked as good (QM=1) by PREPACQC (current aircraft QC module for AMDAR aircraft data).

→ NRLACQC QC module marks the due north winds in this observation as bad (QM=13) because of the incorrect due south wind. Temperatures are marked as good (QM=1).

Example #2b: Erroneous due north winds (cont.)