MTG-IRS L2 data (IASI proxy) assimilation into the ECMWF model

Progress report to IRS-MAG May 2019

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ECMWF

Two types of impact testing:

Depleted 4D-Var NWP system:

CONTROL: All conventional + AMSUA

IASI-L2: CONTROL + **IASI L2 retrievals** of T and q

IASI-RAD: CONTROL + **IASI radiances**

Degraded quality so easier to show impact

Full 4D-Var NWP system:

CONTROL: All conventional + ALL satellite (except IASI)

IASI-L2: CONTROL **+ IASI L2 retrievals** of T and q

IASI-RAD: CONTROL + **IASI radiances**

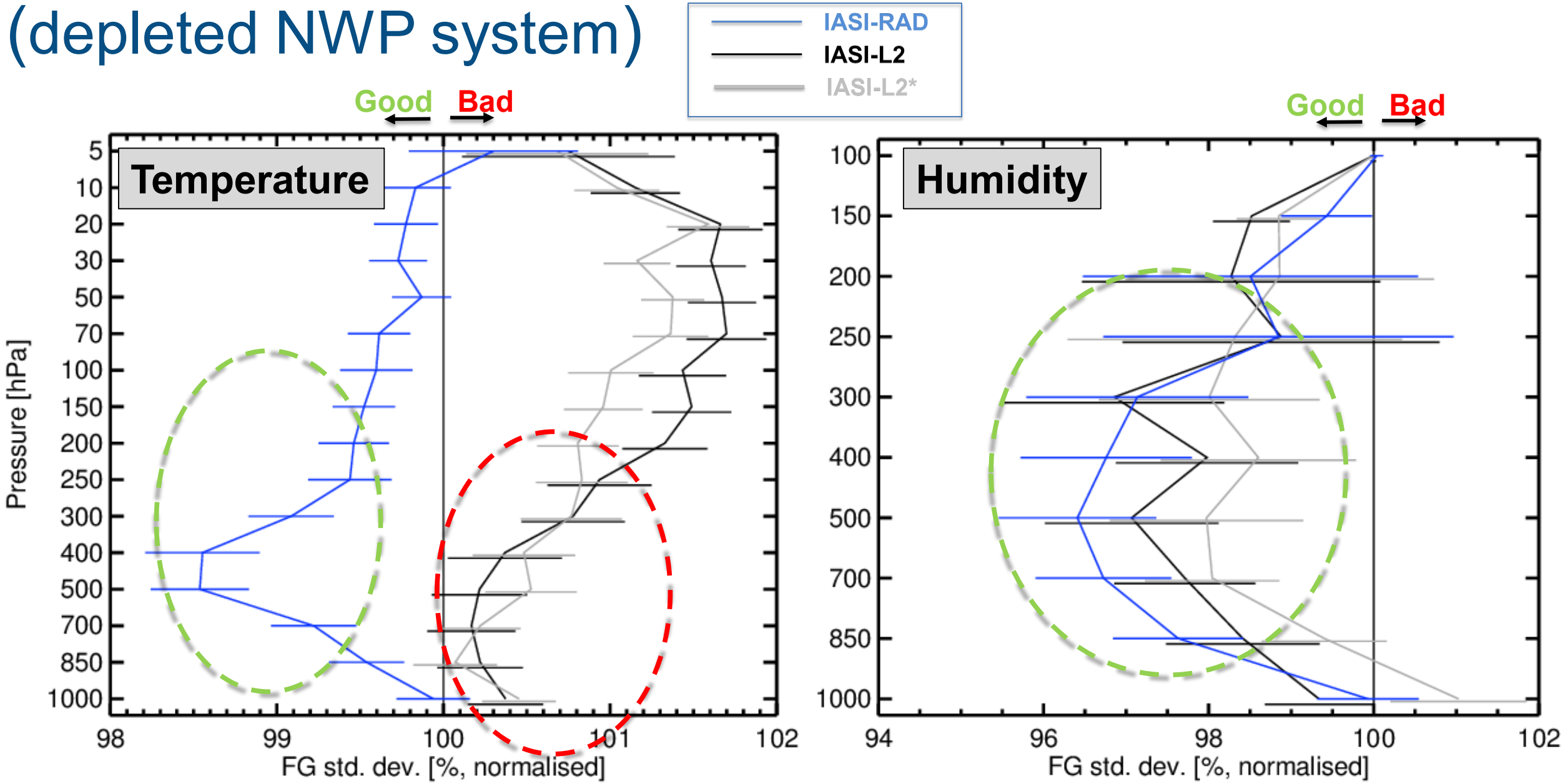
Operational quality so difficult to show impact

In both cases IASI (radiances and L2) only used in clear ocean locations

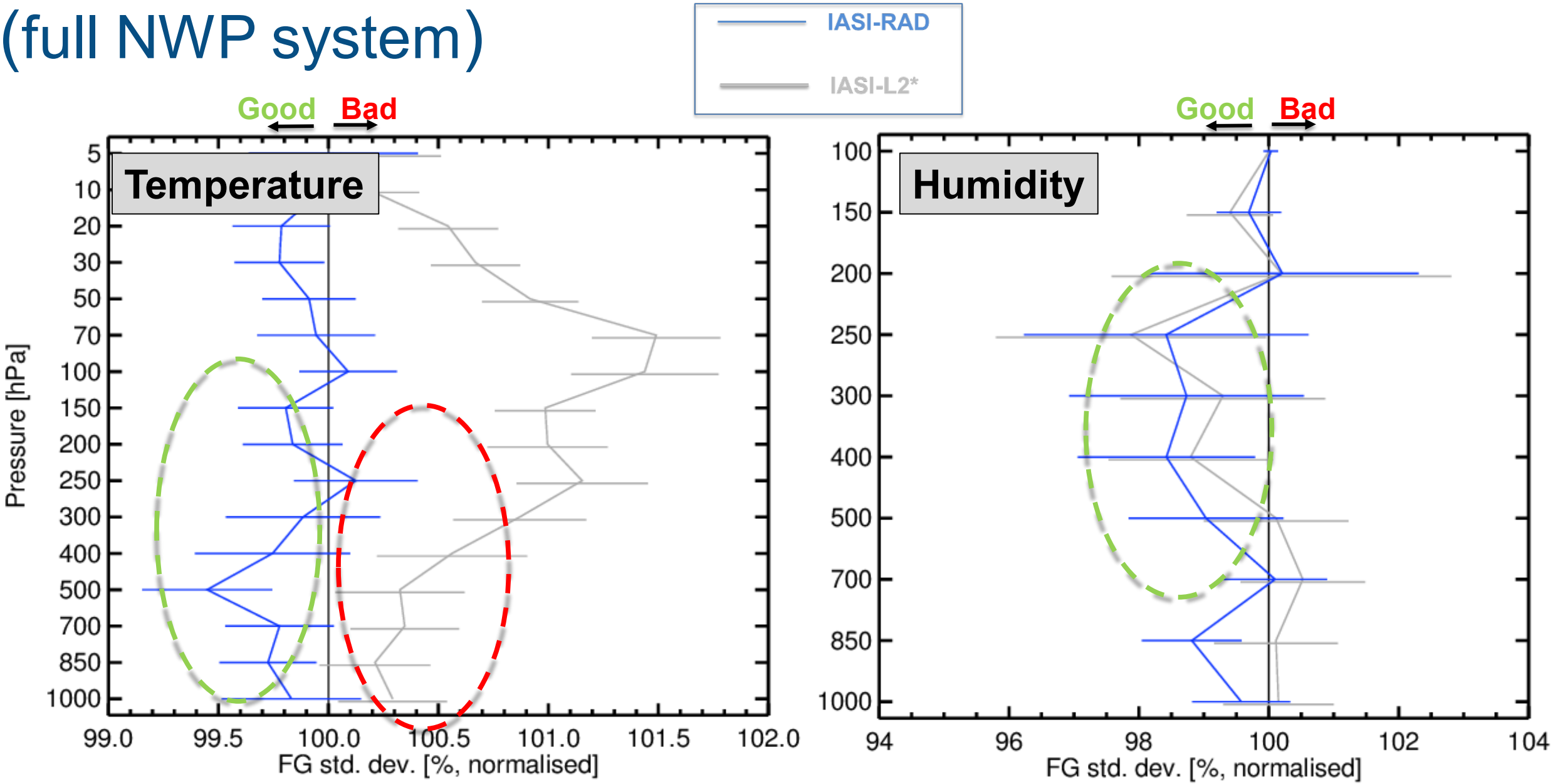
Impact metrics:

- Comparison of short-range forecasts to observations
- Comparison of day-5 forecasts to analyses (global)
- Results from Jan/Feb/Jun/Jul 2017
- Results displayed normalised by control

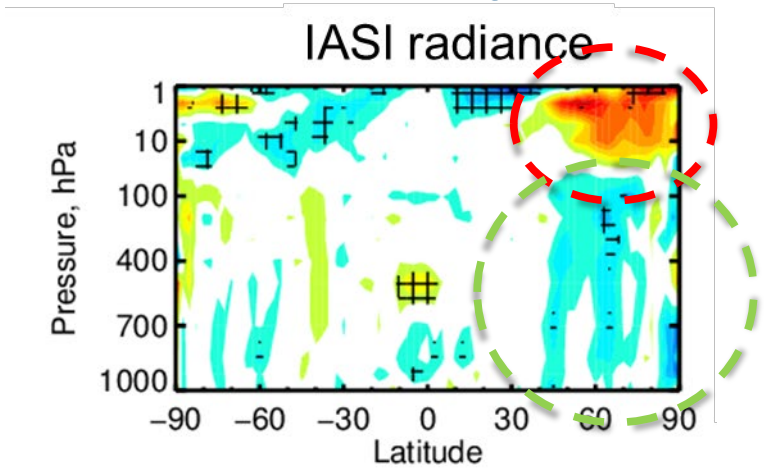
Impact: Short range forecasts v radiosondes (depleted NWP system)

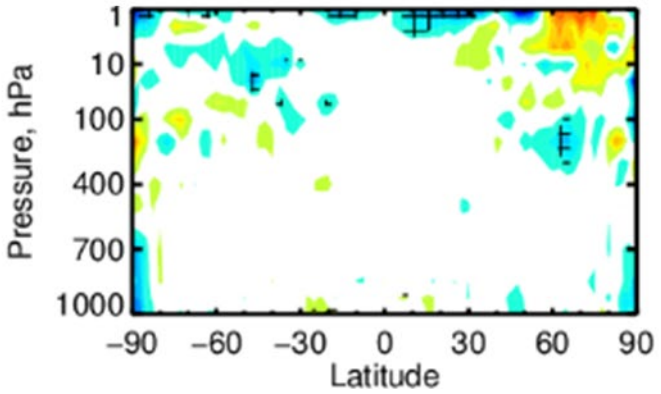


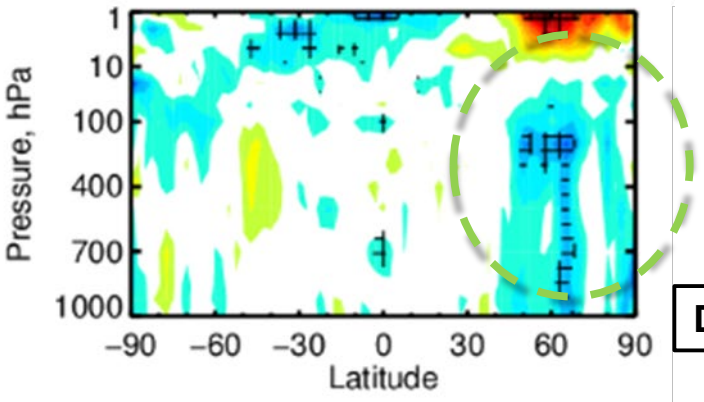
Impact: Short range forecasts v radiosondes (full NWP system)

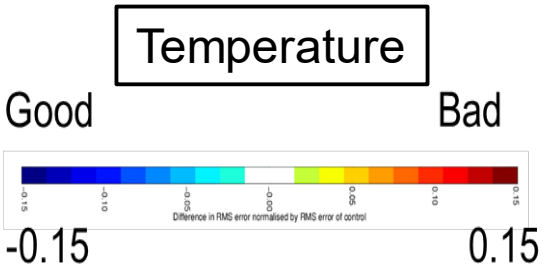


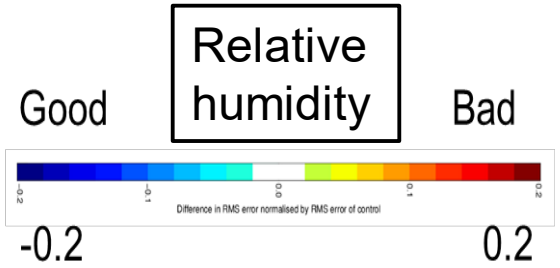
Impact: Day 5 forecasts v analyses (Full NWP system)

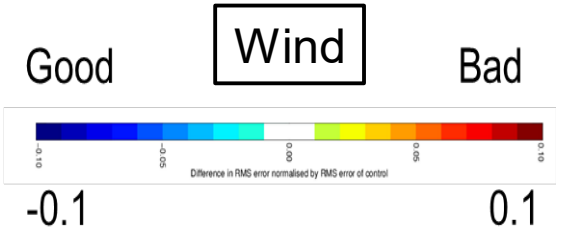




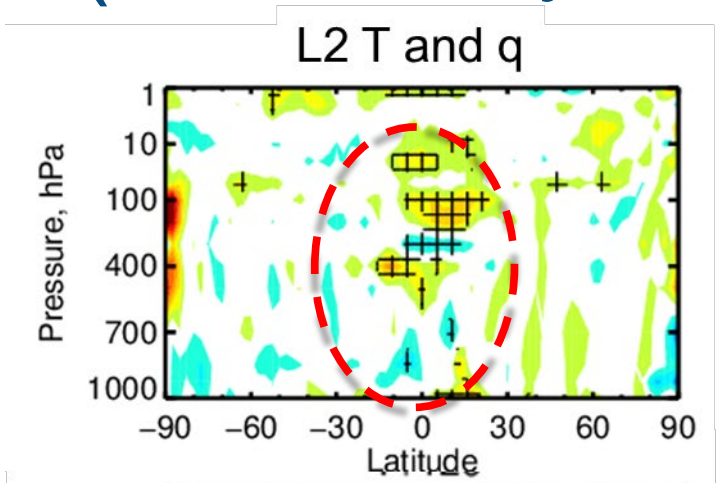


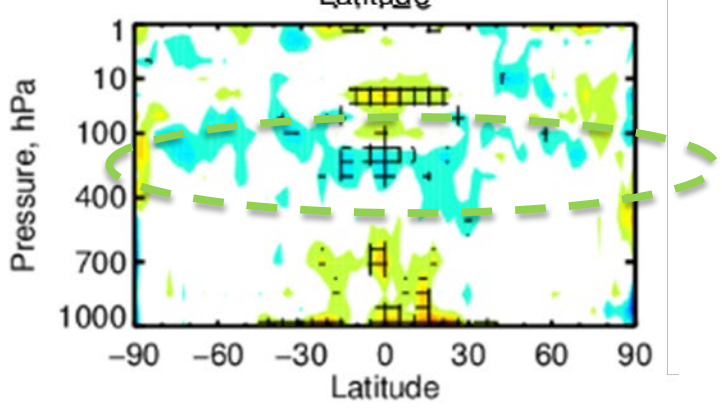


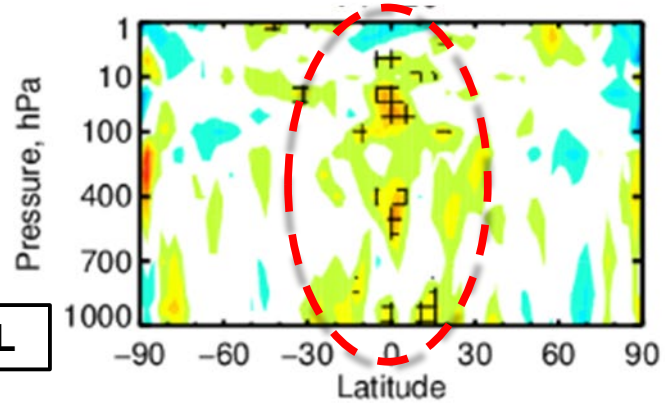




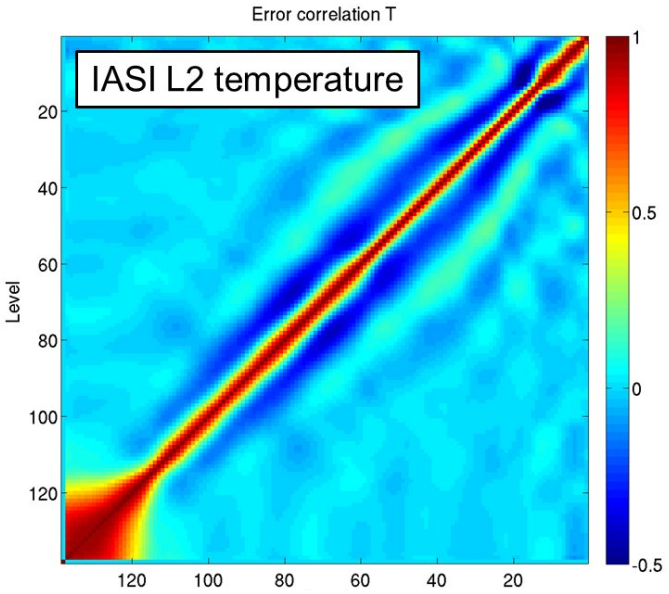
Difference in RMS error normalised by RMS of CTL

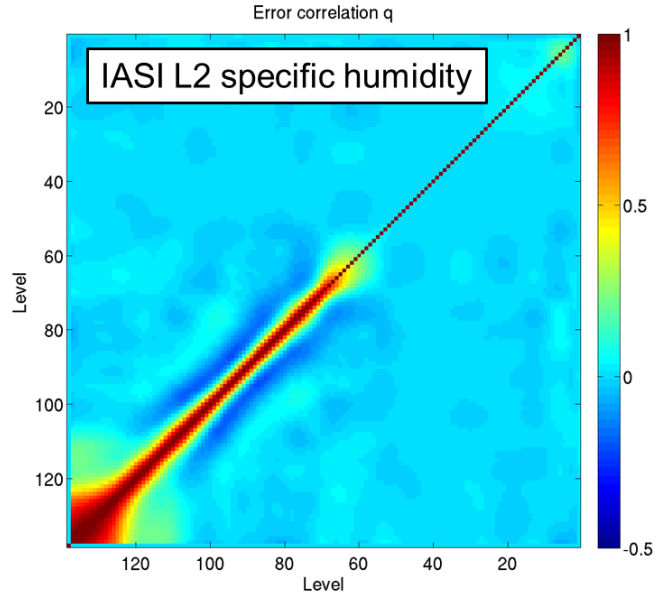






Challenge: Describing L2 error correlations





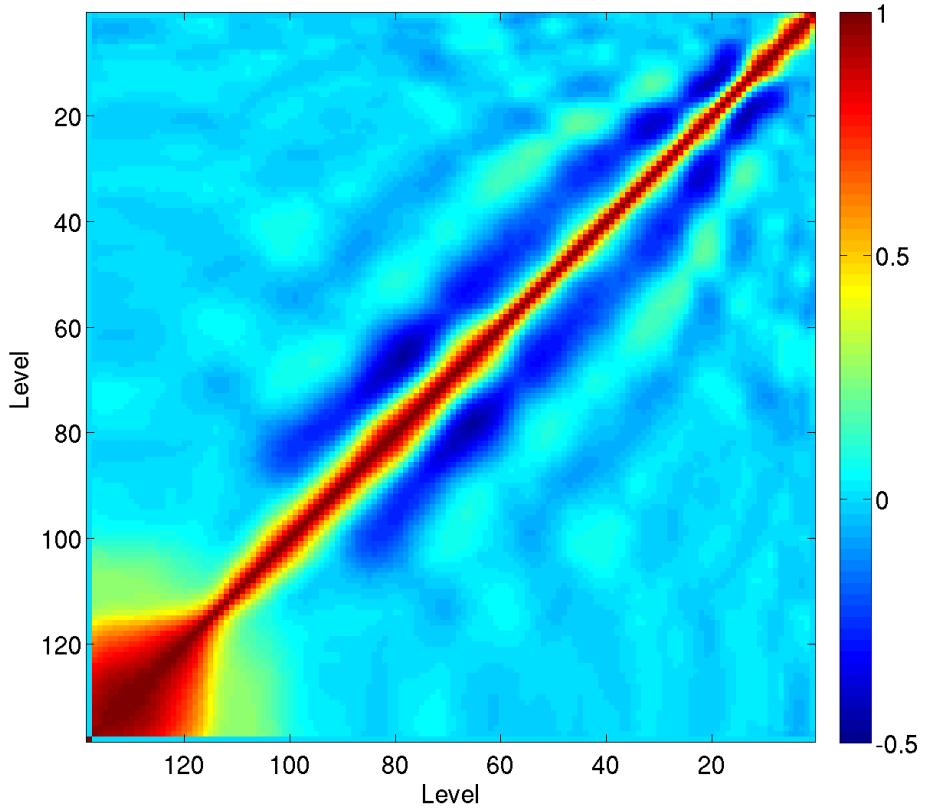
The magnitude of the L2 impact is sensitive to how the error correlations of the L2 retrievals are computed and communicated to the assimilation system:

- Sensitivity to method used (DR/HL/Diagonal)
- Correlations vary with location / season
- Correlations vary with cloud amount

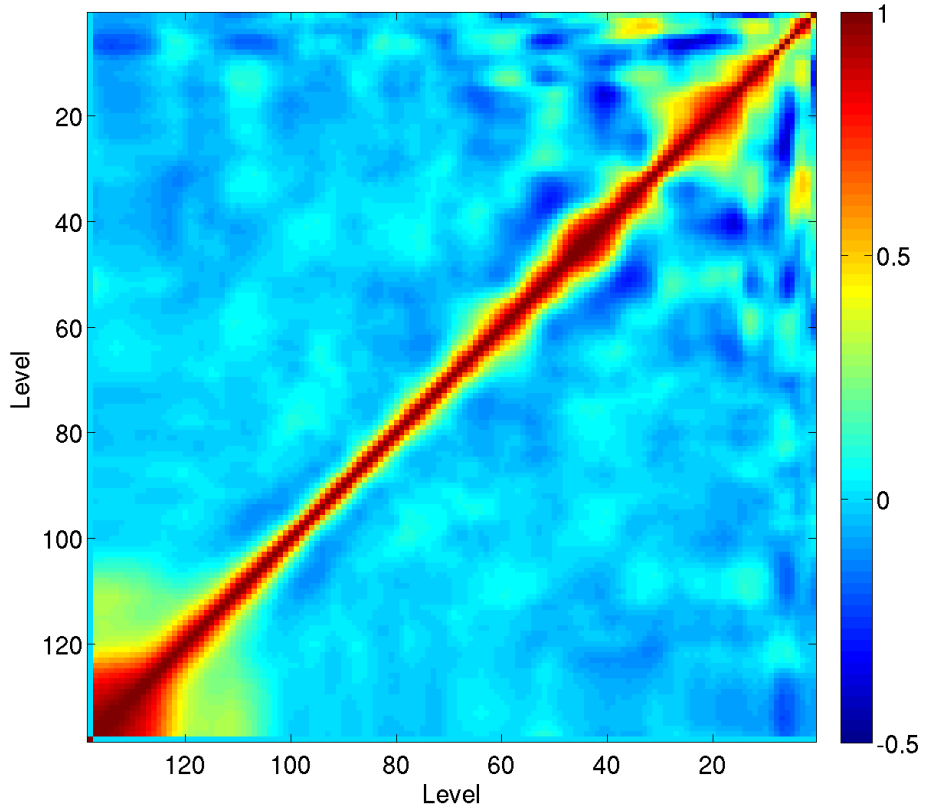
This topic will be studied further in a 6 month extension phase…

Challenge: Describing L2 error correlations (clear)

IASI L2 temperature

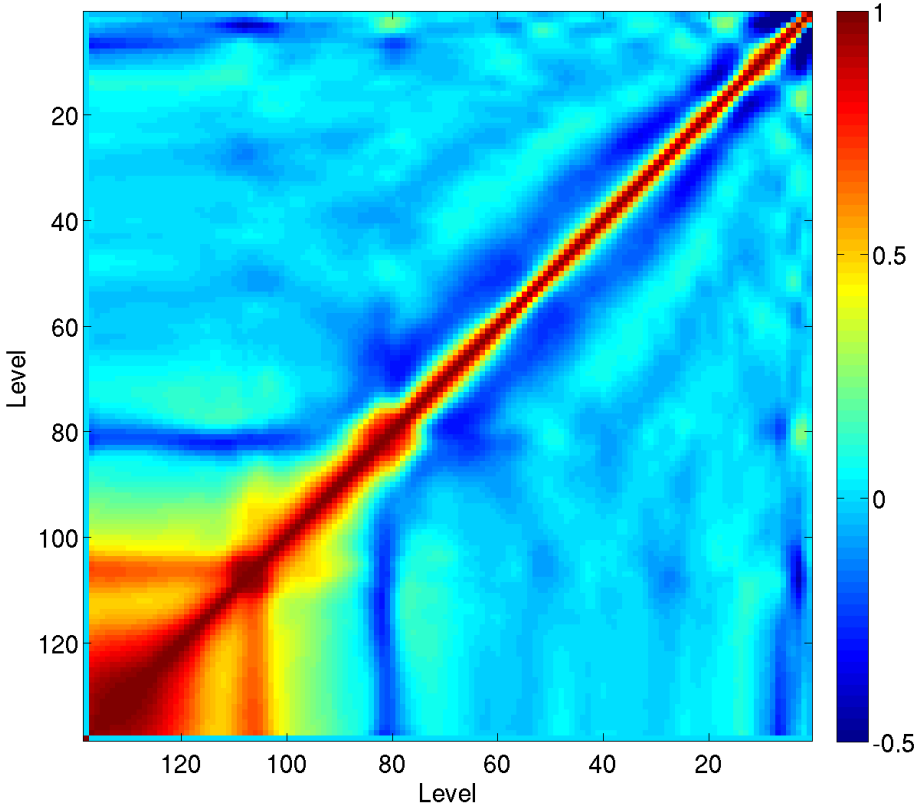


IASI L2 specific humidity



Challenge: Describing L2 error correlations (cloudy)

IASI L2 temperature



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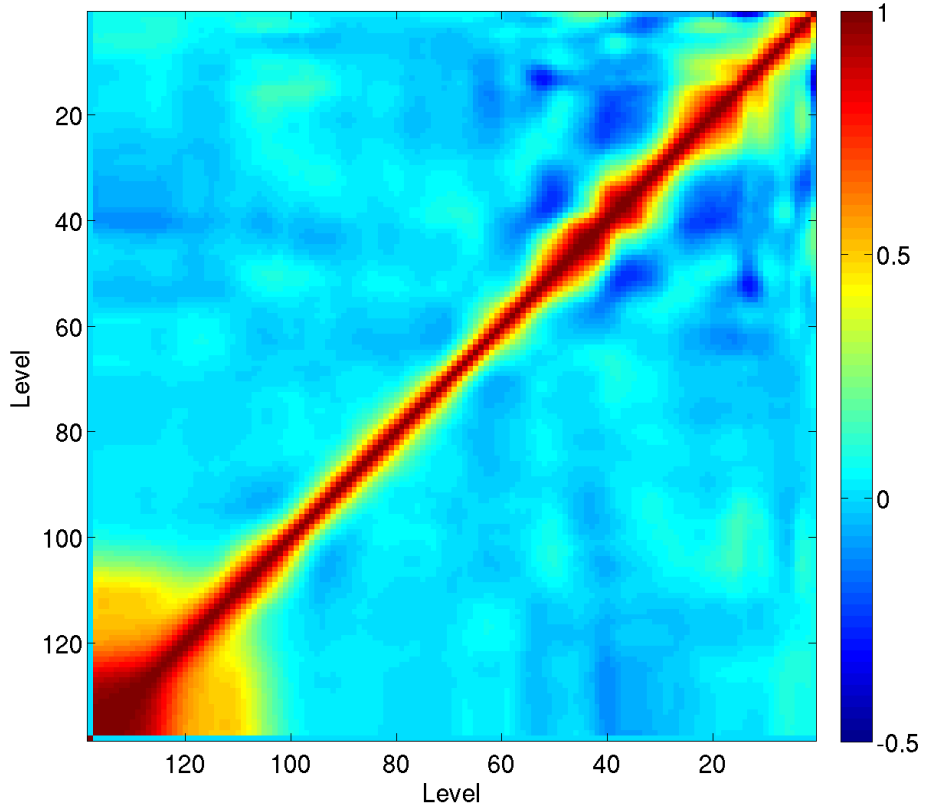

Summary of IASI L2 impact results:

- Very clear **positive** impact of humidity L2
  - Benefit comparable to IASI radiances!
- Very clear **negative** impact of temperature L2
  - These products would degrade the NWP system
- Consistent in full / depleted NWP systems
  - smaller impact in full system
- L2 impact is very sensitive to **error correlations**