

An Assessment of SSMIS Imager Data

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Outline

- Introduction

- UPP SSMIS Data
- All-sky assimilation of MW imager data
- F16 & F17 coverage / first guess departures

- Assimilation Experiments

- Configuration
- Scores
- Fits to other observations

- Ascending / Descending biases

- Summary

UPP / 'All-Sky' assimilation scheme

● **Unified Pre-Processor (UPP) for F16 / F17**

- Reflector emission correction
- Gain correction for intrusion affected scan lines
- All channels remapped to 50GHz channels
- No averaging

see : Steve Swadley presentation 3.1 / Anna Booton poster 7.36

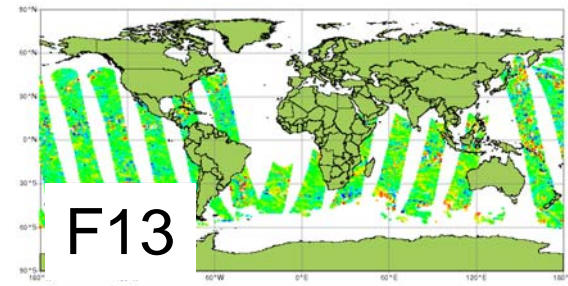
● **'All-Sky' Assimilation of MW Imager Data**

- Direct 4D-Var assimilation of all-sky radiances
- Moist physics in inner loop and scattering RT model
- Operator operates at model grid points
- State dependent observation errors
- Radiances super-obbed to match final inner loop resolution (T255)

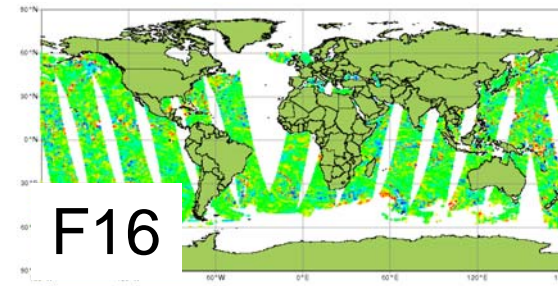
see: Peter Bauer poster 7.33

ECMWF Tech Memos 618, 619, 620 by Alan Geer & Peter Bauer, April 2010

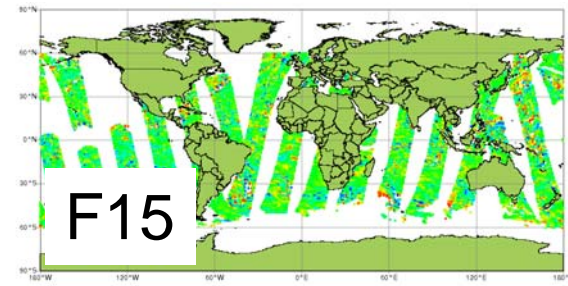
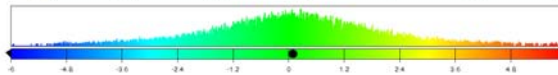
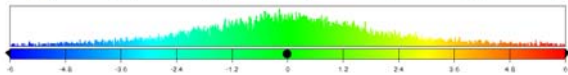
Coverage: SSMI, AMSR-E and SSMIS



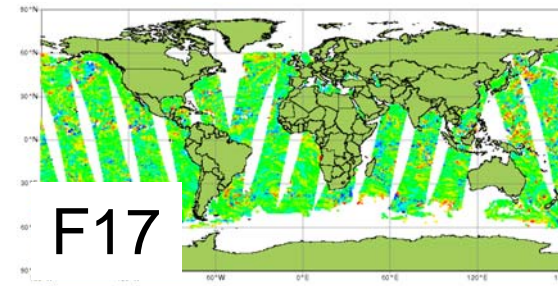
F13



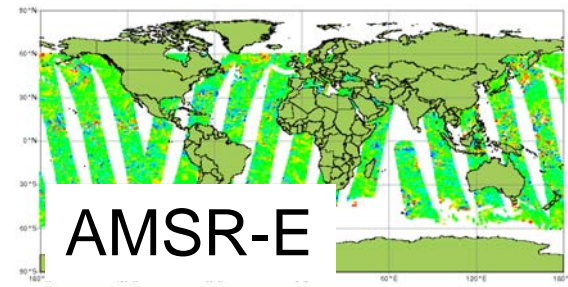
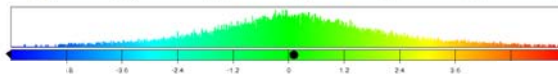
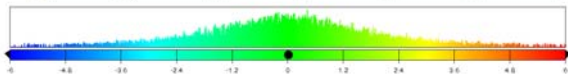
F16



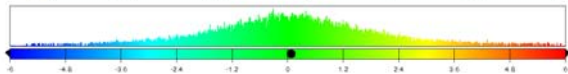
F15



F17



AMSR-E



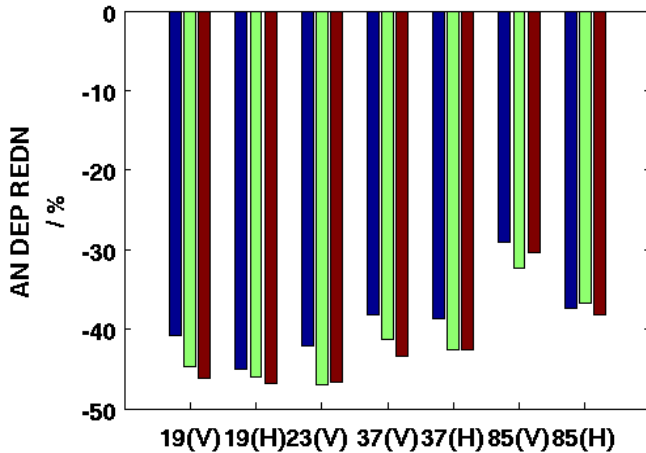
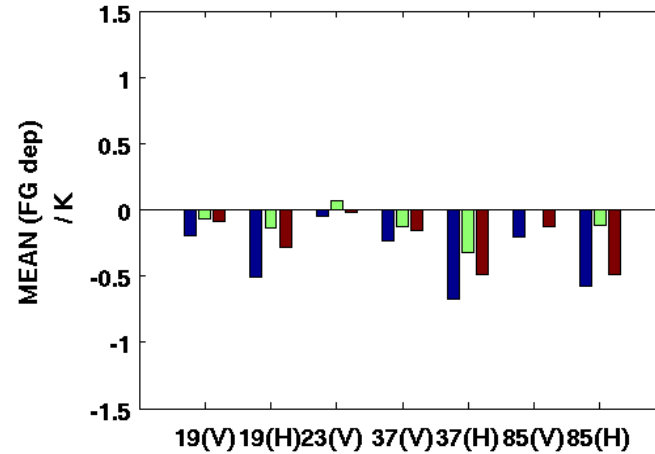
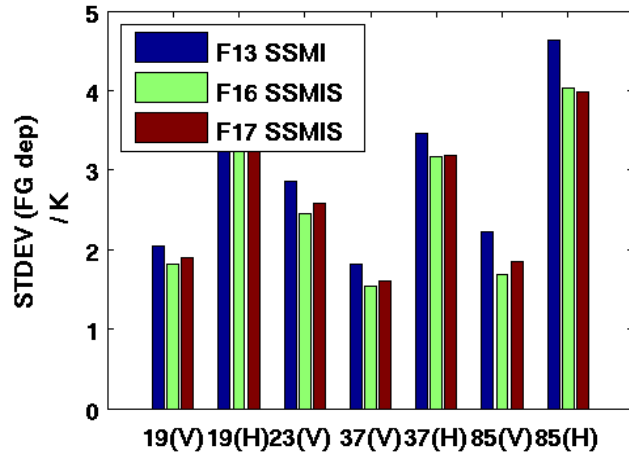
First Guess
departures for
19 GHz (V pol)
shown

-6K

6K

- Wider swath of SSMIS (1700km) compared to SSMI(1400 km) gives near complete coverage in a 12-hour assimilation window
- No obvious problems from initial inspection of FG departures

First Guess Departures



- Based on clear-sky processing 20-30th August 2009.

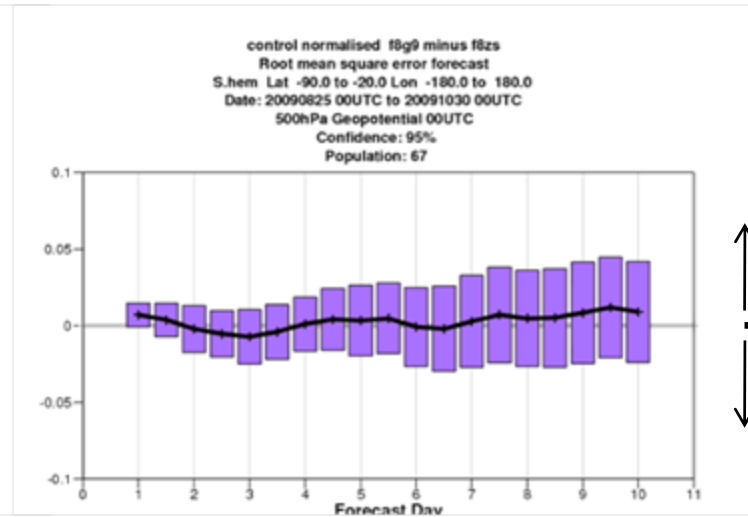
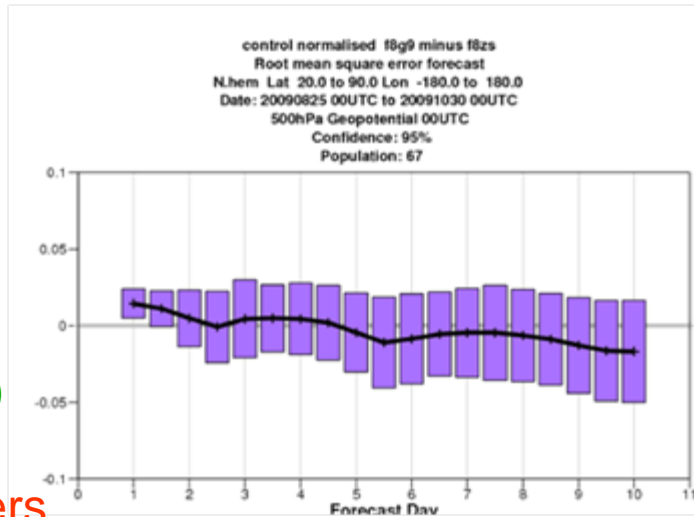
- F16 & F17 SSMIS data of similar quality to F13 in SSMI-like window channels.

Assimilation Experiments

- T799 CY36R3
- 19th August – 30th October 2009
- Three Experiments (full observing systems):
 - **No Imagers**
 - **All-Sky-New (includes F13 + F15 + AMSRE)**
 - All-Sky-New+ UPP F16 & F17 SSMIS

Scores : Z500 RMSE

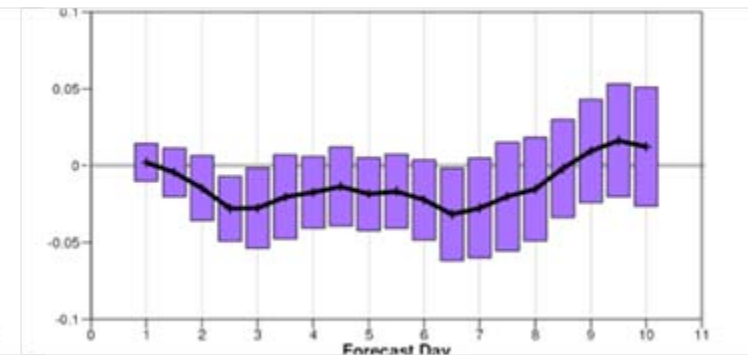
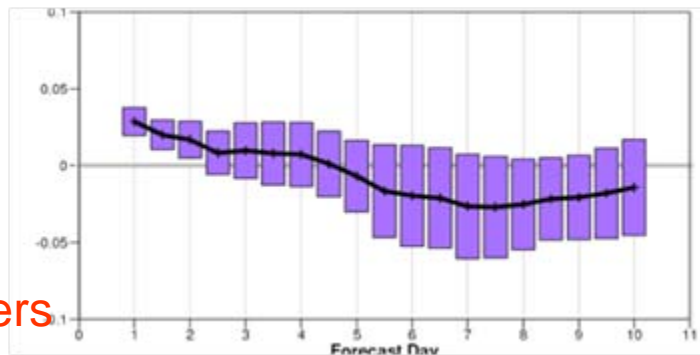
All-Sky
(SSMI+
AMSR-E)
against
No imagers



↑
Imagers
improve
forecast

↓
Imagers
degrade
forecast

All-Sky +
SSMIS
against
No imagers

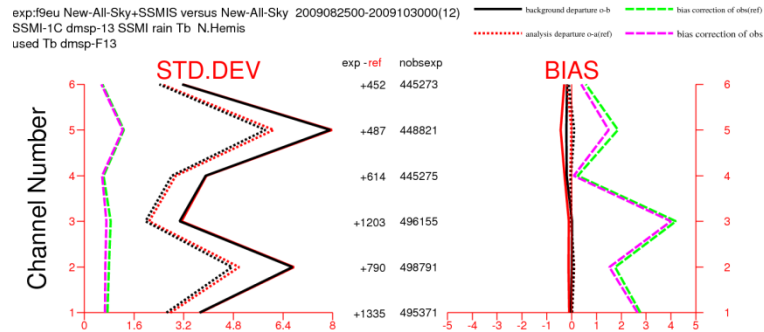


Northern Hemisphere

Southern Hemisphere

Improved FG fit to other MW Imagers

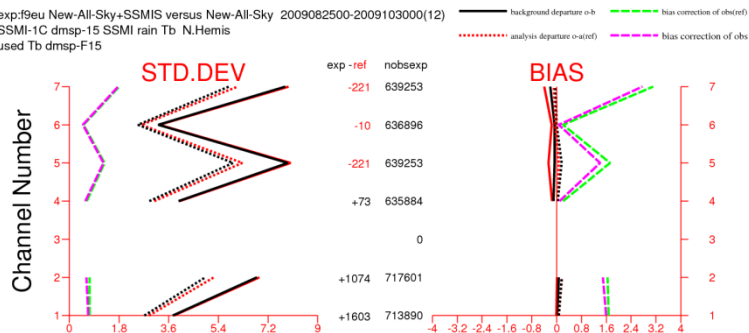
F13 SSMI



(Northern Hemisphere)

Orange line = 'New All-Sky' (includes SSMI & AMSR-E)

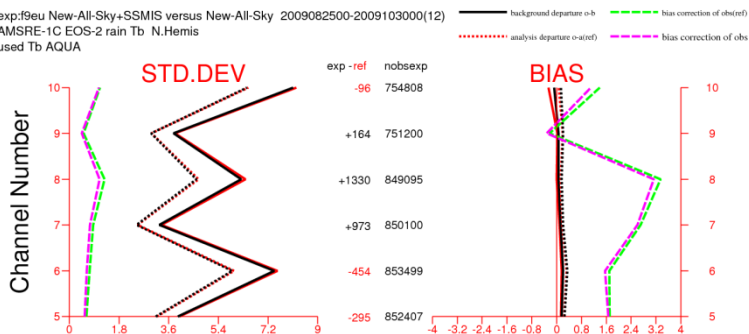
F15 SSMI



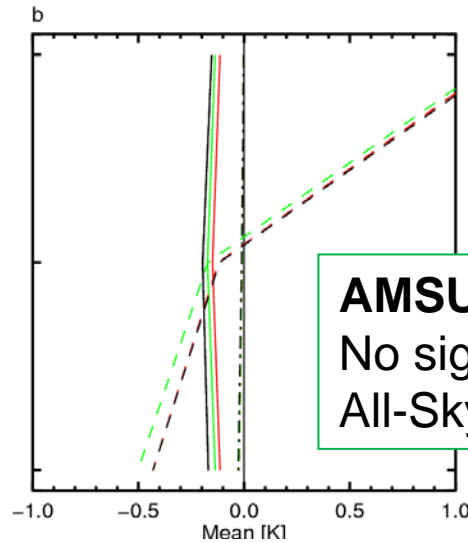
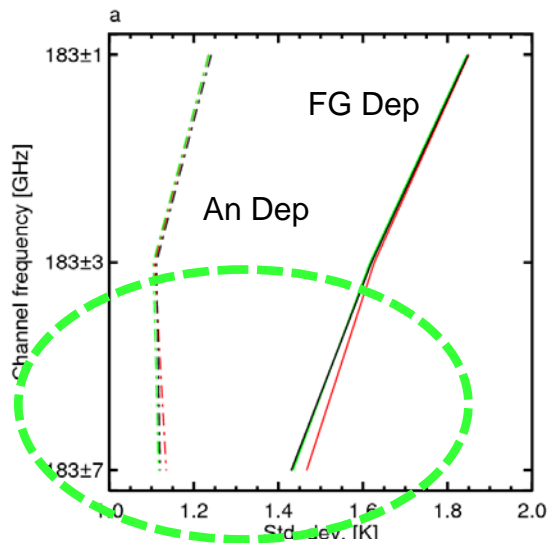
Black line = 'New All Sky' + SSMIS

(dotted = analysis departure
solid = FG departure)

AMSR-E



Improved FG fit to other observations



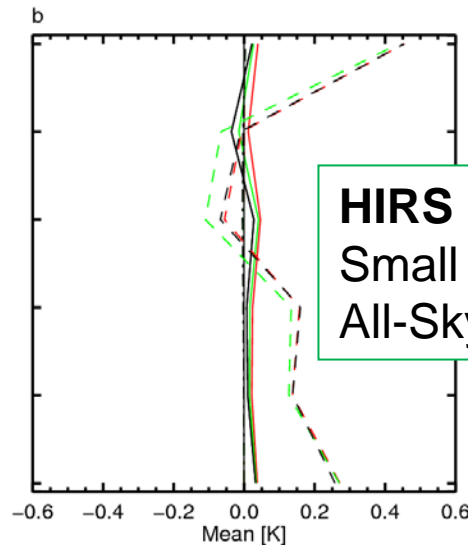
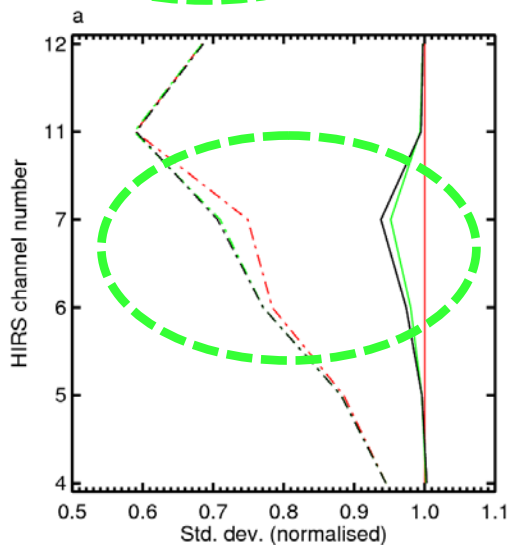
No imagers

All-Sky-New (SSMI + AMSRE)

All-Sky-New +SSMIS

AMSU-B / MHS

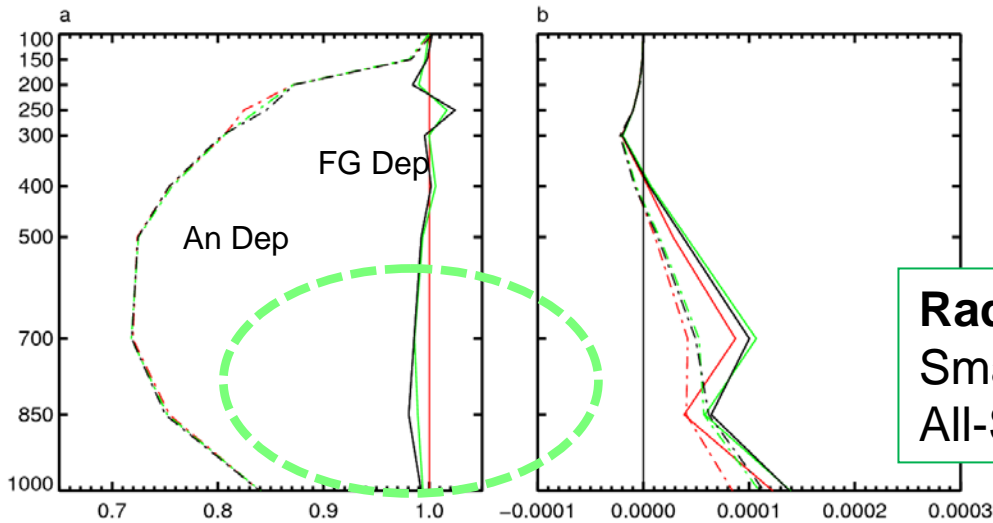
No significant improvement over
All-Sky-New (includes SSMI and AMSR-E)



HIRS

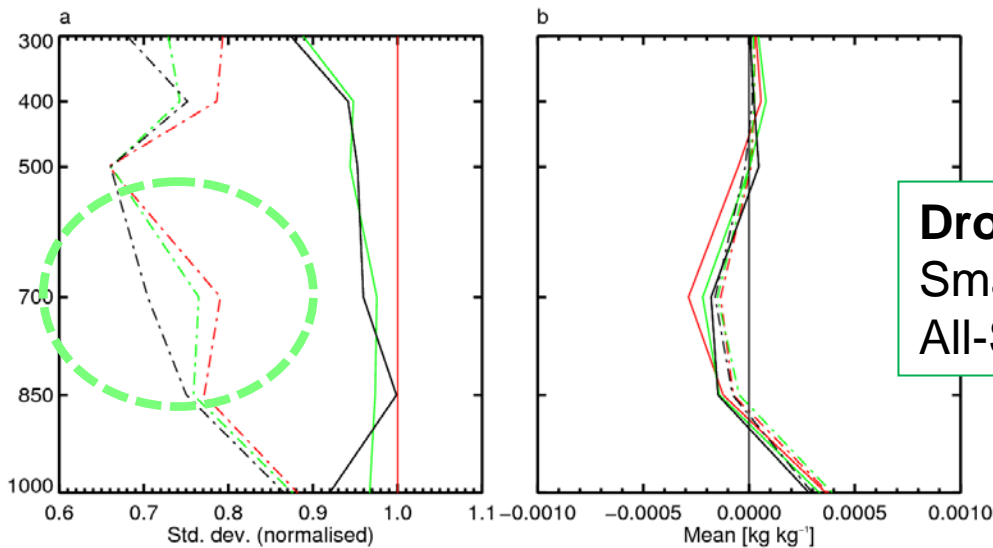
Small improvement over
All-Sky-New including SSMI and AMSR-E

Improved FG fit to other humidity sensitive observations



No imagers
 All-Sky-New (SSMI + AMSRE)
 All-Sky-New + SSMIS

Radiosondes
 Small improvement over
 All-Sky-New including SSMI and AMSR-E



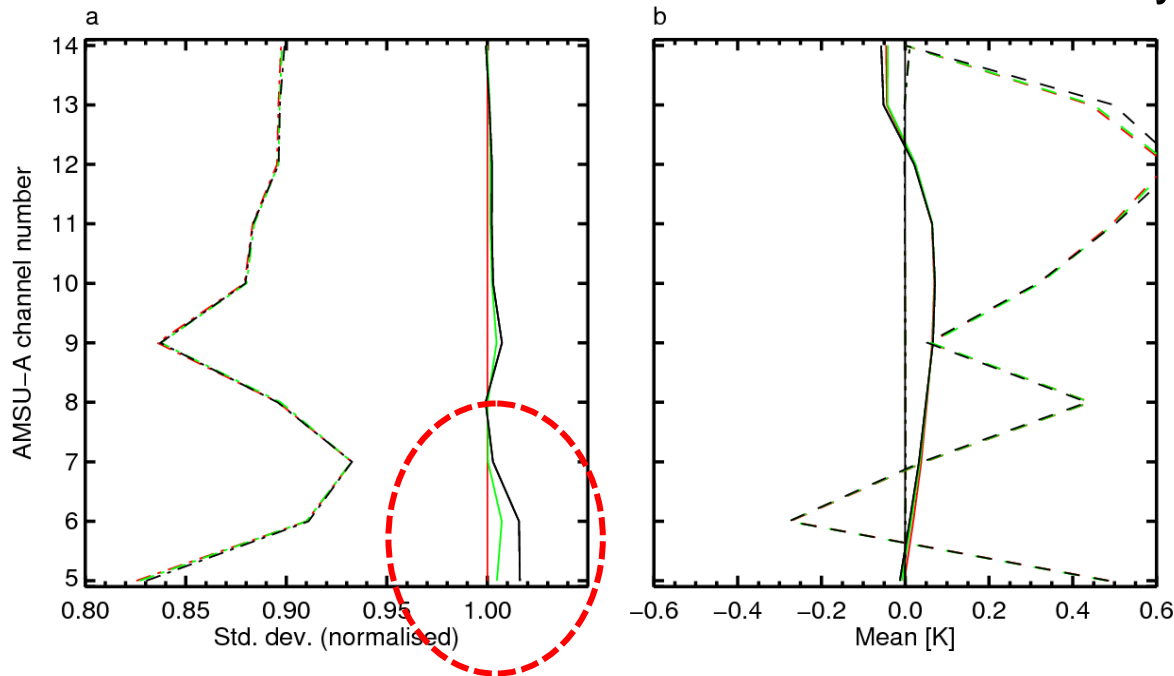
Drop sondes
 Small improvement over
 All-Sky-New including SSMI and AMSR-E

Degraded FG fit to AMSU-A

No imagers

All-Sky-New (SSMI + AMSRE)

All-Sky-New +SSMIS

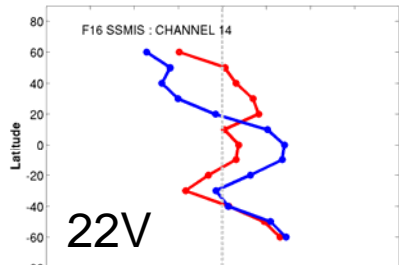
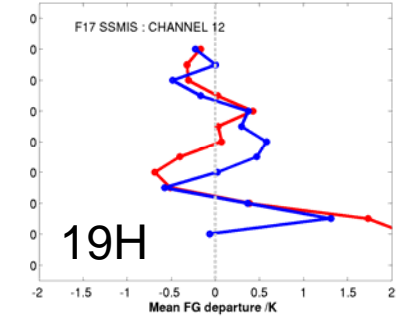
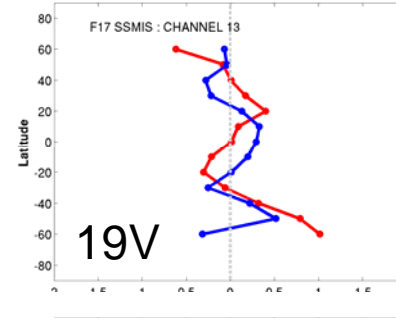
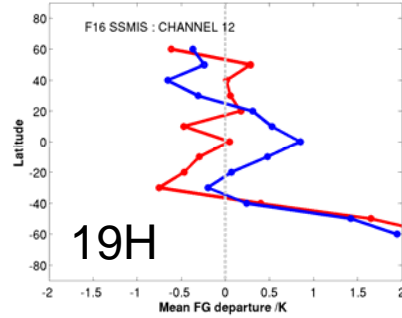
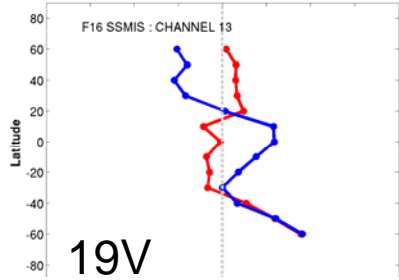


1.5 % degradation in FG fit to AMSU-A

Ascending / Descending Biases

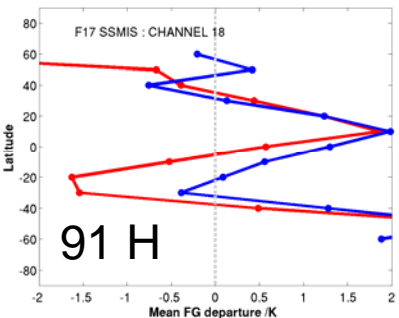
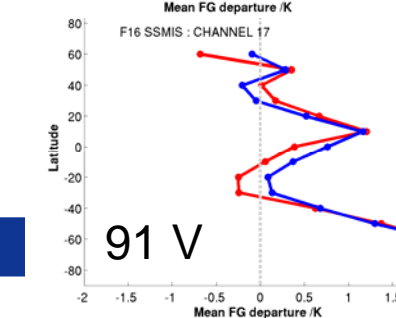
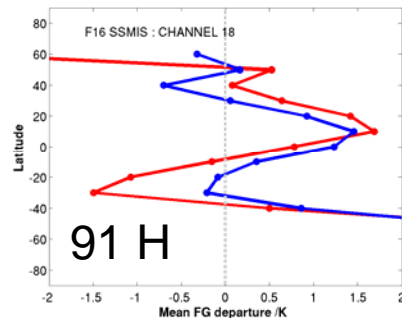
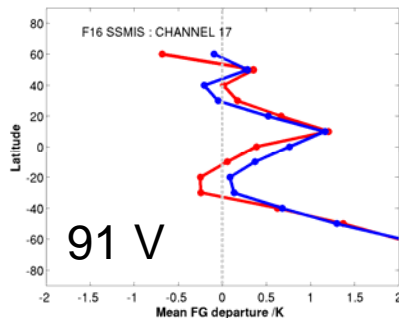
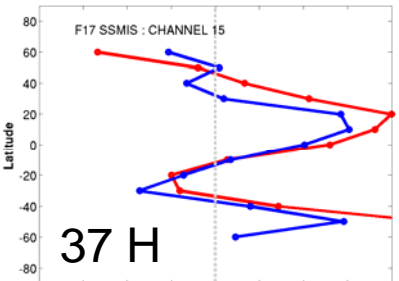
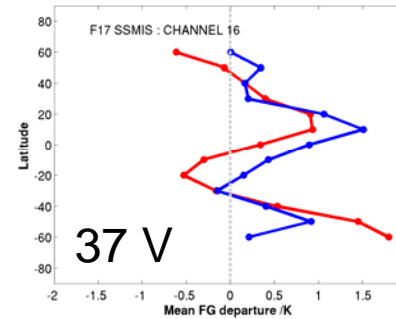
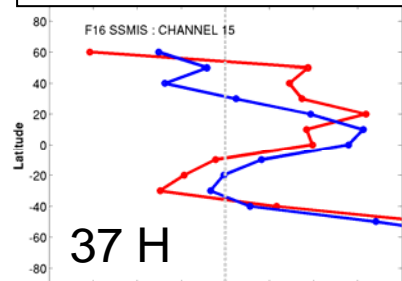
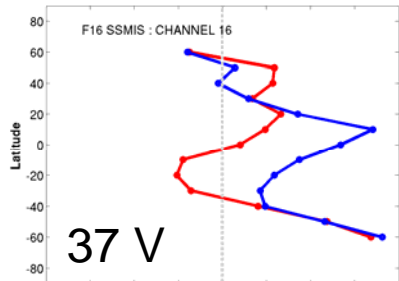
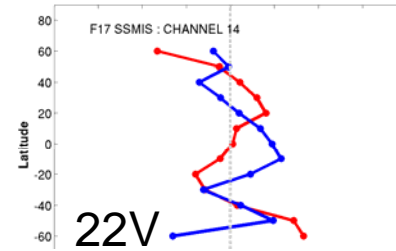
F16

F17



ASC / DESC

- Similar biases for SSMI & AMSR-E
- Model bias ?



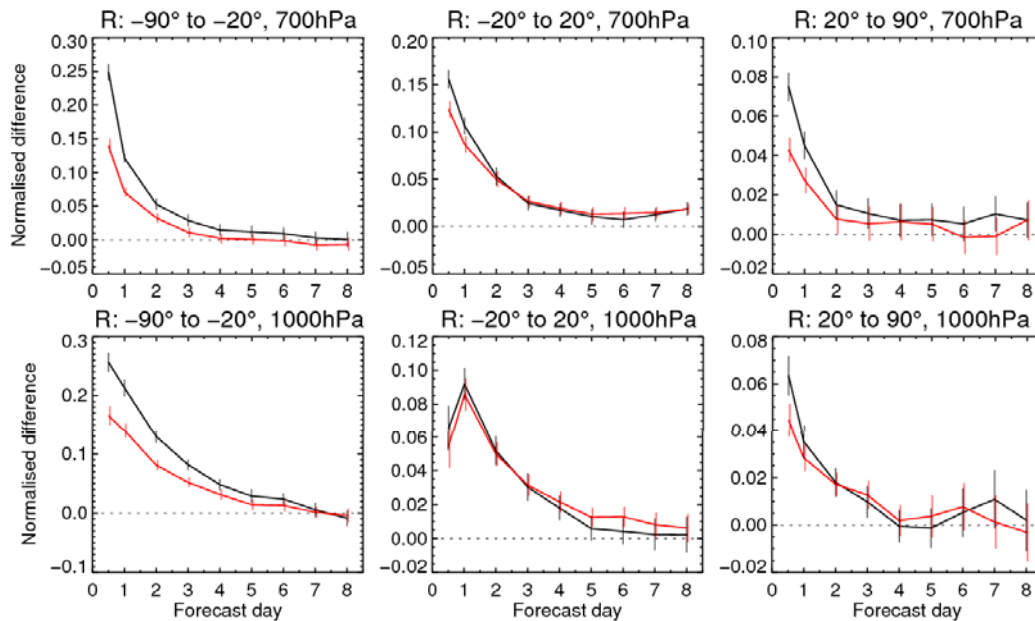
Summary and Plans

- **Operational stream of UPP SSMIS data for F16 and F17 established 19th August 2009. Plans are to monitor / assimilate, depending on further experiments, with upgrade to CY36R4 (summer 2010).**
- **No obvious signs of problems in FG departures. Data quality very similar to SSMI.**
- **Assimilation experiments show:**
 - Neutral / mixed results on Z scores.
 - Improved fits to other observations (HIRS, Sondes & Drop Sondes), as for All-Sky SSMI+AMSR-E.
 - Degradation to AMSU-A ch 5 & 6 FG fits is a concern.
- **Ascending / descending bias, also evident in SSMI/AMSR-E, is probably model related.**
- **SSMIS is set to become a key part of the ECMWF assimilation system.**

The End ...

Thanks !

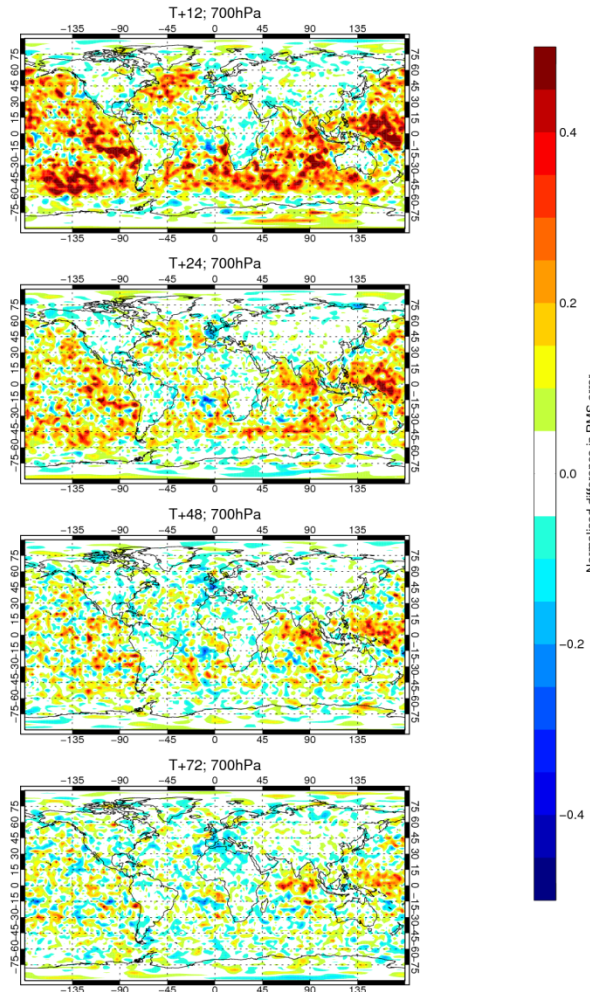




— f9eu - f8g9
 — f8zs - f8g9

RMS forecast errors in R (f8zs - f8g9) ; 25-Aug-2009 to 29-Oct-2009 from 59 to 66 samples.

Verified against own-analysis.



RMS forecast errors in R (f9eu - f8g9) ; 25-Aug-2009 to 29-Oct-2009 from 59 to 66 samples.

Verified against own-analysis.

