

NWP SAF Analysis Report

James Cotton, Oct 2017



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Feature 2.6. MSG positive bias over North Africa

What we know so far

- Large positive speed bias over North Africa and Arabian Peninsula during winter which affects MSG IR and visible channels.
- Largest in magnitude for IR channel, and more marked in HRVIS than VIS 0.8
- Follows location of faster mid-upper level winds/jets at different times of the year
- Mainly over land but does extend over sea in some months: W of Africa in DJF, and Med. in May.
- Linked to large HA errors when tracking cirrus/semi-transparent clouds (AR4) leading to fast winds assigned too low
- Related to mid-level investigations worse during daytime hours, better at night (AR3), possibly due to poor temporal resolution of ECMWF forecast data used in RTM?

Feature 2.6. MSG positive bias over North Africa

Example

- Meteosat-10 IR 10.8 AMVs extracted in December 2016
- QI2 > 80, pressure below 700 hPa height



Feature 2.6. MSG positive bias over North Africa

- Any better for OCA heights?
- Marginally



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^{See Met Office} Hovmoeller by Time of Day, IR

IR10.8, QI2 > 80, 0-40N, 20W-60E, over land (December 2016)

- Bias signal for data 1600-0500 UTC, between 600-800 hPa, but even more pronounced below 800 hPa height 1600-0000 UTC
- Increase in AMV speed
- Signal not related to QI filtering
- Plots spans 80 degrees of longitude and UTC doesn't reflect local (or solar) time.



^{∞ Met Office} Hovmoeller by Time of Day, IR

IR10.8, QI2 > 80, 0-40N, over land (December 2016)

Clearest signal is originating from the region 0-40E



^{See Met Office} Hovmoeller by LMT, IR

IR10.8, QI2 > 80, 0-40N, 20W-60E, over land (December 2016)

- Signal is better defined as we take account of local times.
- Bias onset is around 1700/1800 LMT and the worst of it ends around 0000 LMT, but continues to 0500 LMT at v.low heights

Local Mean Time (LMT) is the Mean Solar Time for a specific location on Earth. It is the same for all locations that share the same longitude. Add or subtract 4 mins for each degree of longitude (1440 mins in a day / 360 deg = 4 mins per deg)



^{See Met Office} Hovmoeller by Time of Day, Vis.

Visible, QI2 > 80, 0-40N, 20W-60E, over land (December 2016)

• HRVIS channel shows some signal in the last couple of hours.



^{Se Met Office} Impact of 3- vs 6- hourly forecasts

- Background forecasts of T1.5m for a grid point in Niger over the desert showing
- 3/6-hourly forecasts updated every 6 hours.
- Shows ~3-4K difference in the 1.5m temperature at 1500 UTC.







Data circled are generally assigned lower heights (e.g. below 350 hPa height) and have a positive bias compared to surrounding data



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At 18Z a new cluster of data appear (squared) with heights below 700hPa or 800 hPa and very large speed bias. In previous cycles the data are not extracted in this area – have checked this is not due to QI filtering.

Case Study – 06 Dec 2016 18Z

Meteosat-10, 18UTC RUN, 6 December 2016

IR10.8, QI2 > 80

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- 18 UTC
- Vectors show a cluster of winds with speeds greater than 35/40 m/s from the south west.



Case Study - 06 Dec 2016 18Z

IR10.8, QI2 > 80

- 18 UTC
- Best-fit pressures are less than 300 hPa and are generally well constrained.
- Ob minus best-fit pressure differences are >400 hPa.



IR10.8, QI2 > 80

- Example profile from AMV located in problem area extracted at 1730 UTC
- Bias +38 m/s
- Very dry profile until single moist layer around 170-260 hPa.
- AMV assigned 808 hPa, model best-fit pressure is well-constrained near top of moist layer at 190 hPa.



Sat 57 IR10.8 20161206 1730 UTC

Case Study – 06 Dec 2016 18Z

IR10.8, QI2 > 80

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- Example profile from AMV located 'near' at 1630 UTC
- Assigned much higher and closer to best-fit level
- Bias only +3 m/s



Sat 57 IR10.8 20161206 1630 UTC

0030, 0630, 1230, 1830 UTC

- IR imagery shows a line of cirrus cloud streaming north-eastward.
- In the hours around 12 UTC the surface has warmed (darker) and the thin transparent cloud is harder to detect.
- Assume the height of these clouds remains constant,
- Then measured radiance from these clouds has a larger contribution from the transmitted radiation from the surface.
- Could explain why the bias has a diurnal signal if AMVs cannot be extracted at these times.



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0030, 0630, 1230, <mark>1730</mark>, 2330 UTC

 Met Office MSG Cloud Top Temperature Product





1730 UTC

OCA Cloud Products – thanks to Pete Francis



- 0030, 0630, 1230, 1730, 2330 UTC
- OCA Cloud Top
 Pressure

