

FY-3 data usage at the Met Office

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Overview

Over the past 5 years, Met Office scientists instruments from the Feng Yun 3 and 4 set

FY-3B MWTS-1 and MWHS-1

FY-3C MWTS-2, MWHS-2, MWRI, and GNOS

FY-3D MWTS-2, MWHS-2, MWRI, HIRAS, and GNOST

FY-4A GIIRS



Data Usage



Assessment of FY-3D MWT/HS

MWTS

- Problem with the average of the instrument raw digital counts
- O-B within ±1 K to ATMS but noisier
- Scan-dependent bias
- Striping noise

MWHS

- Different calibration compare to FY-3C
- O-B at 183 GHz within ±2.6 K to ATMS
- Striping noise



Combined assimilation of MWTS-2 and MWHS-2 channels yields a 0.1% reduction in RMSE (against MO analyses).

RMSE difference against control

NH_PMSL											ŀ					an
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				•												an
																an
		•		•												an
NH_1250																an
														1		an
														1.		an
		•		•	•							•				an
NH_2250																an
NH_2500														÷.,		an
NH_2850											÷	÷	÷	1.		an
TR_W250					. ·	. · ·	•									an
TR_W500		1.1														an
TR_W850		1.1							•							an
IR_WIOm			•	•	•								•			an
TR_1250																an
TR_T500			•		•					•	•					an
TR_T850			•			•	•			•						an
TR_T_2m			•		•											an
SH_PMSL				•								11	11	11		an
SH_W250		•														an
SH_W500		•	•													an
SH_W850		•														an
SH_W10m																an
SH_T250																an
SH_T500																an
SH_T850																an
SH_T_2m														۳		an
SH_Z250																an
SH_Z500																an
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Assessment of FY-3D MWRI



The assimilation of MWRI (FY-3D) along with the instrument on FY-3C yields a neutral change in RMSE (against EC analyses).

Reduced global bias (stdv) compared to MWRI FY-3C

- Low biased compared to GMI
- Ascending-descending bias reduced to <0.2K

RMSE difference against control



Assessment of FY-3D HIRAS



- O-B FSR with ±2.6 K ($1\sigma \le 2K$) where the confidence in the model is largest.
- O-B NSR within ±0.1 K of those of CrIS but 0.2 K noisier.
- Sunlight contamination of detector 3 calibration towards the end of the descending node.

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NH_W250			۷	*	۷		*	٠	۷	٠	*	٠	۷	۲		ar
NH_W500			۷	•	+	•			+	٠	+	٠	٠	+		ar
VH_W850				÷	•	•	٠	٠	۳	٠	٠	٠	٠	٠		ar
IH_W10m		٠	٠		•	•	٠	٠	٠	٠	٠	٠	٠	•		ar
NH_T250			•	۷	۳	٠	•		٠	•	•	•				ar
NH_T500			•	۷		•			۷	٠	٠	٠	•	•		ar
NH_T850							•	•	•	•	٠	•	•	•		ar
NH_T_2m									٠	•	•					ar
NH_Z250			▼	•	•	۷	•	•	۷	٠	٠	۲	٠	•		ar
NH_Z500						•	•		۳	٠	•	٠	۲	٠		ar
NH_Z850			•	•			۲	•	۲	•	•	۲	•	•		ar
TR_W250			۷	۷	۳	٠								٠		ar
TR_W500			•	•	۳	٠	1	1	٠.		1	1				ar
TR_W850			•	1		1	1		1	•	1	۳	۳	۷		ar
R_W10m		۳	•	•			1					1	•	•		ar
TR_T250			•	۷	÷.,				۸	۵		+	•			ar
TR_T500				۷	۳	1	۷	•	۷	•	•	۷	•	٠.		ar
TR_T850			1	*	÷	1	٧	۷	٣	•	۷	•	•	1		ar
TR_T_2m			•							•		•				ar
SH_W250				•	۳	۷	•	~	V	▼	•	•	۲	▼		ar
SH_W500				▼	•	•	•	~	V	▼	▼	V	~	۲		ar
SH_W850			•	7	۷	۷		•	V	▼		▼	▼	•		ar
H_W10m		۷				•		▼	V		•	V		•		ar
SH_T250				▼	V	V	V	▼	V		▼	•	•	•		ar
SH_T500			V	V	▼	V		~	V		▼	V		•		ar
SH_T850				*		٠	*	٣	v	•	Υ.	۲.	▼	٠.		ar
SH_T_2m											•		•	•		ar
SH_Z250				V	~	V	V	▼	V		▼	V	▼	۲		ar
SH_Z500			V		•	V			V		V	V	V	•		ar
SH_Z850			۷	۷	1	۷	▼	▼	V	▼	▼	▼	V	▼		ar
c H	0+1	T+6	T+12	T+24	T+36	T+48	T+60	T+72	T+84	T+96	+108	+120	+132	+144	+168	

RMSE difference against control

Assimilation of detector 4 over ocean yields negative results but the channel selection is sub-optimal.

Assessment of FY-3D GNOS



- Data generally unbiased and comparable to • other satellites.
- Bias in setting occultations above 45km due to ٠ local multipath - CMA working on correction.
- Increase in RMS at 25km due to change in ٠ smoothing (less correlation, larger RMS).

0.19% reduction in RMSE when assimilating GNOS data from FY-3D (measured against ECMWF analyses), setting data above 40km excluded.

RMSE	diff	ere	enc	e a	gai	nst	CO	ntrol
NH W50								anl
NH_W100								anl
NH W250								anl
NH_W500		•						anl
NH_W850								anl
NH_W10m								anl
NH_T50		<u>ه</u>			• •			anl
NH_T100		Δ Δ	A A		• •			anl
NH_1250		• •						ani
NH_1500		: 11						ani
		• •						ani
								ani
NH-2500								ani
NH_2850							÷÷++	anl
TR W50							11	anl
TR W100								ani
TR ⁻ W250							•	ani
TR ⁻ W500								anl
TR ⁻ W850								anl
TR_W10m								anl
TR_T50		A A						anl
TR_T100						• • •		anl
TR_1250		• •						anl
TR_1500		• •				• • • • •		ani
TR 1850								ani
								ani
		• •	* *	• •	* * * *		1. * -	ani
SH_W250		•						ani
SH_W500							÷	anl
SH_W850								ani
SH W10m								ani
SH T50	1000	A A						ani
SH T 100		Δ Δ	A A	A A				anl
SH_T250		A A						anl
SH_T500								anl
SH_T850		•						anl
SH_T_2m	1.1						1.4	anl
SH_Z250		• •			1 e e			anl
SH_2500						ti e i e		ani
SH_2850				1.1			1.4.1	ani
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Future Plans

- FY-3D microwave (and GNSS) instruments should be assimilated in operation by summer 2020.
- Channel selection for FY-3D HIRAS (Q4 2019 Q1 2020) and new assimilation experiments.
- Implement FY-4A GIIRS processing capability (Q4 2019 Q1 2020) and assimilation experiments.
- MWHS-2 118 GHz in all-sky data assimilation (Q2-Q3 2020).



Questions?

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