Presented by

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Prepared by

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HAIC-HIWC Science Team Meeting 11/11/2015 - Melbourne

Cayenne ROBUST dataset

HAIC – High Altitude Ice Crystals
Content

- Data quality
- Calibration
- Results: to be produced

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HAIC – High Altitude Ice Crystals
Data quality

- ROBUST data processing started recently: As expected no more power oscillation problem due to strict separation of CDP and ROBUST probe power supply

- Awaiting final statement on F20 TAT (status: dry power regression with TAT as is!)

- Robust data are ‘slightly’ corrupted= (incomplete 10 Hz data lines, pb. data communication…). Corrupted lines filtered.

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HAIC – High Altitude Ice Crystals
Calibration

- Dry power calibration is performed for each flight using CDP concentrations close to 0.
- Ficture correction is set to 0.97 (reprocessed also for Darwin data)
- Efficency collection is set to 0.4 for TWC calculation

As for Darwin: Dry convective heat loss computation.

During many flights, the regression curve for the dry power term shows a systematic evolution of the slope with flight time.

This is possibly due to the decrease of the A/C mass (fuel consumption) and it's impact on the balance of the A/C, including flow field around aircraft

Assumption : for the same TAS, the airflow under the wing is slower when the A/C is lighter: Consequently the dry power term decreases slightly with flight time.

As for Darwin: Dry convective heat loss computation

A. Commonly used regression formula for dry power calculation of Robust probe:

$$\log (P_{dry}/(T_f-T_a)) = a + b*\log(p.V/T_f)$$

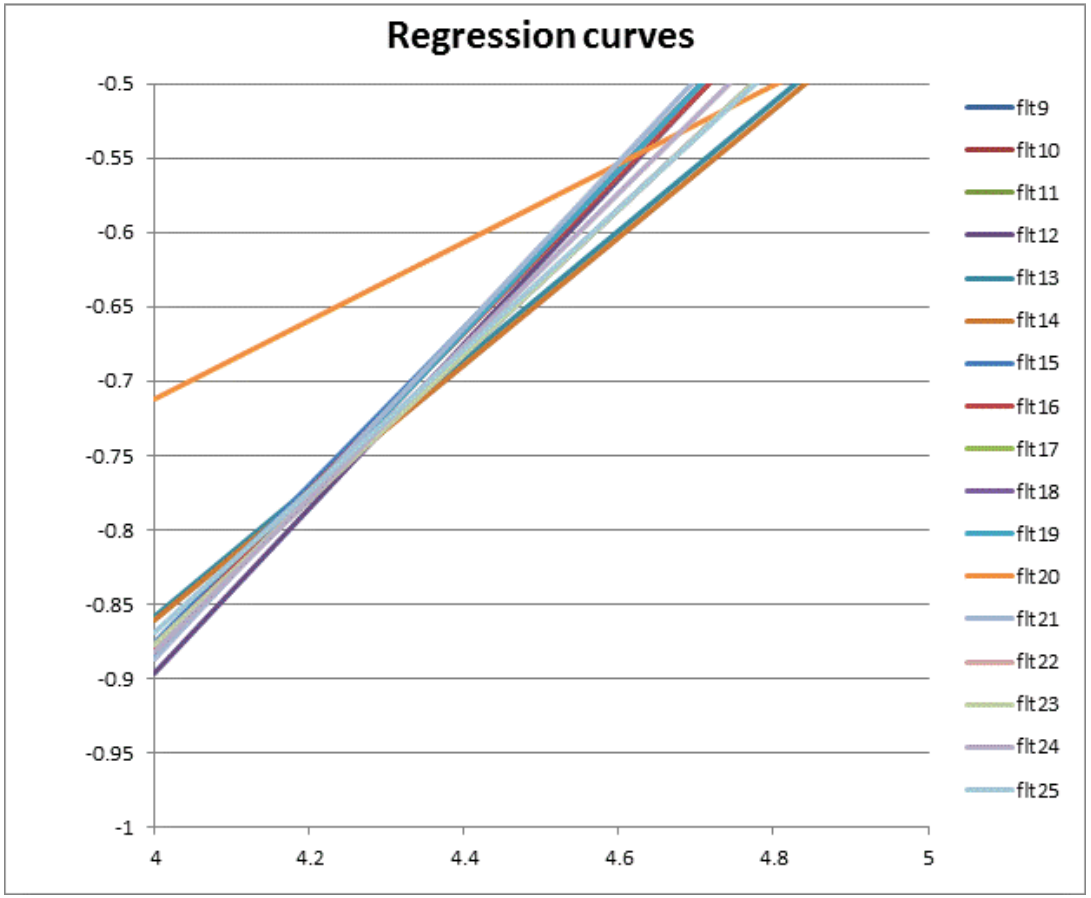
B. Replace above regression equation by:

$$\log (P_{dry}/(T_f-T_a)) = a + b*\log(p.V.\ f(t)/T_f)$$

where f(t) is a function of flight time

$$f(t) = 1- K.\ time\_from\_departure$$

HAIC – High Altitude Ice Crystals
Calibration



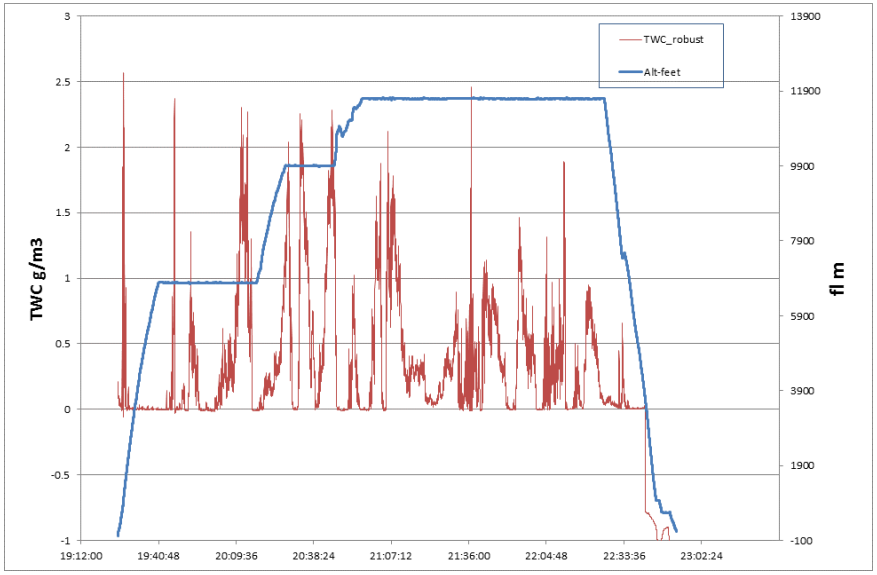
Flight 20???

- The regression curves are consistent except for flight 20 which shows a different behaviour. The differences observed in the slope are due to different selection of the dry air data
- Flight 20 to be further investigated (de-icing issue on the robust probe?)
- Confidence in the observed TWC is reduced

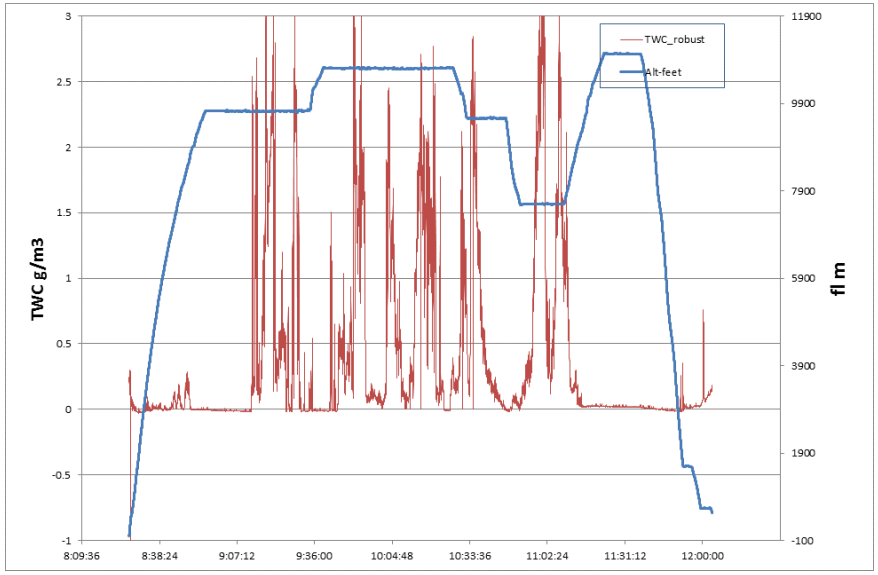
HAIC – High Altitude Ice Crystals
Calibration

Dry regression application and subsequent TWC calculation: example flights 24 & 25

Flt25 28/05/2015



Flt 24 27/05/2015



Next: Correlation with IKP: Check for time synchronisation with IKP: flight 26?

Rest of ROBUST probe dataset consistent with IKP time.

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HAIC – High Altitude Ice Crystals
Results

DARWIN dataset:

ROBUST to IKP correlation and linear regression shows average efficiencies of

	ikp=slope*robust+intecept			ikp=slope*robust+0	
flight	intercept	slope	Raw robust / IKP	slope	Raw robust / IKP
1	0.00078356	0.606570341	0.66	0.613002864	0.65
2	-0.01431681	0.83094348	0.48	0.812526961	0.49
3	0.00100736	0.736980563	0.54	0.738612431	0.54
4	-0.03663418	0.882492836	0.45	0.836216338	0.48
6	-0.03066837	1.01976762	0.39	0.997924	0.40
7	0.00856823	0.858561942	0.47	0.868835331	0.46
8	-0.05690905	0.949293926	0.42	0.900494601	0.44
9	-0.00407414	0.912145392	0.44	0.907071795	0.44
10	-0.01355622	1.041748436	0.38	1.032639316	0.39
11	0.00788174	0.933632945	0.43	0.945525802	0.42
12	-0.06661835	1.053146336	0.38	1.004665681	0.40
13	-0.07444301	1.079475126	0.37	1.036266659	0.39
14	-0.01194585	0.777255208	0.51	0.7653646	0.52
15	0.01654766	0.793892086	0.50	1.033344522	0.39
16	-0.03761927	1.015174659	0.39	0.988163343	0.40
17	-0.00206485	0.763321495	0.52	0.75888148	0.53
18	-0.01025714	0.891104811	0.45	0.881915249	0.45
19	-0.01122168	0.845774257	0.47	0.833434619	0.48
20	-0.01119525	0.880604324	0.45	0.858630711	0.47
21	0.00323712	1.01317834	0.39	1.03902218	0.38
22	0.01016063	0.96103859	0.42	0.970672162	0.41
23	0.01924604	1.00387813	0.40	1.022668563	0.39

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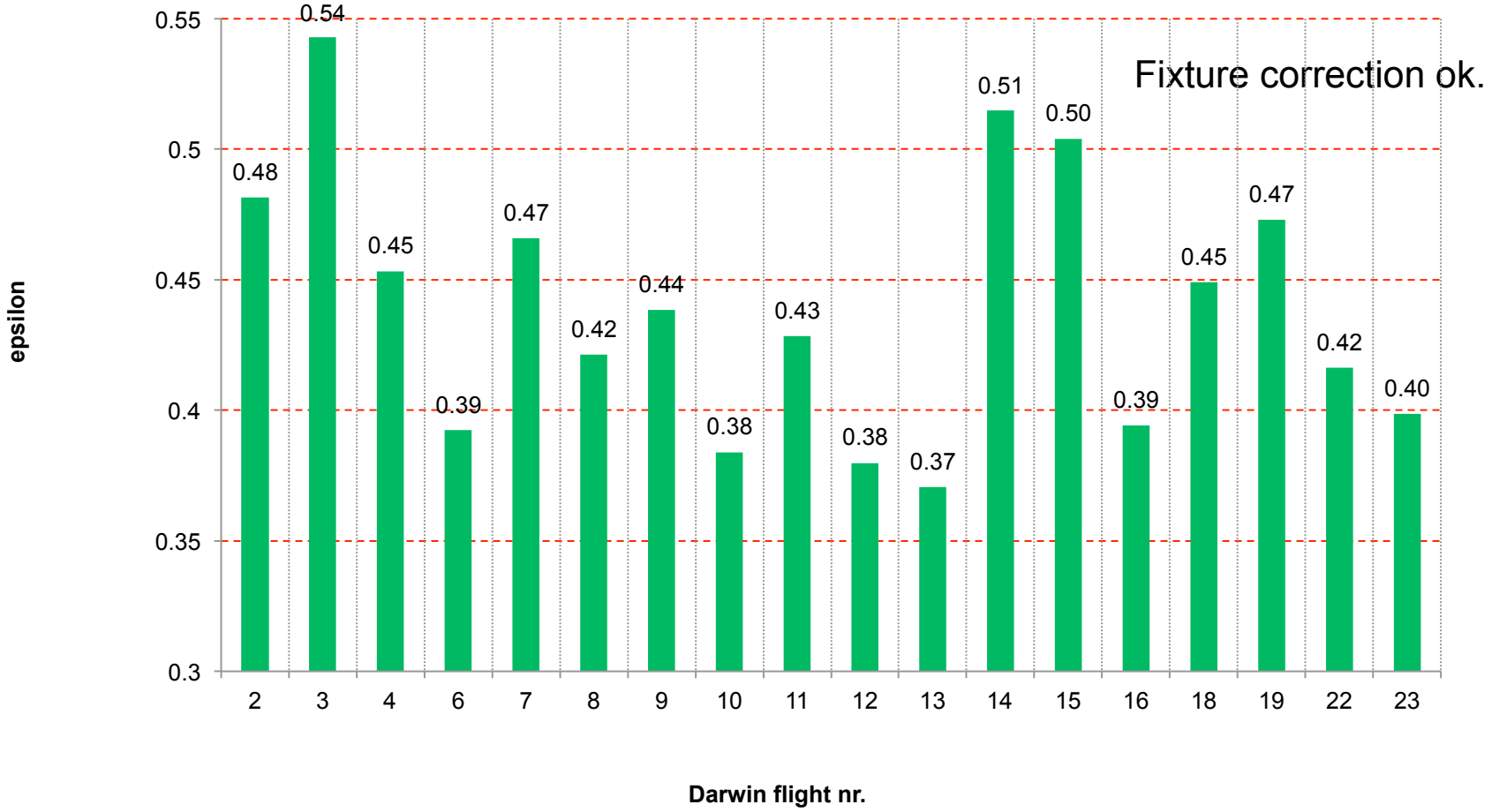

HAIC – High Altitude Ice Crystals
Results

CAYENNE dataset:

ROBUST to IKP correlation and linear regression shows average efficiencies of:

	ikp=slope*robust+intecept			ikp=slope*robust+0	
flight	intercept	slope	Raw robust / IKP	slope	Raw robust / IKP
10	0.03497739	0.78363399	0.51	0.817587132	0.49
11	0.02190001	0.77649562	0.52	0.808434073	0.49
12	0.00037637	0.81060953	0.49	0.811882871	0.49
13	-0.01486269	0.95979699	0.42	0.951392978	0.42
14	0.00565558	0.93021431	0.43	0.934822182	0.43
15	0.00844251	0.9732416	0.41	0.979926666	0.41
16	0.02150992	0.86127896	0.46	0.886284506	0.45
17	0.02162698	0.77022826	0.52	0.792383775	0.50
18	0.01928883	0.90564312	0.44	0.918690533	0.44
19	-0.0197971	1.00207745	0.40	0.988699237	0.40
20	-0.04711097	0.99775249	0.40	0.967972815	0.41
21	0.0444231	0.76700034	0.52	0.803074553	0.50
22	-0.08106219	0.99319435	0.40	0.938206659	0.43
23	-0.02541937	0.96196022	0.42	0.94577477	0.42
24	0.02047979	0.89953409	0.44	0.912275602	0.44
25	0.03193444	0.8181335	0.49	0.850310195	0.47
26	0.03663749	1.02790161	0.39	1.051912695	0.38

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CAYENNE dataset:
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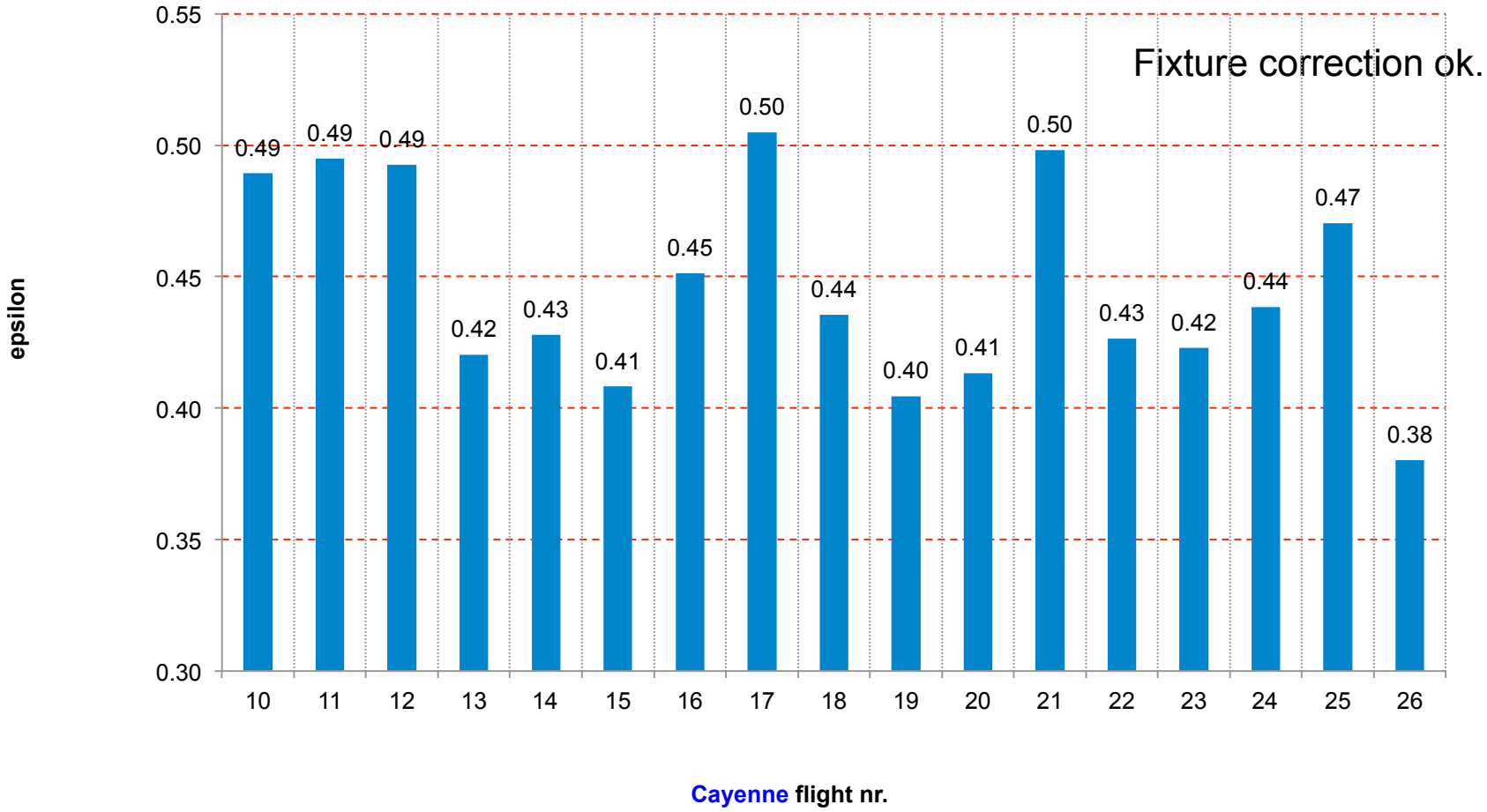

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Results

- Some more checks needed:
  - TAT in F20 data
  - Time synchronisation with IKP
  - Flight 20 regression curve issue

- Calibration (removal of the dry term): Local calibration (i.e. for each flight), select zero CDP concentration cases carefully!

- Error in ‘Fixture Correction’ applied (also Darwin dataset concerned)

- Produce and release the final data set (Airbus & CNRS)

- Publication: Use both datasets – discuss who and when…

High Altitude Ice Crystals (HAIC, 314314)

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