

Presented by

Prepared by

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# HAIC/HIWC Science Team Meeting

HAIC/HIWC Status of datasets – SAFIRE dataset

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# What was recorded ?

## Digital output from instruments

- GPS/Inertial navigation system (Novatel + AIRINS)
- Dew-point hygrometers 1011-C, CR2
- WVSS-II
- ADC (TAS, T, Z)
- Rosemount ICE detector

## Analog output from instruments

- P,  $\Delta P$
- T (2 sensors)
- Thin-film Humidity

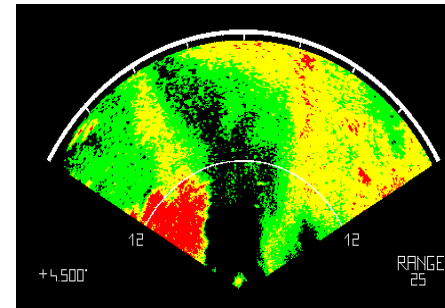
## Images

### Cockpit



→ T. Ratvasky

### Pilot's WX radar



→ S. Harrah

# Delivered files

## **Just after flight:**

- .Quick-looks plots
- .Flight reports
- .Copy of raw measurements of non-SAFIRE instruments
- .Data file of « safe » parameters

## **A few days after each flight:**

- .General purpose 1 Hz files, containing usual meteorological parameters (NASA-AMES format).
- .« Fast » (5Hz) angles and RICE

## **Currently available :**

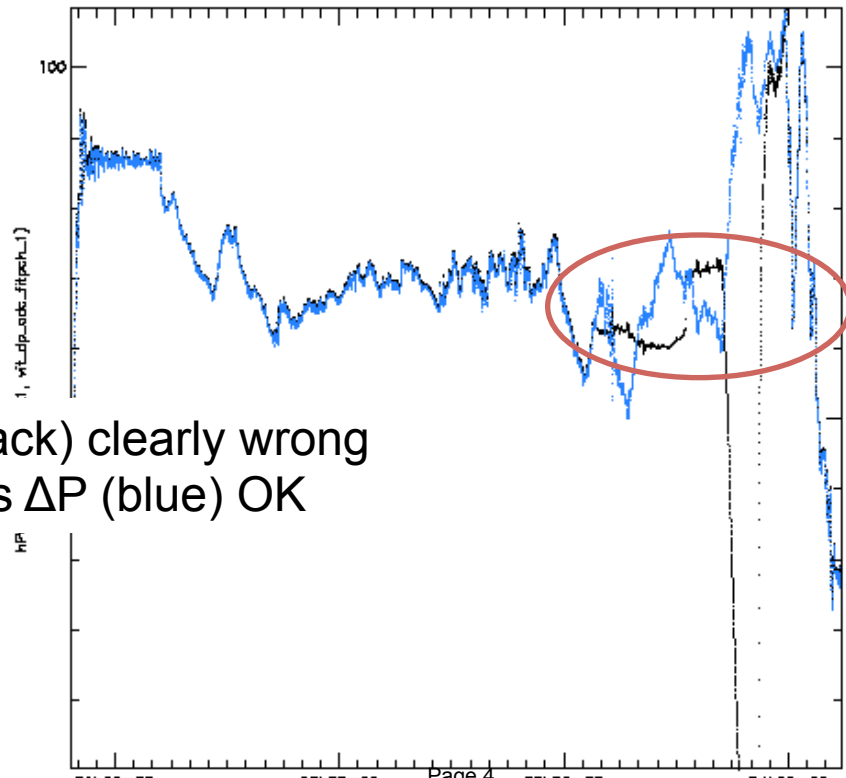
- .Version 4 of general purpose 1 Hz files, since November 2015

# The boom “problem”

Not-so rare problems on dynamical pressure measurements on the boom.

Avionics (« ADC ») measurements provide a robust back-up

Probable cause : Ice accretion.  
isn't it precisely the point of HAIC ?

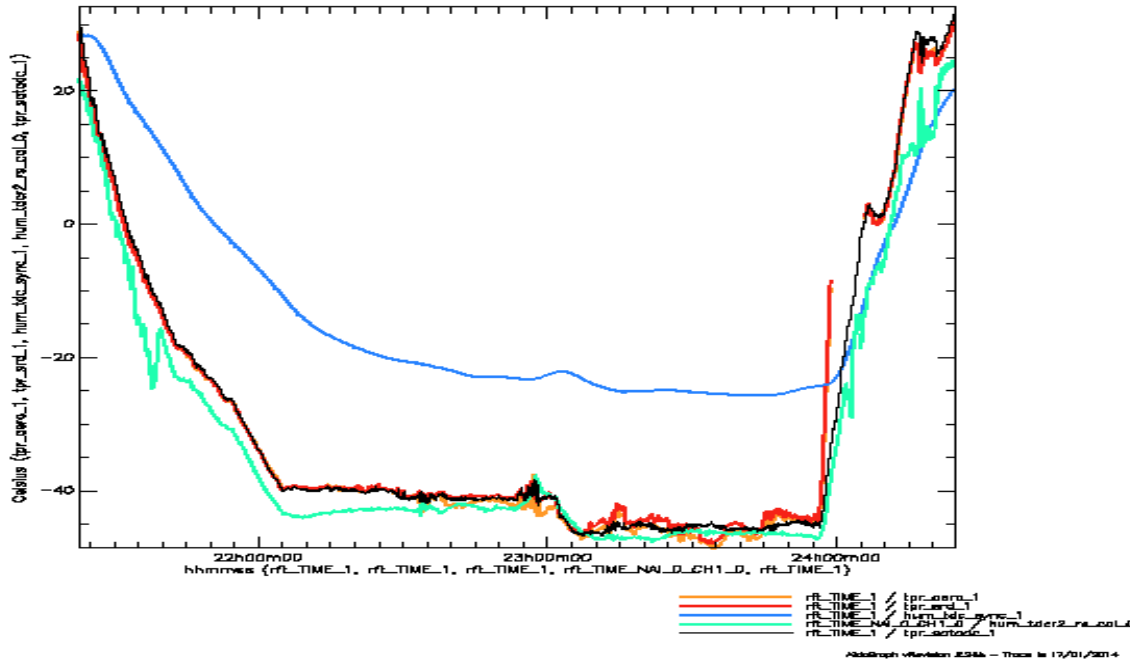
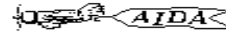


Boom  $\Delta P$  (black) clearly wrong  
while avionics  $\Delta P$  (blue) OK

# Hygrometers

The first dataset contained only the 1011-C. Bad luck !  
 Current version includes CR2 (better, but not perfect) and WVSS-II

Campagne HAIC  
 Vol FALCON fs140002 du 16/01/2014  
 de 21h22m51 à 00h24m39 UTC le lendemain



F20		Mesures		
Date	N°	Td_c analo	Td_c RS	CR2
jeu 16/01	1	=RS	Orange	Green
	2		Red	Green
ven 17/01	3		Red	Green
sam 18/01	4	=RS	Orange	Green
mar 21/01	5		White	Green
jeu 23/01	6		Orange	Green
ven 24/01	7		White	Green
lun 27/01	8	=RS	Orange	Red
mar 28/01	9		Red	Red
mer 29/01	10		Orange	Red
jeu 30/01	11		Red	Yellow
dim 02/02	12		Orange	Yellow
lun 03/02	13		Orange	Yellow
mar 04/02	14		Orange	Green
mer 05/02	15		Red	Green
ven 07/02	16		Orange	Green
sam 08/02	17		Red	Green
sam 08/02	18		Orange	Green
dim 09/02	19		Orange	Green
lun 10/02	20		White	Green
lun 17/02	21		White	Yellow
lun 17/02	22		Red	Red

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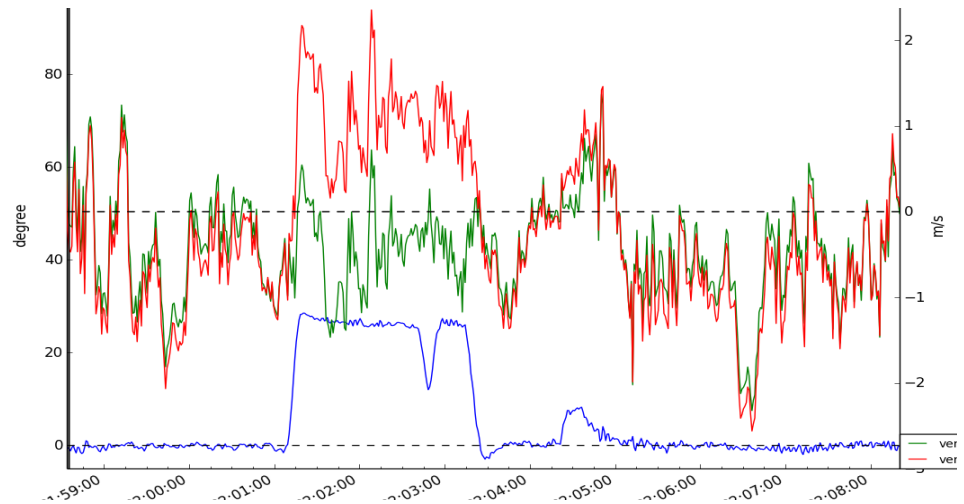


# Wind - 2014

Wind computation depends on semi-empirical laws (pressure  $\rightarrow$  speed, angles) and empirical small offset correction.

Values used in early 2014 are the sum-up of additional correction : (approx.) OK in straight legs, BAD during turns. This has been cleaned-up, better values were available at the end of 2014.

End-of-2014 version (green)  
doesn't bump during turns



# Wind - 2015

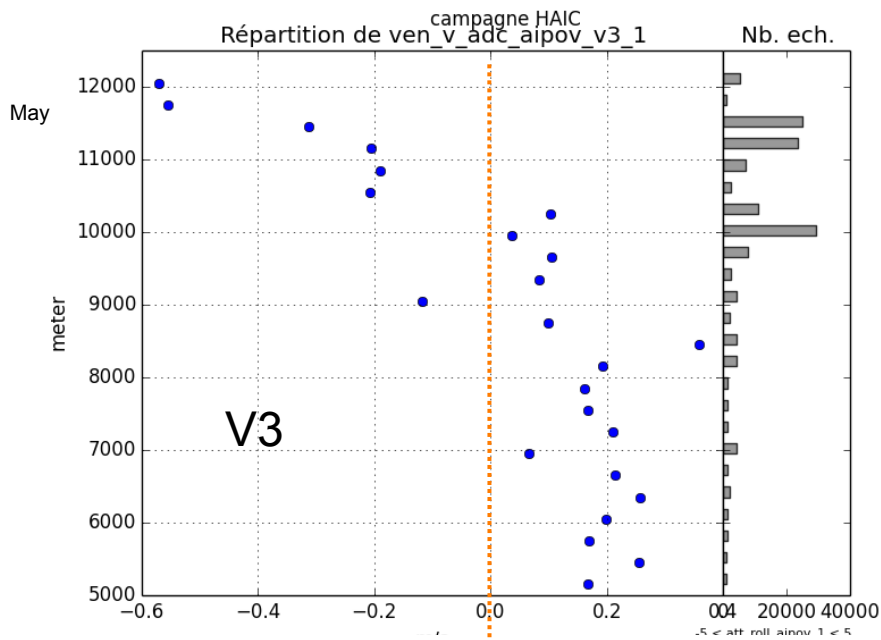
Next problem : bias in vertical component, correlated to altitude (feedback from A. Protat and J. Delanoë).

A corrected version of the calibration of the angle of attack allowed to :

- .divide by 2 the mean vertical wind,
- .greatly reduce the correlation of the wind with the angle of attack.

Applies to both campaigns (Darwin-2014 & Cayenne-2015)

Results available in version 4 of the dataset (nov. 215)

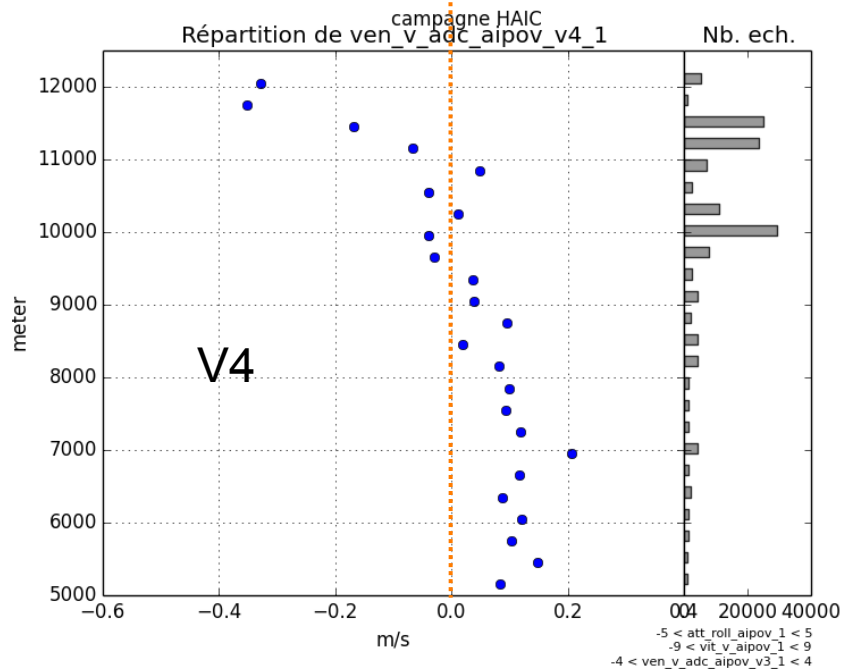


Median of vertical wind conditioned to altitudes (slices of 300m).

All flights of the 2014 campaign, except turns ( $|\text{roll}| < 5^\circ$ )

Impact of new calibration :

- More samples close to 0
- Global spread divided by 2



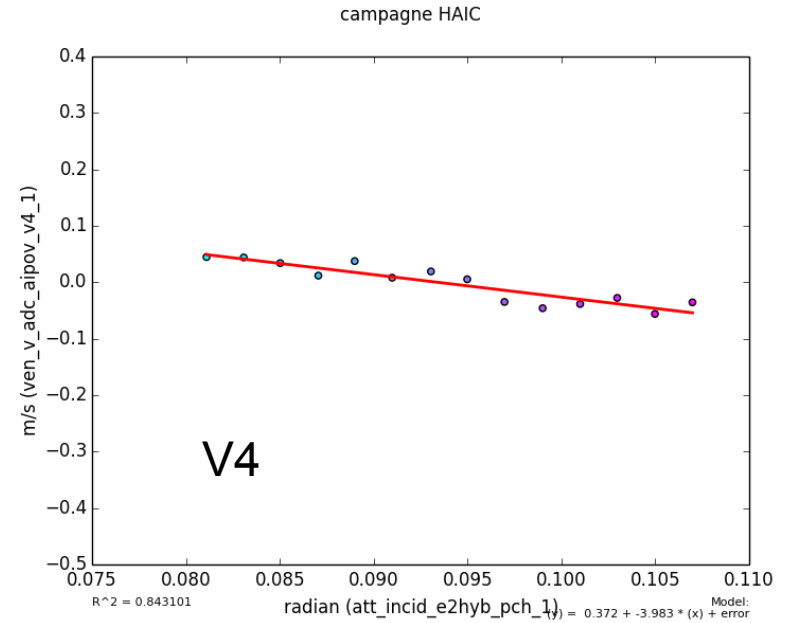
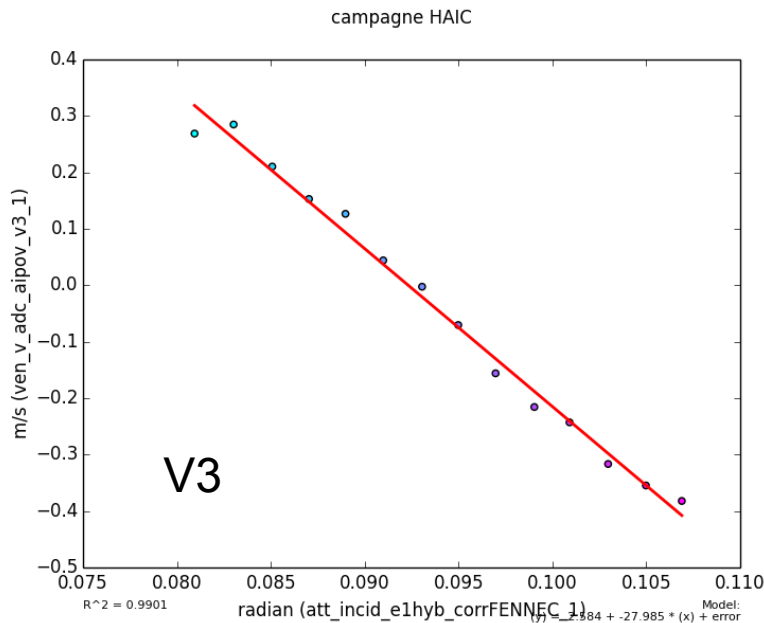


# Vertical wind (Y axis) correlated to angle of attack (X axis)

Medians of bins conditioned to angle of attack.  
All flights of the 2014 campaign ( $|\text{roll}| < 5^\circ$ )

Impact of new calibration :

- Correlation almost disappeared (slope divided by 10)



# If you were to remember only one slide

- **The last version of the dataset is Version 4**
- **It was released in November 2015 (for both campaigns, Darwin-2014 & Cayenne-2015)**
- **changes relate to wind (mostly vertical)**

Questions about dataset, files, ... can be addressed to  
`bruno.piguet@meteo.fr`

F20 parameters in database:

....

Flight , date....

event\_marker : from operator (see flight report) (count)

latitude : Latitude AIRINS synchronised on Sampling times (GPS synchronised clock (degree)

longitude : Longitude AIRINS synchronised on Sampling times (GPS synchronised clock (degree)

altitude : from GPS (meter)

altitude : Altitude from AIRINS synchronised on Sampling times (GPS synchronised clock (meter)

platform\_roll\_angle : Roll angle AIRINS synchronised on Sampling times (GPS synchronised clock (degree)

platform\_pitch\_angle : Pitch angle AIRINS synchronised on Sampling times (GPS synchronised clock (degree)

platform\_orientation : True Heading AIRINS sampled on the variable named rft\_TIME\_100 averaged and sampled (degree)

air\_pressure : from front sensor, corrected for the so-called static defect (hPa)

air\_temperature : from deiced Rosemount sensor (Celsius)

air\_temperature : Deiced Rosemount impact temperature averaged at 1 Hz (Celsius)

air\_temperature : Total air temperature from Air Data Computer synchronised on Sampling times (GPS synchronised clock (Celsius)

dew\_point\_temperature : from 1011C dew-point hygrometer (numeric output) (Celsius)

relative\_humidity : from Aerodata sensor (%)

humidity\_mixing\_ratio : Water vapor mixing ratio from 1011C hygrometer dew point (digital output) interpolated on Sampling times (GPS synchronised clock (gram/kg)

humidity\_mixing\_ratio : from Aerodata sensor (gram/kg)

humidity\_mixing\_ratio : WVSS-2 Mass Mixing Ratio interpolated on Sampling times (GPS synchronised clock (gram/kg)

platform\_speed\_wrt\_air : True Air Speed from Air Data Computer synchronised on Sampling times (GPS synchronised clock (m/s)

platform\_acceleration : Z-axis aircraft acceleration AIRINS synchronised on Sampling times (GPS synchronised clock (meter second-2)

platform\_course : Track AIRINS sampled on the variable named rft\_TIME\_100 averaged and sampled (degree)

platform\_speed\_wrt\_ground : AIPOV ground speed (m/s)

platform\_course : from GPS (degree)

platform\_speed\_wrt\_ground : from GPS (m/s)

upward\_platform\_speed\_wrt\_ground : Vertical speed AIRINS synchronised on Sampling times (GPS synchronised clock (m/s)

angle\_of\_attack : from sensor on the boom (degree)

angle\_of\_sideslip : from sensor on the boom (degree)

eastward\_wind : Zonal wind component (m/s)

northward\_wind : Meridional wind component (m/s)

upward\_air\_velocity : Vertical wind component (m/s)

wind\_from\_direction : Wind direction (degree)

wind\_speed : Wind speed (m/s)

mic\_msofreqice\_rs\_sync\_1 : MSO frequency of ice detector synchronised on Sampling times (GPS synchronised clock (Hz)

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SAFIRE FLIGHT NUMBER: fs150006

FILE START TIME (seconds since 2015-04-17 00:00:00 UTC): 42324.480113

FILE STOP TIME (seconds since 2015-04-17 00:00:00 UTC): 49752.480009

TAKE-OFF TIME (HHMMSS UTC): 120336

LANDING TIME (HHMMSS UTC): 133625

## High Altitude Ice Crystals (HAIC, 314314)

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