Cayenne-2015 Data set status, NRC CV580 – Aircraft In-situ data

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Environment Canada Environnement Canada

Outline

- Basic Systems Info and Available measurements
- Systems' field Performance
- Sample Data
- Timeline – Processing and Analysis

List of available measurements and sensor for Cayenne, May 2015

Parameters	Sensors
Aircraft state and Navigation	GPS: Novatel GPS (x2) IMU: Honeywell IMU (x2), AIMMS20_IMU, Litton Radioaltimeter, TIT, RPM, HP
Atmospheric state	Temperature: Rosemount (x2), AIMMS Pressure (Ps & Pd): Honeywell, 858 Air Data (alpha & beta): Rosemount 858, AIMMS20 RH: Chilled Mirror, AIMMS20, Licors (x3)

Cayenne Aircraft In-situ Data

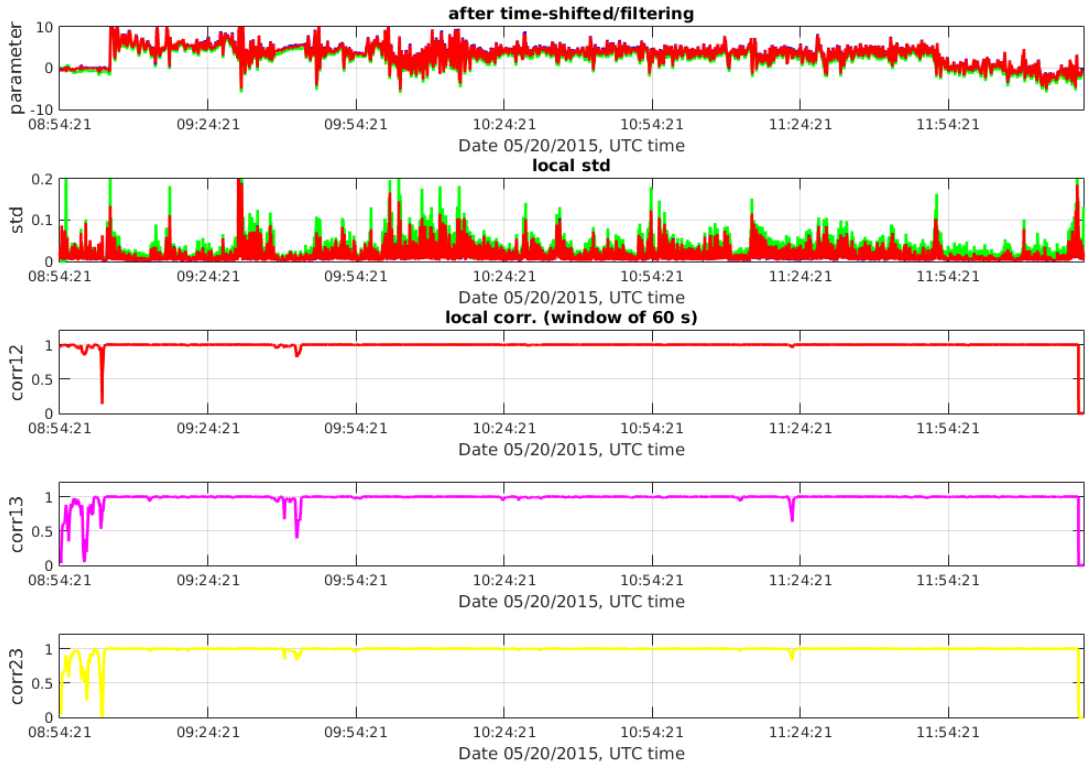
❖ Quality control procedure

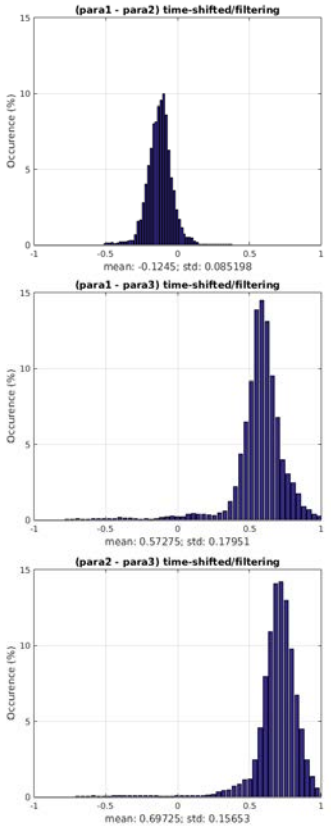
- Honeywell (Hg) GPS as main clock
- Variables available from multiple sensors are corrected for time-shift issue (the most reliable sensor is selected as the reference)
- Remove outlier samples by using a median and averaging filters
- Monitor data consistency (across sensors) and detect for faulty data segments by standard statistical methods (local correlation, local standard deviation and gradient)
- Correct biases and combine measurements from different sensors to generate final products

Aircraft State Data Examples

❖ Pitch (deg)

para1: Hg
para2: POK
para3: AIMMS



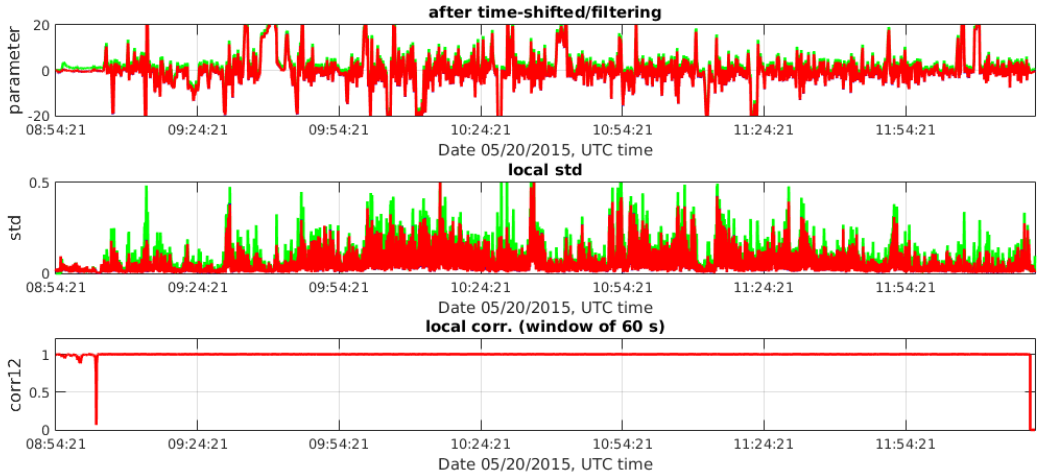


- Consistent measurements from Hg and POK and the bias is negligible

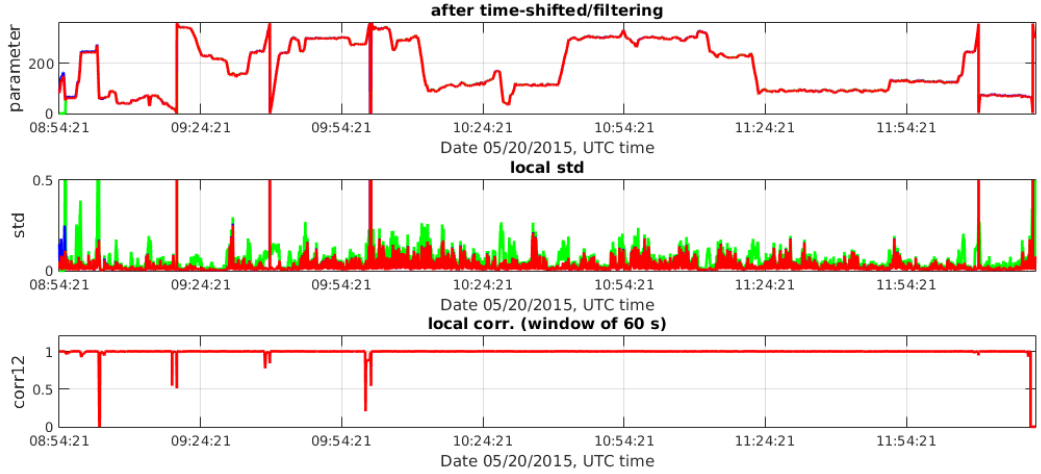
Aircraft State Data Examples

❖ Roll (deg)

- Similar performance for Roll and Heading/Yaw



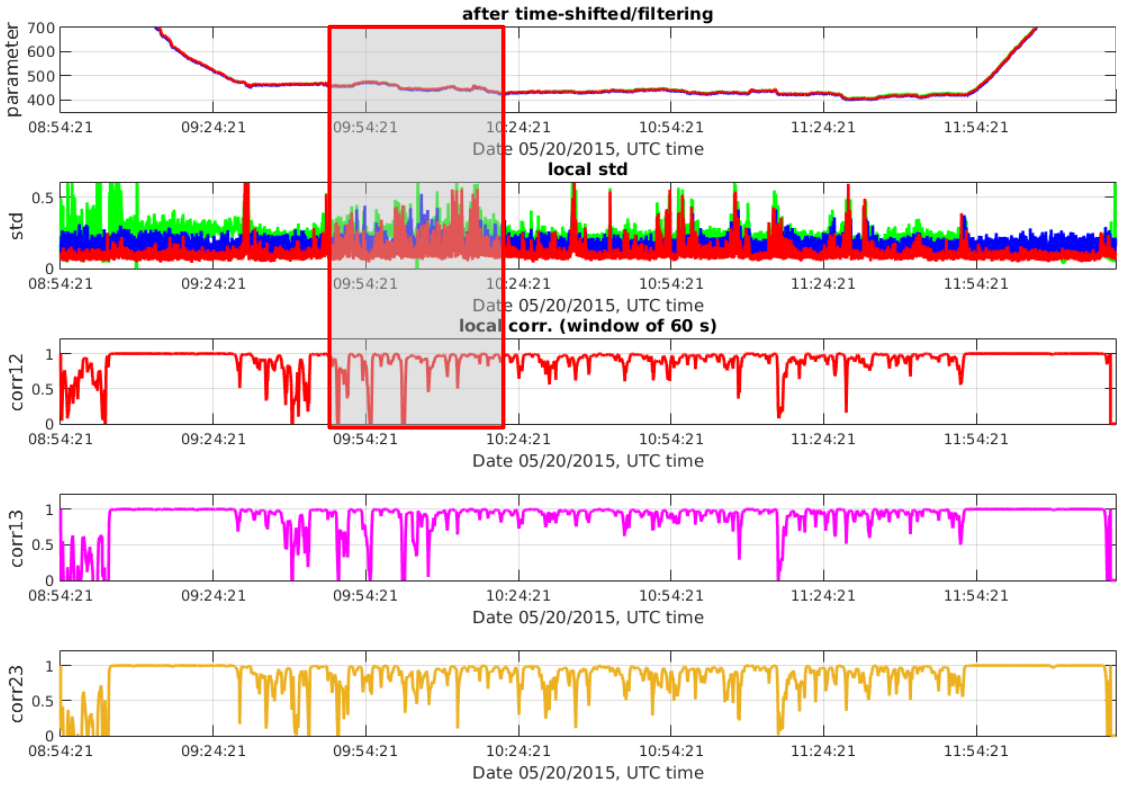
❖ Heading (deg)

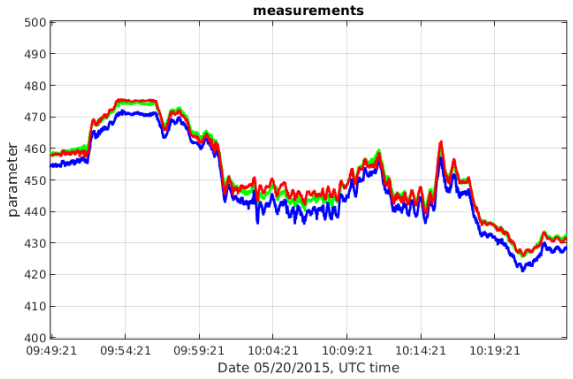


Data Examples (cont.)

❖ Static pressure (Ps (mb))

para1: scalar
para2: 858
para3: fuse



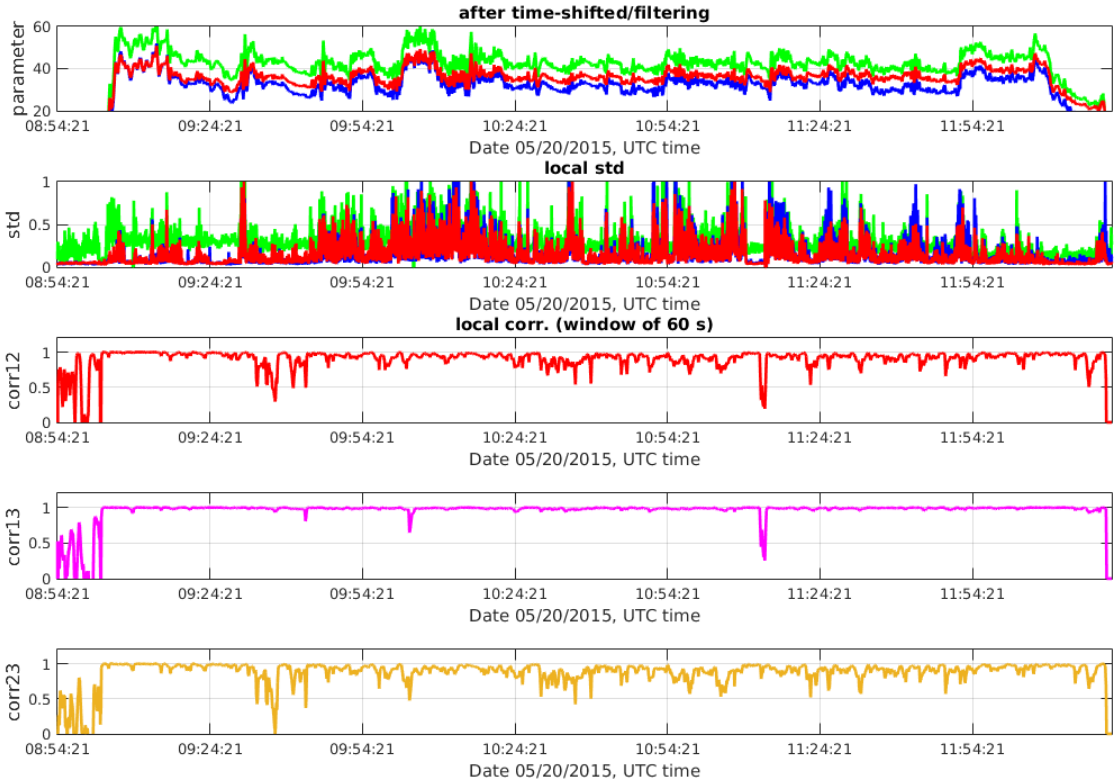


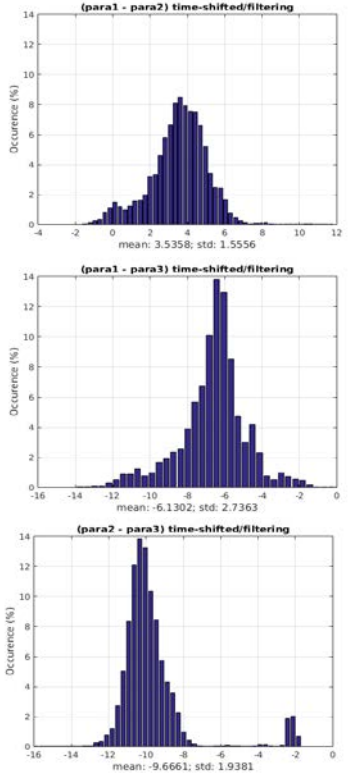
- Good agreement between the measurements.
- Scalar shows less variation
- 858 is slightly lower

Data Examples (cont.)

❖ Dynamic pressure (Pd (mb))

para1: scalar
para2: 858
para3: fuse





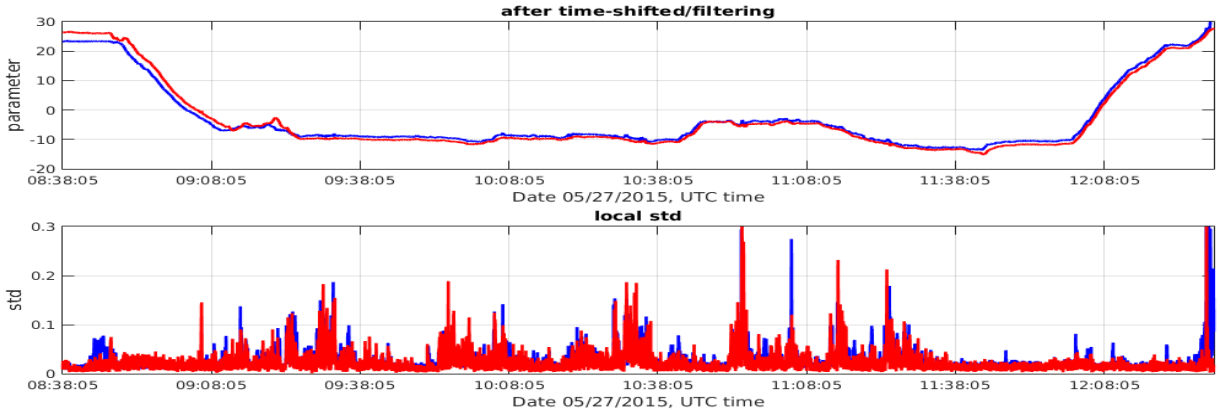
- Great correlation between scalar and fuselage
- Location bias

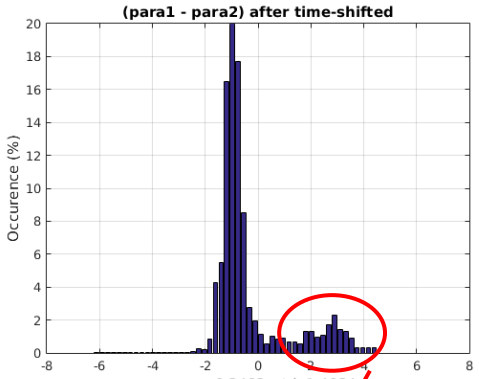
Data Examples (cont.)

❖ Temperature (deg C)

- May 27a case

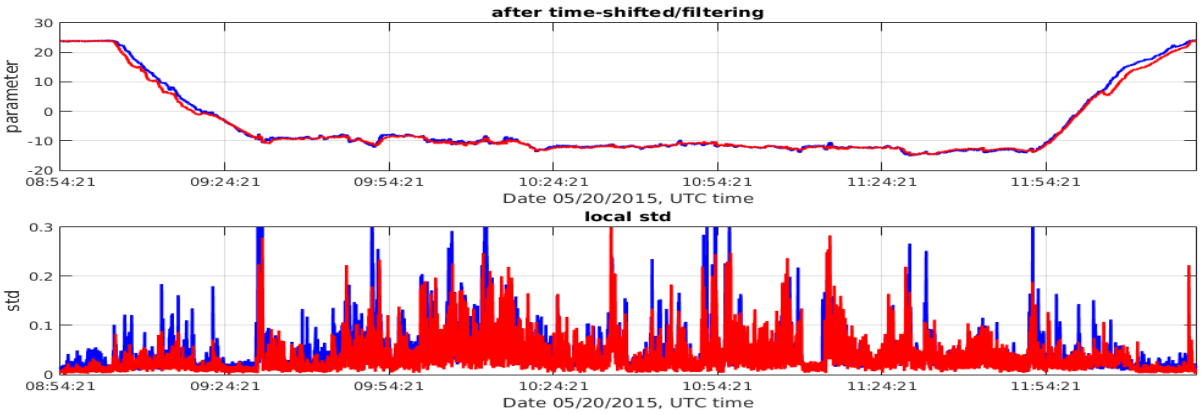
para1: AIMMS
para2: scalar

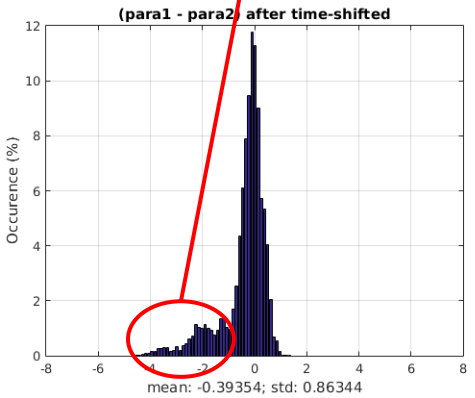




taking off and landing

- May 20 case

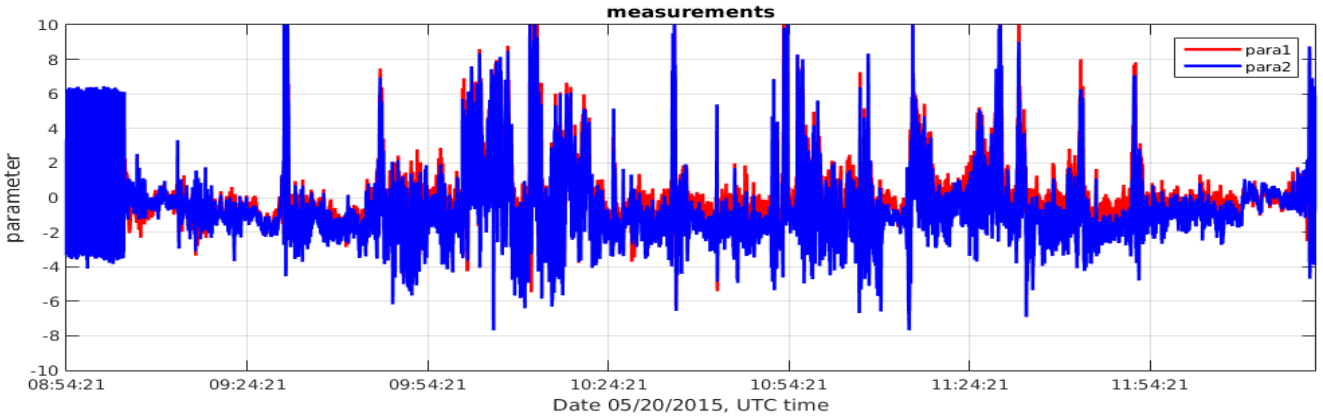




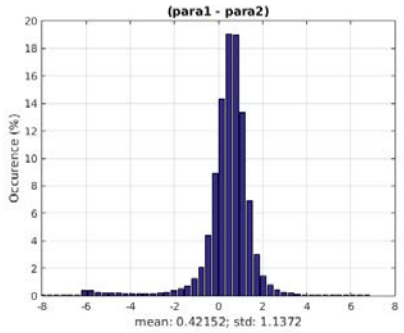
Cayenne Aircraft In-situ Data Examples

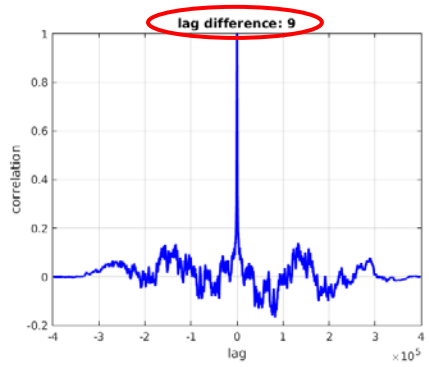
❖ Vertical Wind

para1: AIMMS
para2: Pod

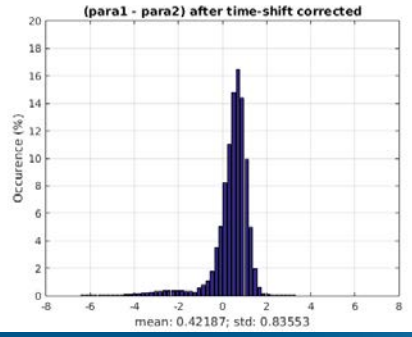


hist. of diff. before time-shifted





hist. of diff. <u>after</u> time-shifted



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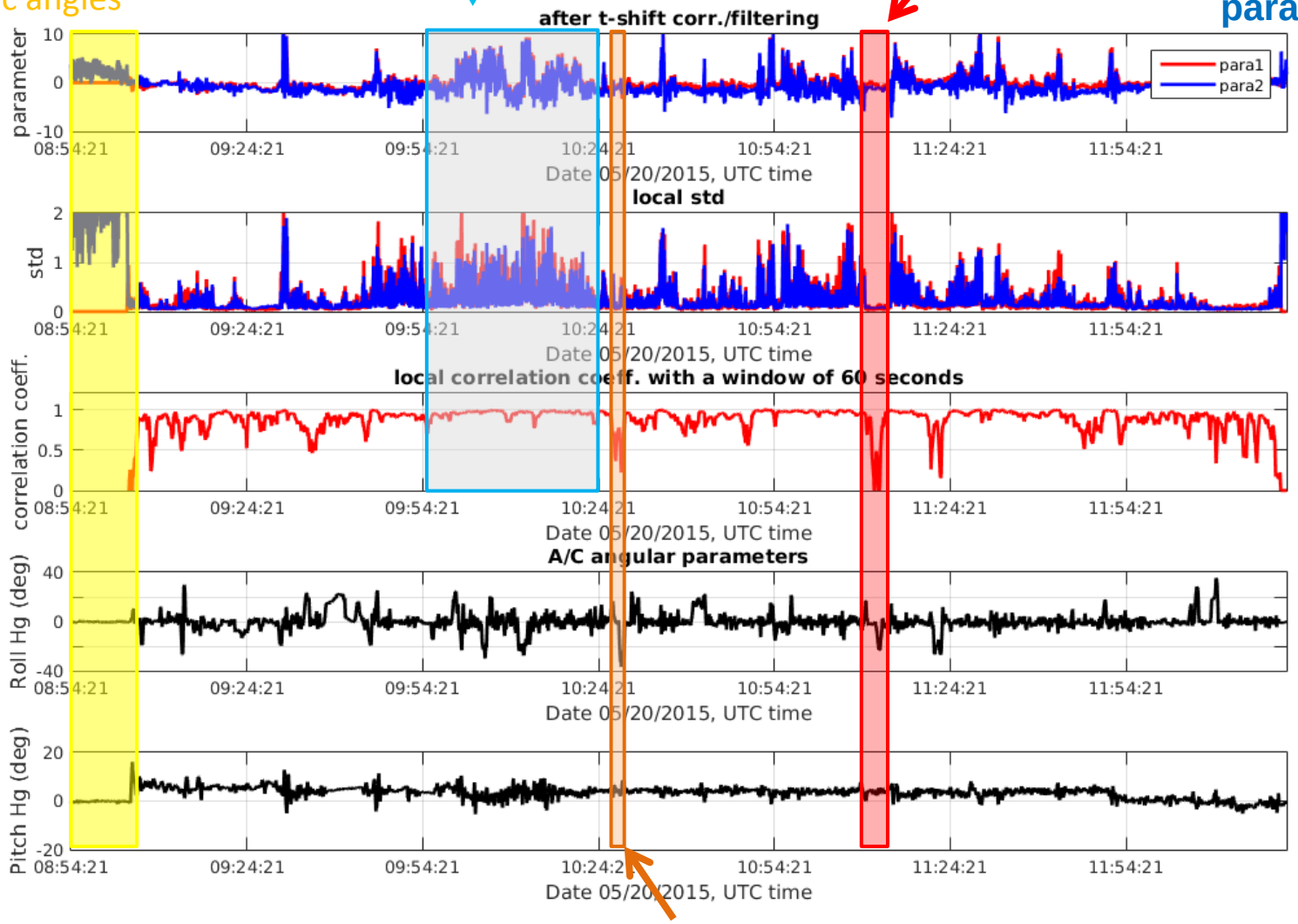
❖ Vertical Wind (cont.)

Unusable (A/C on ground): very low corr. and very large std. and zero a/c angles

interesting event: high corr. and large std.

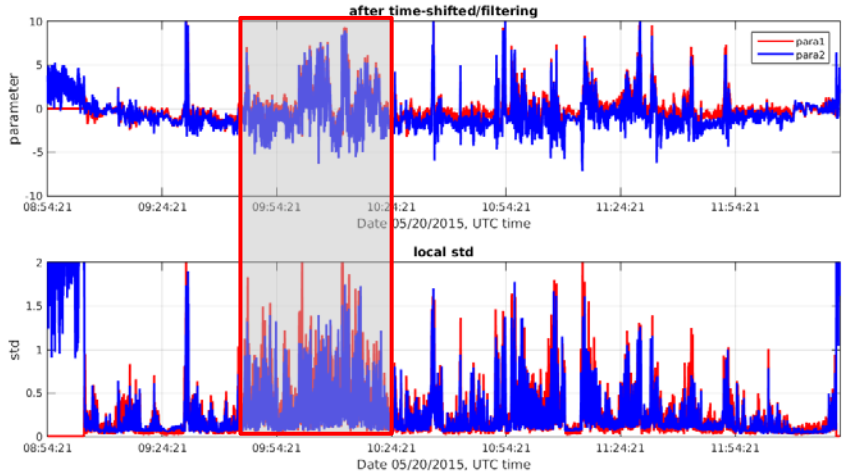
unreliable segment: very low corr. and very low std.

para1: AIMMS
para2: Pod



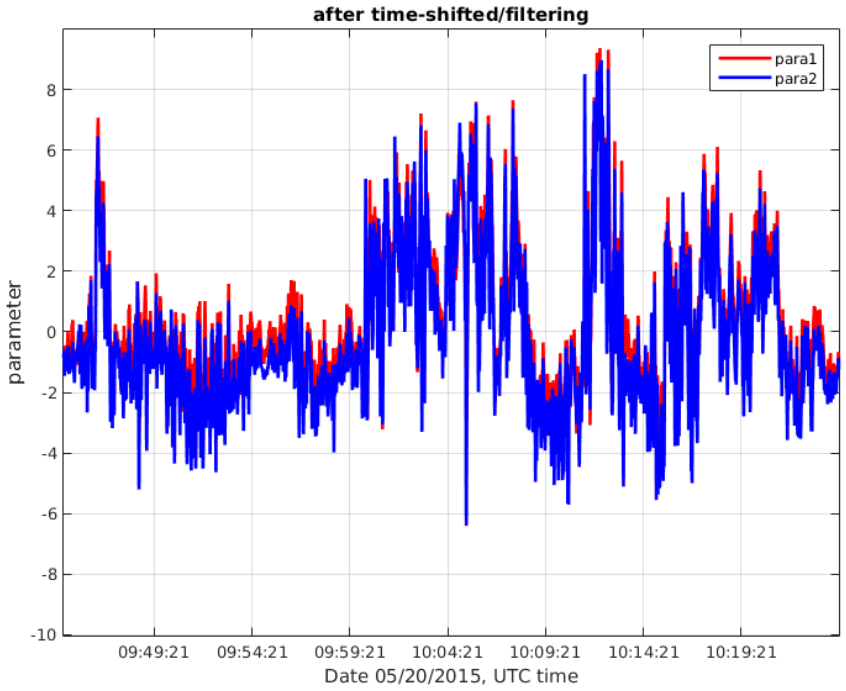
lower corr. due to roll

❖ Vertical Wind



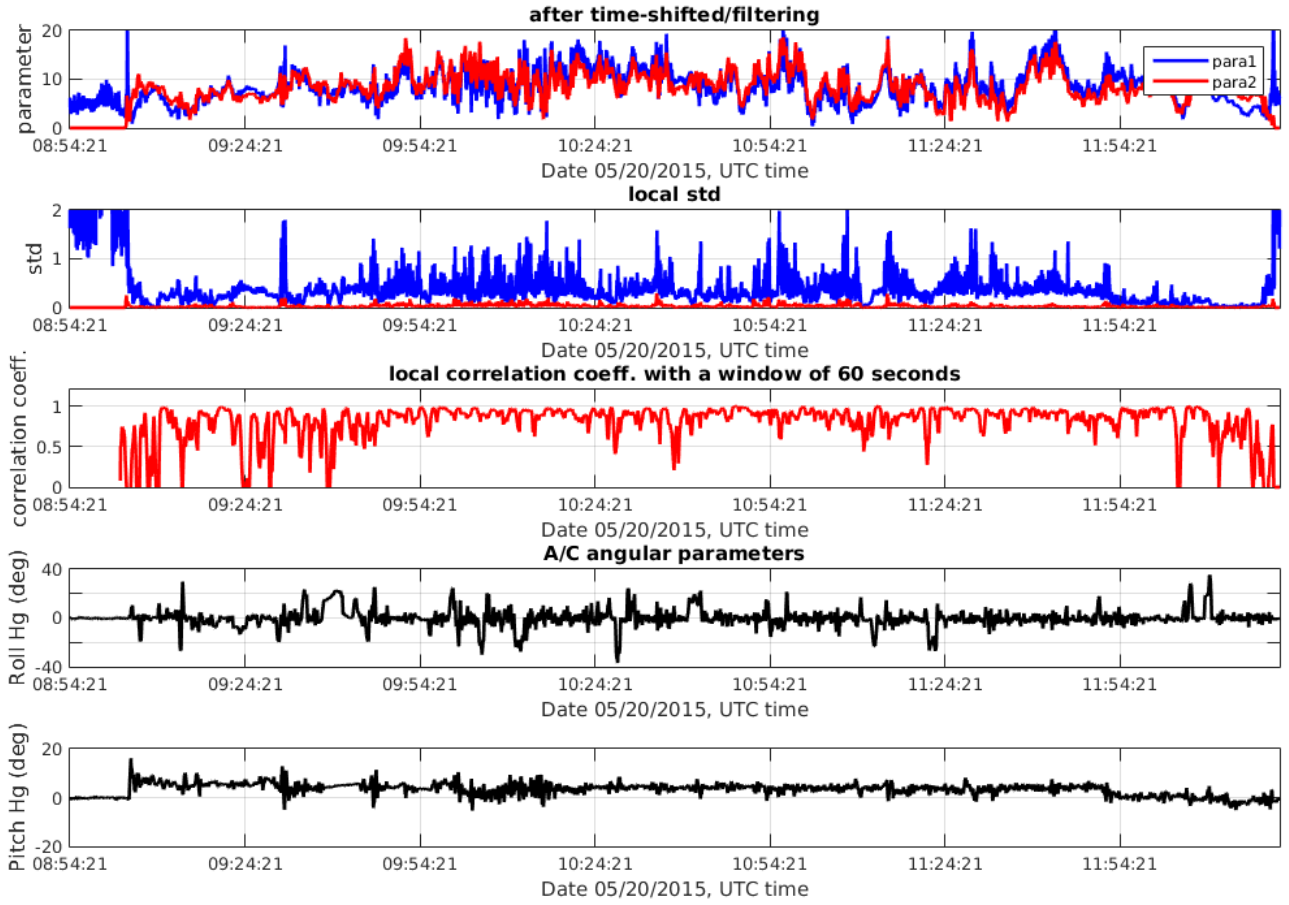
para1: AIMMS
para2: Pod

Important event: good agreement between the measurements



More wind component examples from the two sensors

❖ Wind speed



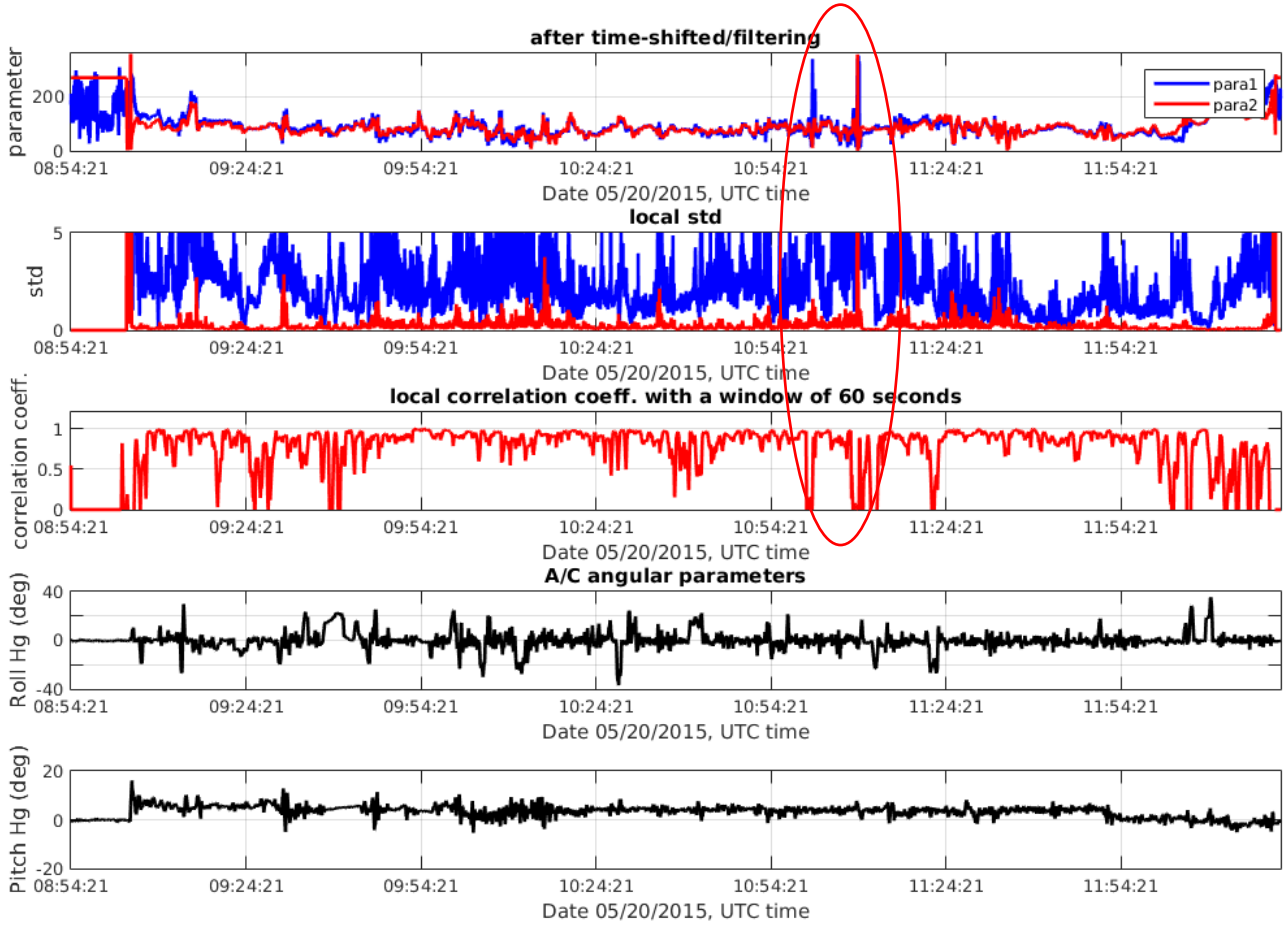
para1: AIMMS
para2: Pod

More wind component examples from the two sensors

❖ Wind direction

In general, both sensors provide correct measurements but AIMMS data shows less variation.

para1: AIMMS
para2: Pod



Plan

- Complete data quality assessment and processing for version 2 of data – Before 31-01-2016.
- Lab Technical Report – 31-Mar-2016

High Ice Water Content (HIWC) Program