

## AMMA 2006

Report on the MIPAS-STR measurements on the transfer flights from Italy to Burkina Faso and on five local flights in Ouagadougou



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### Summary

MIPAS-STR was integrated on M-55 on Wednesday, July 26 in Verona. After successful EMC on July 28 a 4-hour-testflight was performed on July 29 with flight direction almost south towards Sicily. The flight was supported by EUFAR for test of the new instrument IRIS.

The lowest tangent point for the limb measurements was set to 6 km and not modified during the whole campaign.

Despite the original planning the flights had to be operated by only one pilot, which causes the aircraft to have an intermediate stop in Marrakech for a minimum of 10 hours. The maximum flight altitude for transfer was restricted by MDB to 19 km due to aircraft limitations, so the flight levels were set to 18 and 19 km for both transfer legs.

The take-off for transfer was on July, 31 at 23:25 local time with a delay of about 20 hours to the original flight plan. After an overall flight time of approx. 7:40 h the aircraft arrived in Ouagadougou.

The reason for this delay was on the one hand the pilot problem (restrictions for planning were a) a 12 hours minimum rest of the pilot in Marrakech b) landing at daylight in Ouaga c) maximum instrument hold time of 24 hours d) high sun exposure of the aircraft in Marrakech) and on the other hand an additional 12 hour delay because of logistical problems (of MIPAS-STR) with the liquid helium.

Instrument performance and reliability was excellent during test, transfer and all local flights. Unfortunately only housekeeping data were measured on the backward transfer flights because of lack of liquid helium.

More about AMMA:

<http://www.pa.op.dlr.de/amma-dlr/>

<http://www.isac.cnr.it/~utls/m55amma/>

<http://www.amma-eu.org/>

<http://amma.mediasfrance.org/>

[http://nadir.nilu.no/scout-tropical/secure/DB\\_M55\\_AMMA.html](http://nadir.nilu.no/scout-tropical/secure/DB_M55_AMMA.html)

UTC	29.07. Verona testflight	31.7./01.08. Verona Marrakech	01.08. Marrakech Ouaga	04.08. Ouaga Local I	07.08. Ouaga Local II	08.08. Ouaga Local III	11.08. Ouaga Local IV	13.08. Ouaga Local V
Take-off	05:51	21:25	10:59	08:25	12:15	11:45	14:43	12:49
Landing	09:39	01:16	14:58	12:13	16:06	15:30	18:22	16:22
MIPAS-STR profiles								
From (Lat./Lon.)	06:19 (--/--)	21:47 (44.70/9.94)	11:21 (30.35/-8.47)	09:02 (--/13.6)	12:48 (--/--)	12:18 (--/--)	15:37 (--/--)	13:25 (--/11.6)
Until (Lat./Lon.)	09:05 (--/--)	00:43 (33.01/-7.32)	14:30 (13.60/-2.12)	11:37 (--/5.4)	15:30 (--/--)	14:54 (--/--)	17:47 (--/--)	15:48 (--/4.2)

Table 1: Overview of flight times and MIPAS-STR measurements

**Verona test flight (29/07/06)**

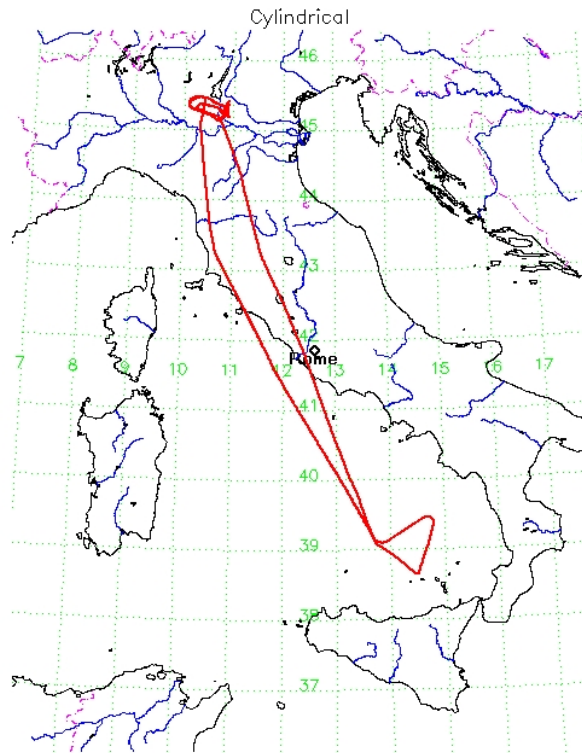


Abb.1: Test flight from Verona on July, 29.

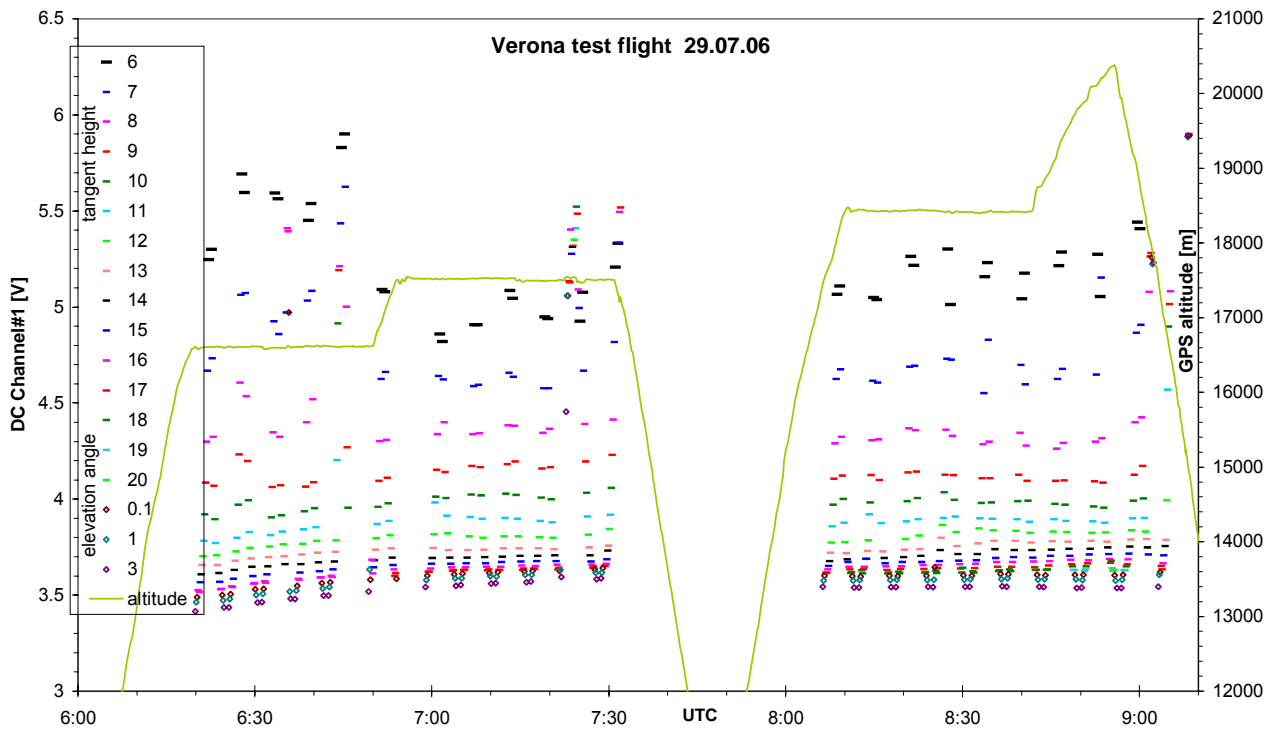


Abb.2: DC plot vs flight level for the test flight from Verona to Sicily.

### Transfer Flights



Abb.3: Forward transfer flights from Verona to Ouagadougou

### Verona – Marrakech ( 31 July/ 1 August )

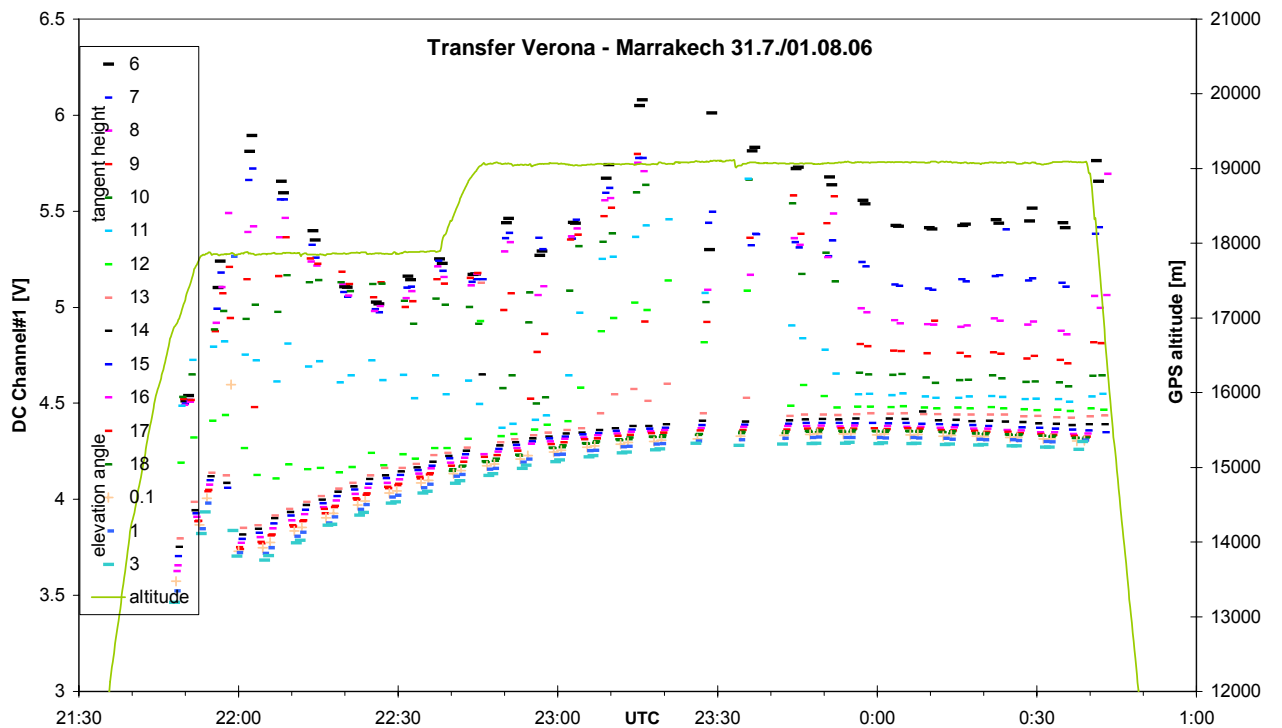


Abb.4: DC plot vs flight level for the flight from Verona to Marrakech

Marrakech - Ouagadougou (1 August)

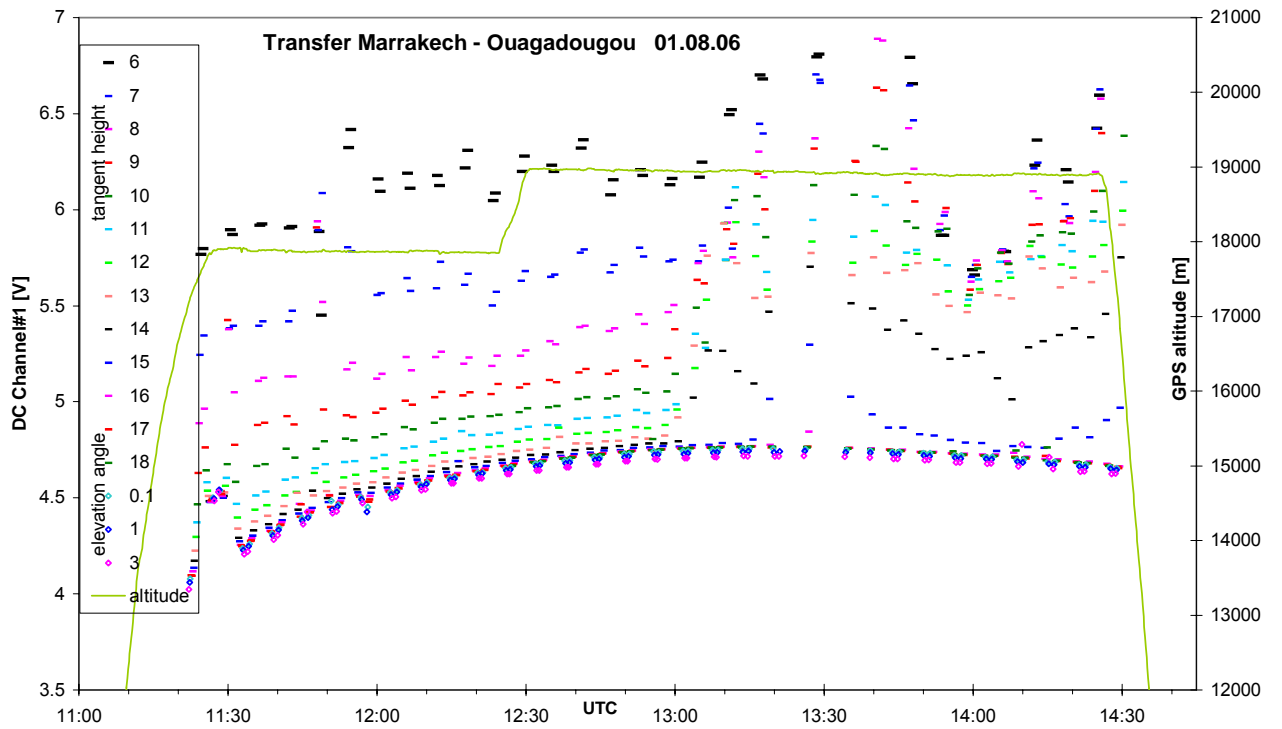


Abb.5: DC plot vs flight level for the flight from Marrakech to Ouagadougou

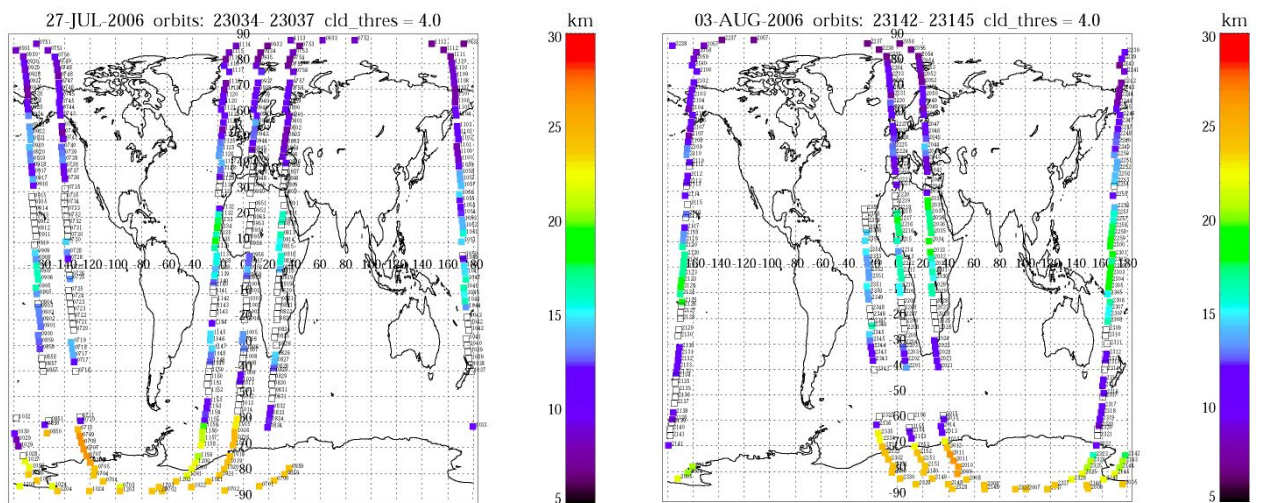


Abb.6: Corresponding observation pattern with cloud index of MIPAS on ENVISAT before and after the transfer flights

### Ouagadougou local flights

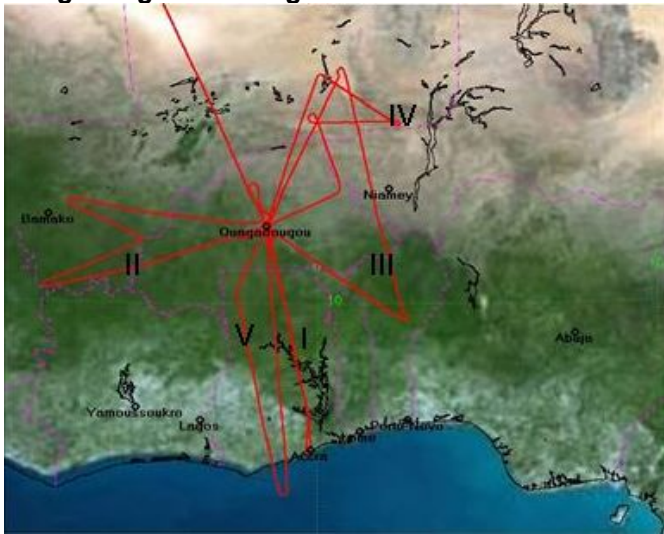


Abb.7: The flight patterns of the five Ouagadougou local flights

### Local flight I (04/08/06)

Flight was dedicated to “large scale transport and MCS outflow”.

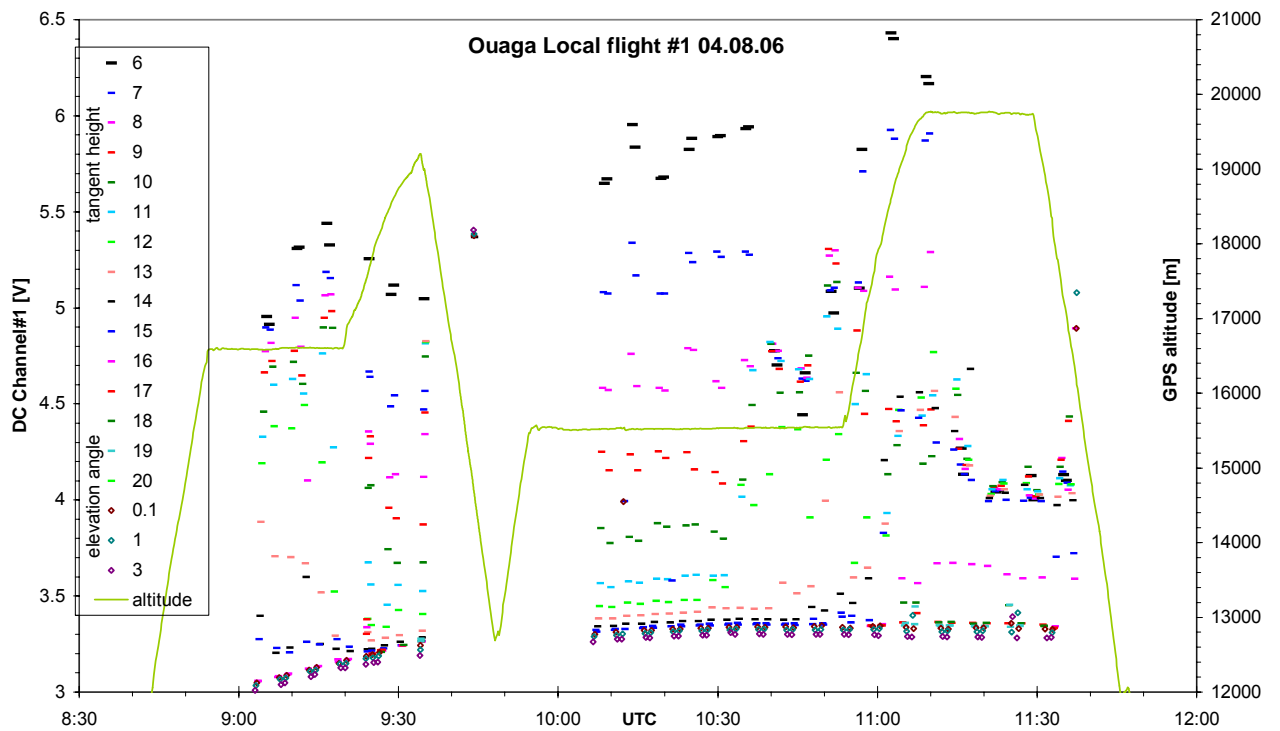


Abb.8: DC plot vs flight level for the first local flight

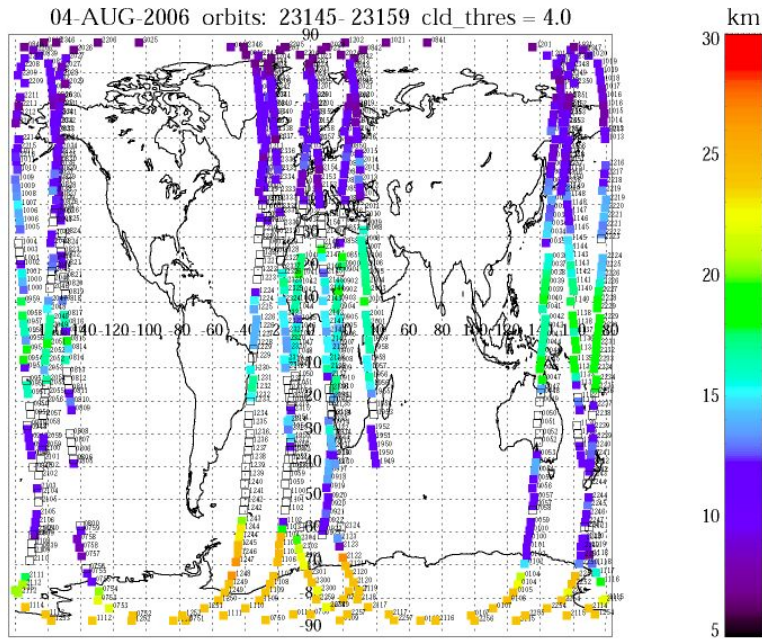
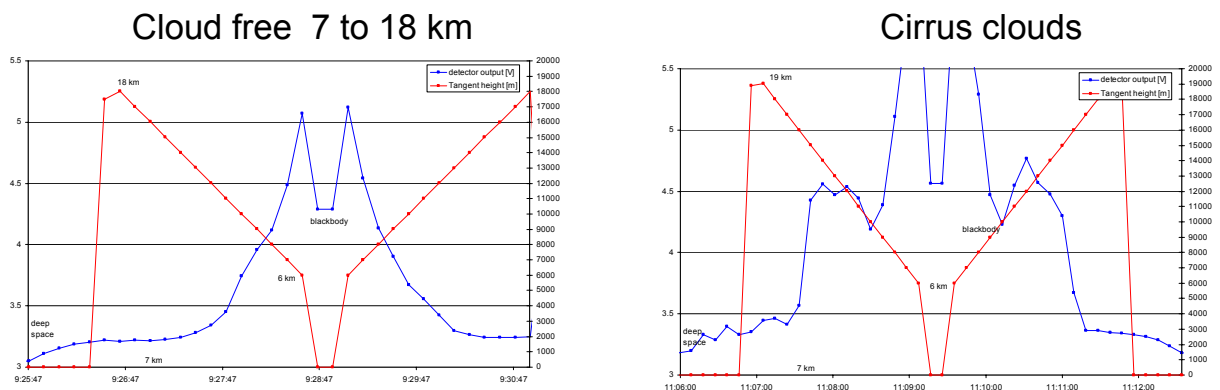


Abb.9: Corresponding observation pattern with cloud index of MIPAS on ENVISAT for local flight I



1. Local flight 04/08/06

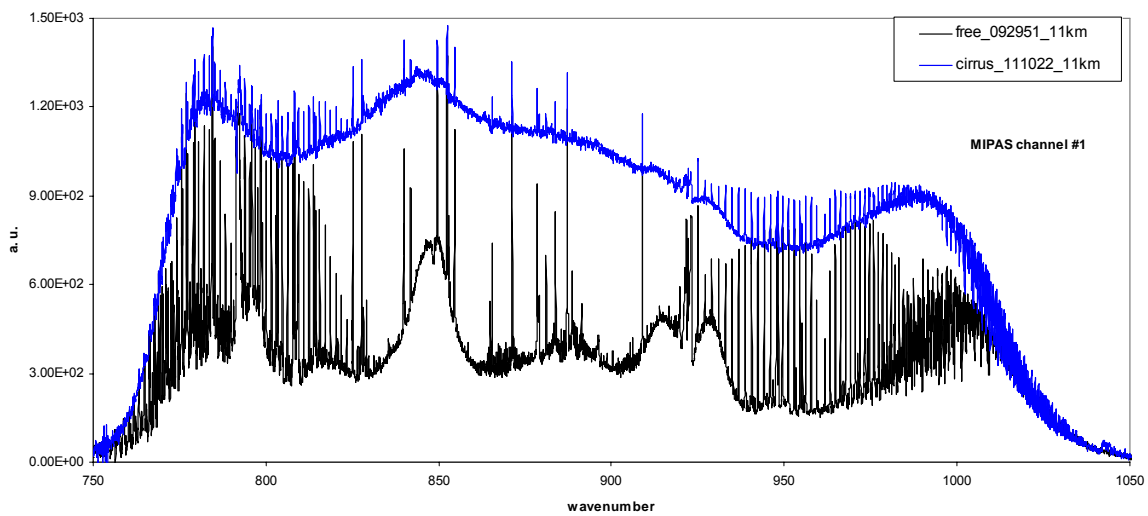


Abb.10: Measurement examples for cloud free limb spectra and spectra affected by cirrus clouds. Above the DC output (channel #1) of the detector versus the corresponding tangent heights is shown.

**Very first results of the first local flight from a cloud-free limb measurement at about 09:30 (calculated almost real-time during the campaign)**

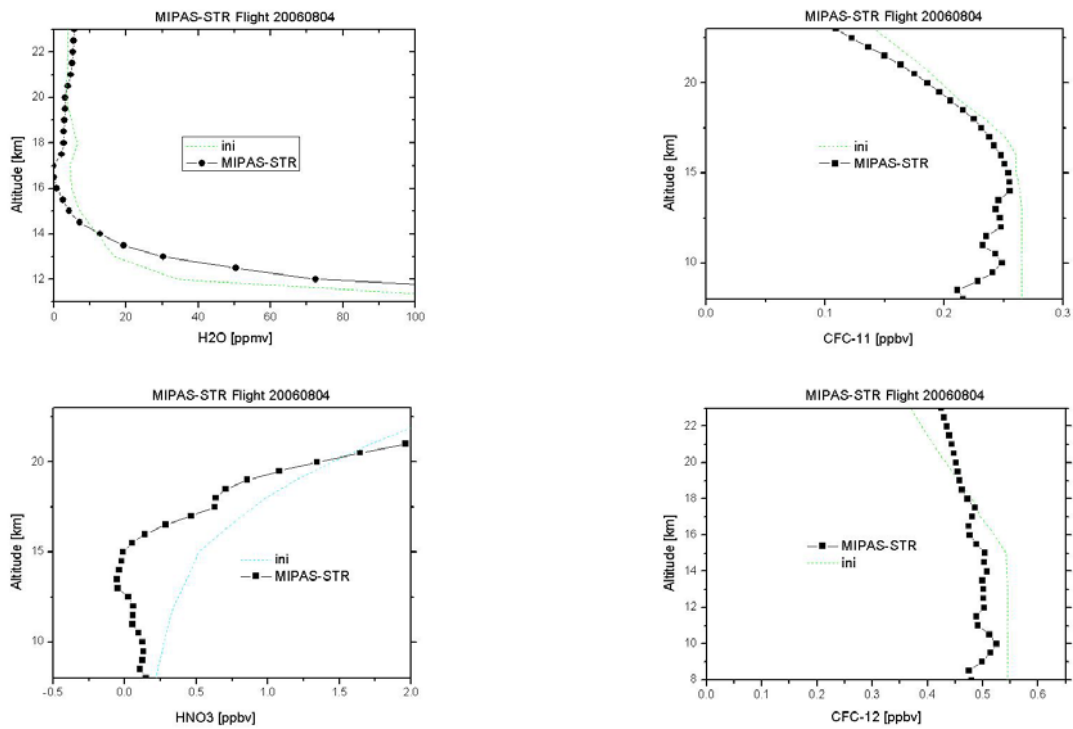


Abb.11: Very rough first vertical profiles of HNO<sub>3</sub>, H<sub>2</sub>O, CFC-11 and CFC-12.

**Local flight II (07/08/06)**

Flight was dedicated to "MCS close-up"

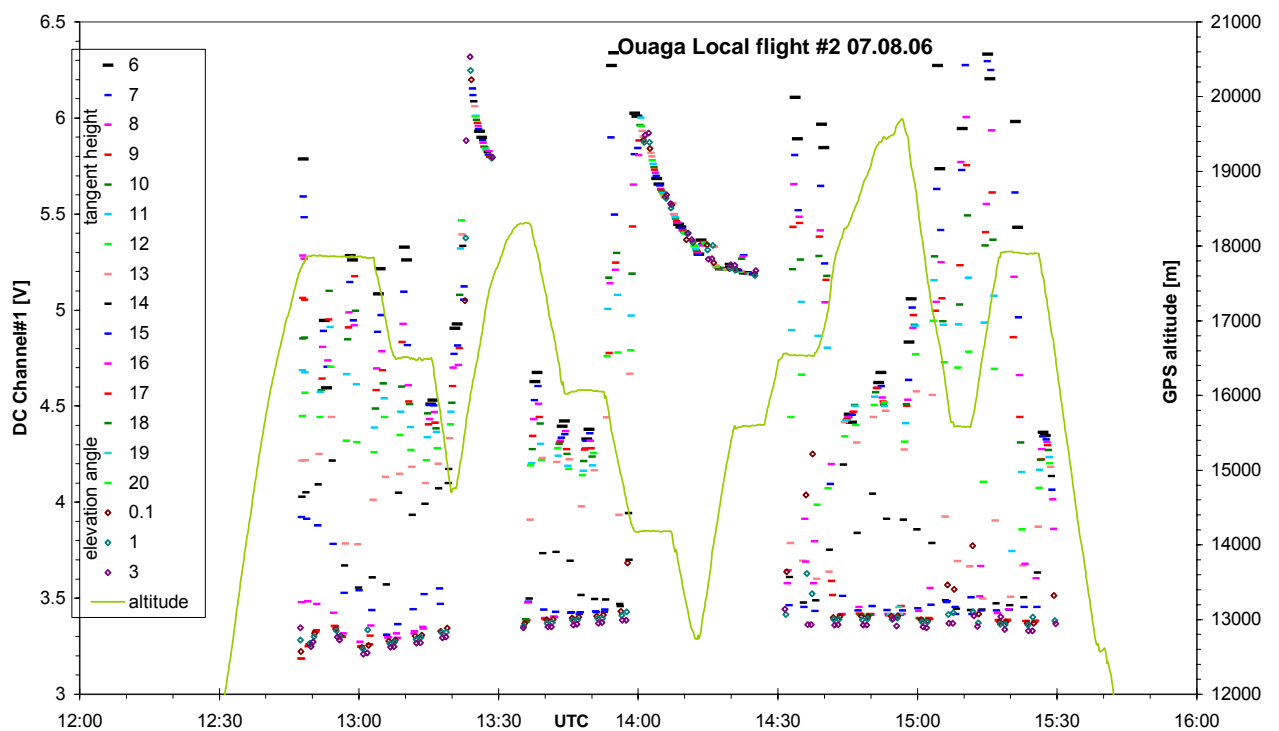


Abb.12: DC plot vs flight level for the second local flight

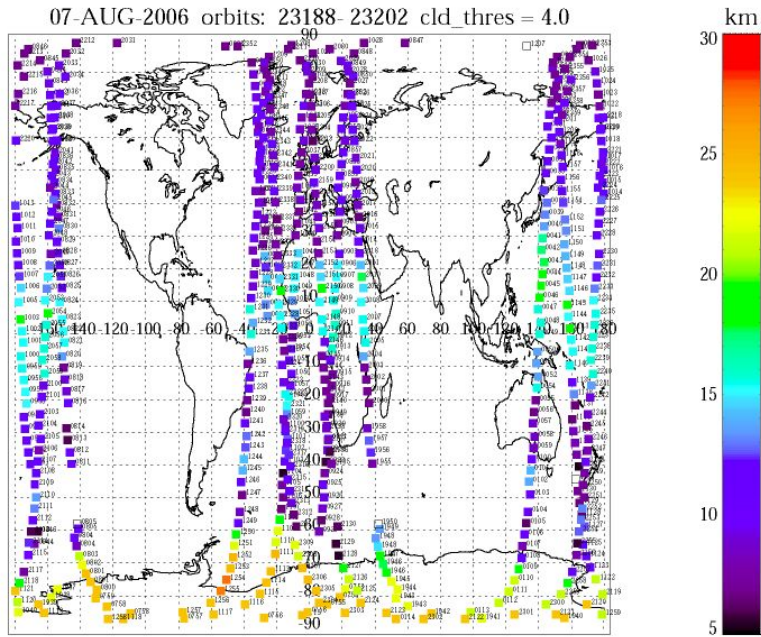


Abb.13: Corresponding observation pattern with cloud index of MIPAS on ENVISAT for local flight II

**Local flight III (08/08/06)**

Flight was dedicated to “Calypso validation” .

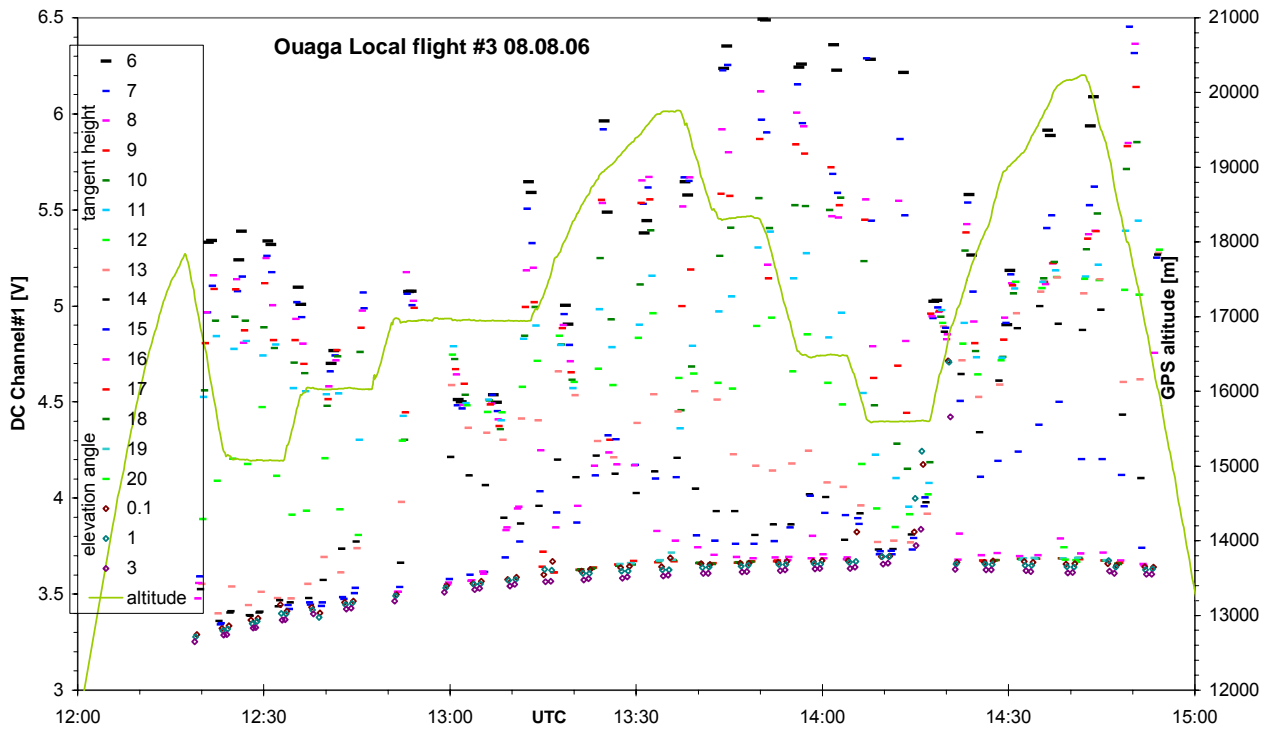


Abb.14: DC plot vs flight level for the third local flight



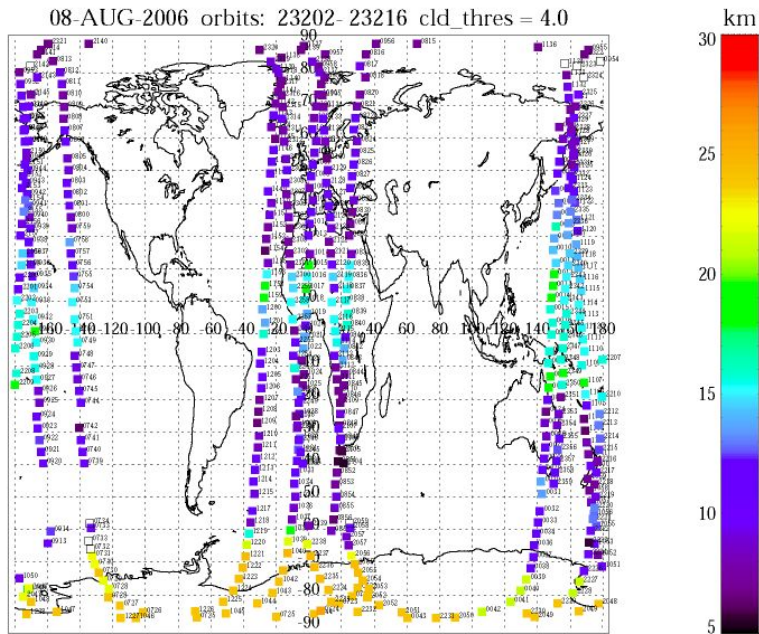


Abb.15: Corresponding observation pattern with cloud index of MIPAS on ENVISAT for local flight III

On August 9, between local flights III and IV, a check of the LOS was performed. The mirror “F2” was slightly modified.

**Local flight IV (11/08/06)**

Flight was again dedicated to “MCS close-up” .

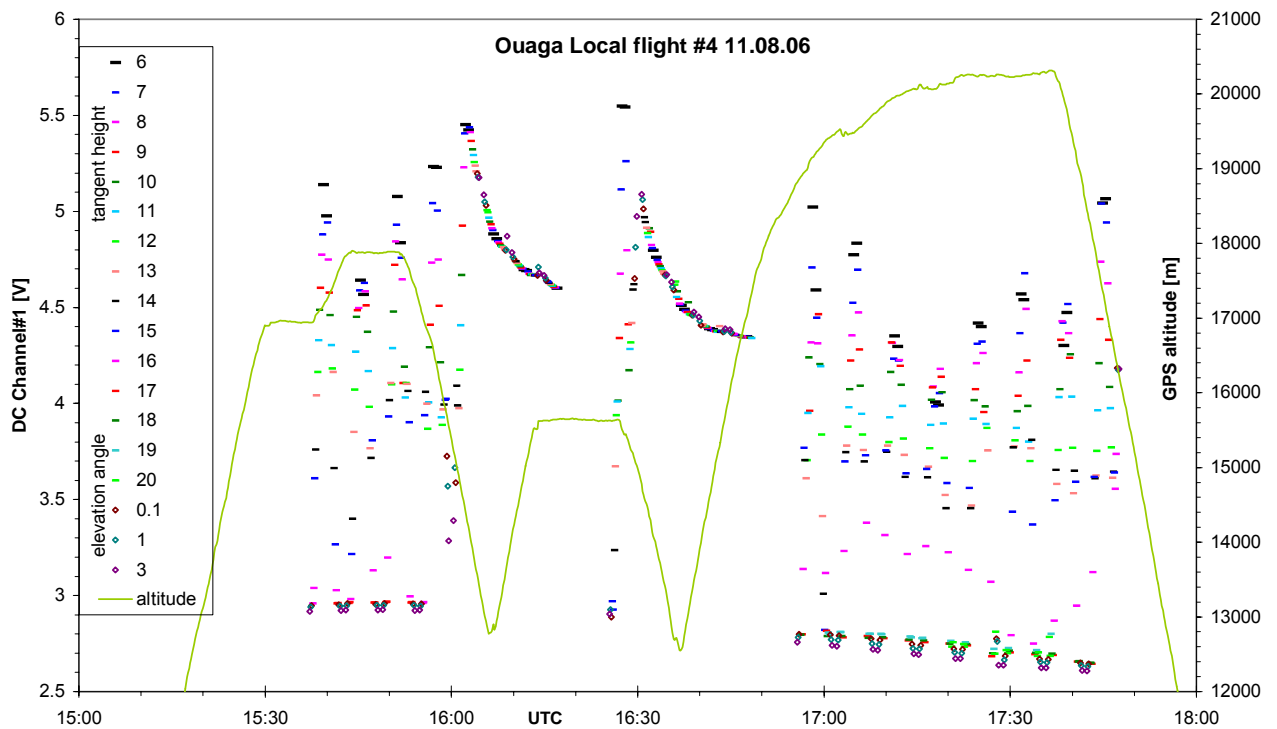


Abb.16: DC plot vs flight level for the fourth local flight

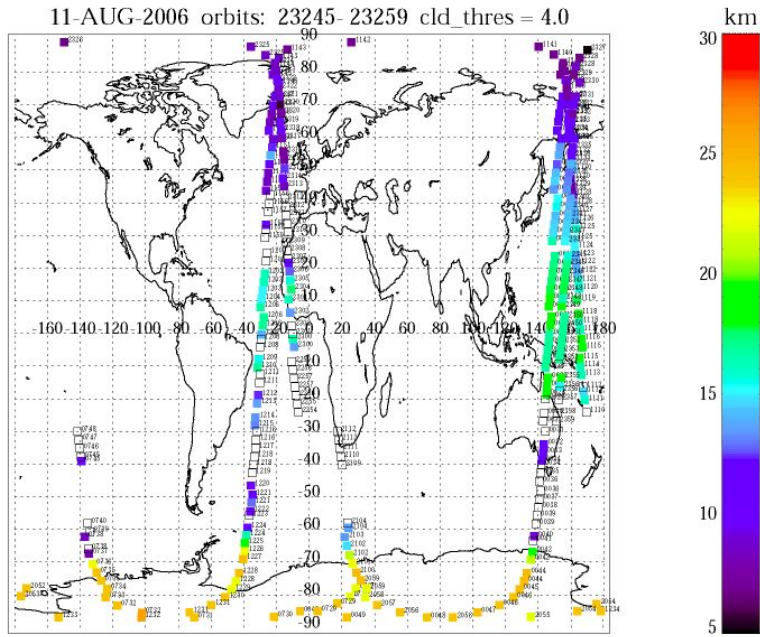


Abb.17: Corresponding observation pattern with cloud index of MIPAS on ENVISAT for local flight IV

### Local flight V (13/08/06)

Flight was dedicated to “large scale transport” as flight I and combined with a Calypso meeting.

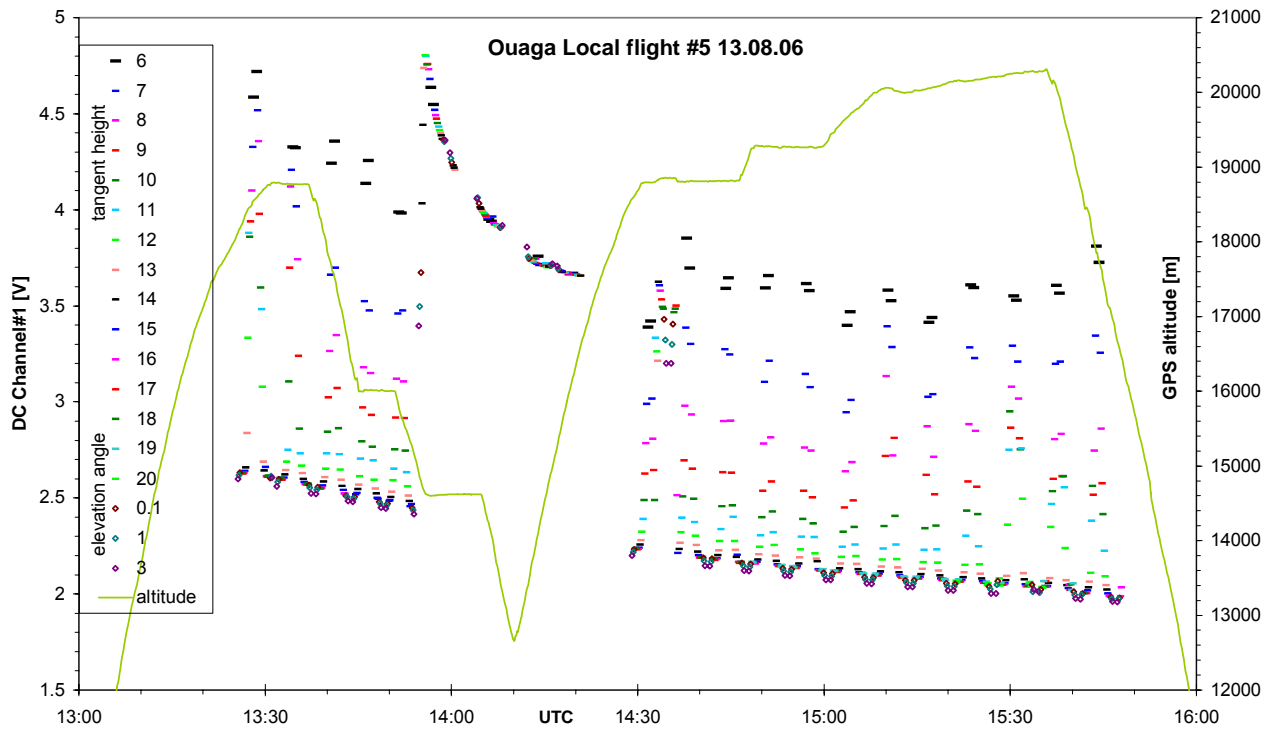


Abb.18: DC plot vs flight level for the fifth local flight

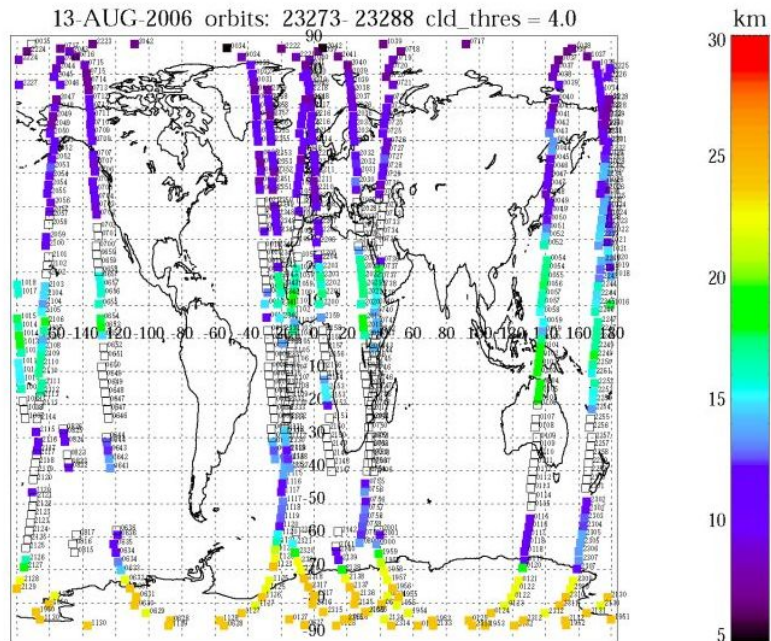


Abb.19: Corresponding observation pattern with cloud index of MIPAS on ENVISAT for local flight V

Temperature profiles for all AMMA flights

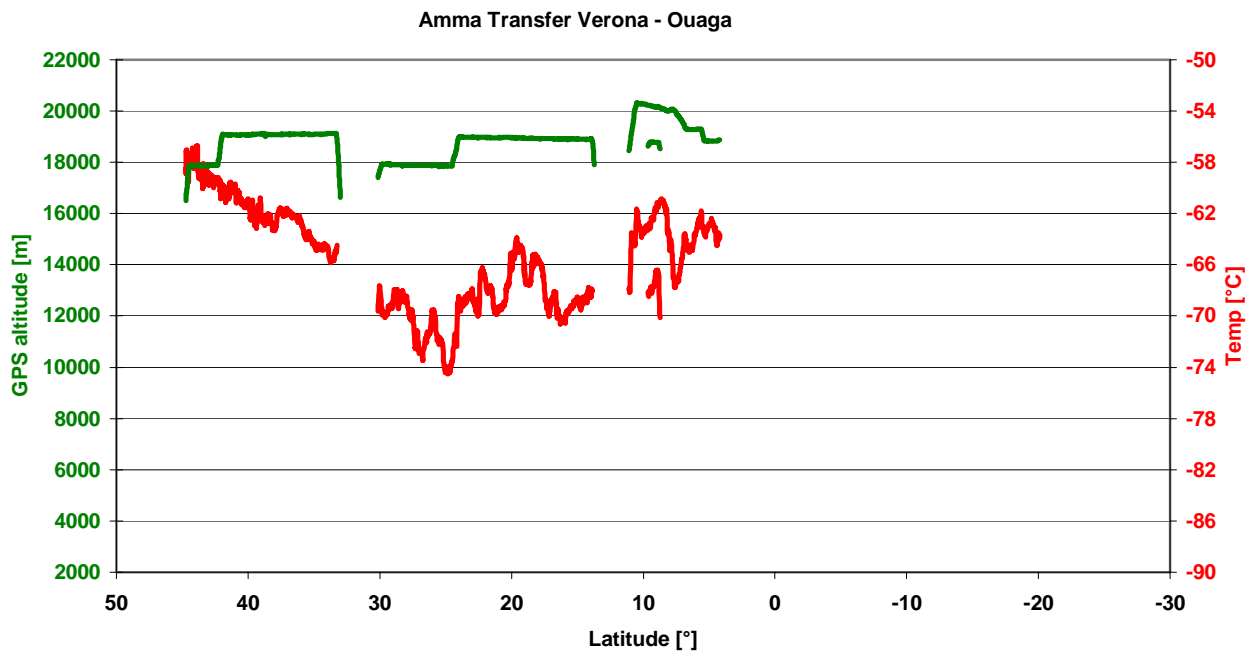


Abb.20: Temperature on flight levels above 16 km from Verona (Lat 44.7°) to Ouagadougou (Lat 13.6°).

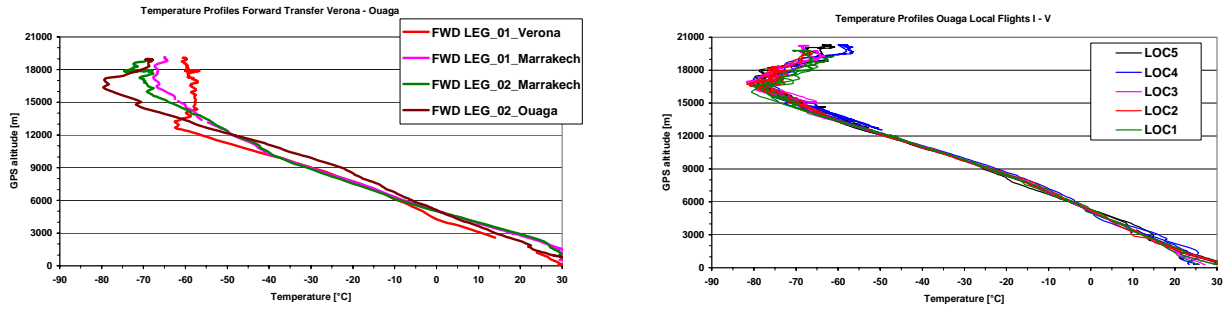


Abb.21: Temperature profiles for all AMMA ascents and descents in Verona, Marrakech and Ouagadougou.

### Calculated NESR for pre- and inflight conditions during AMMA flights

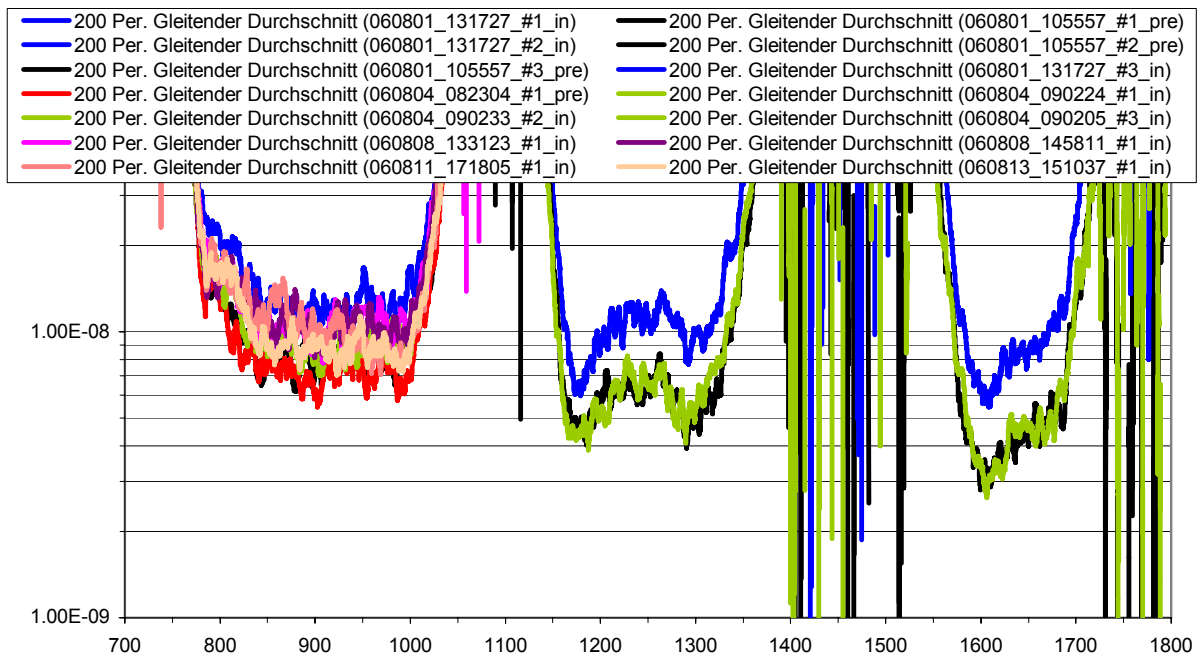
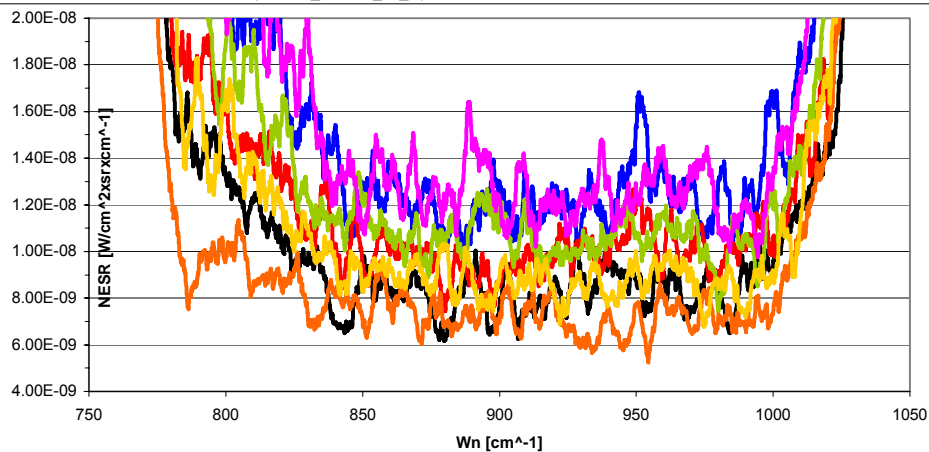
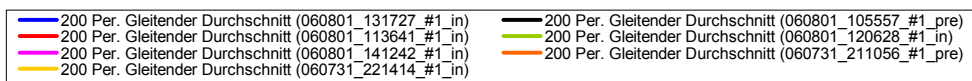
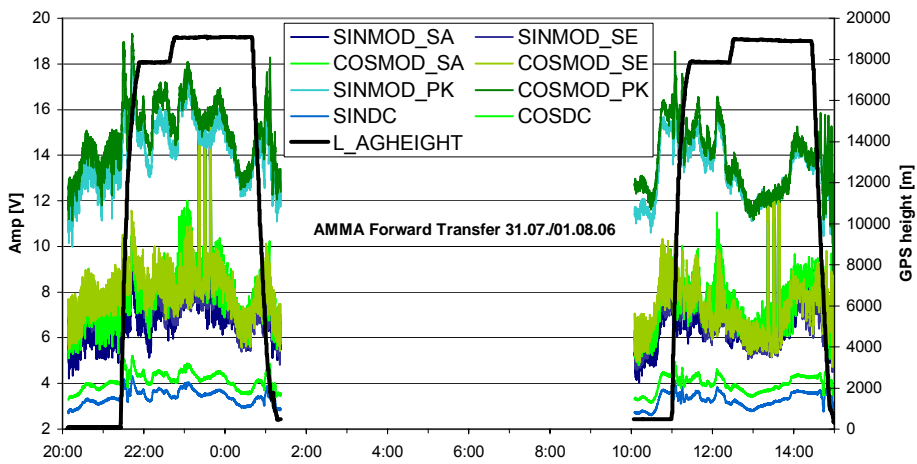
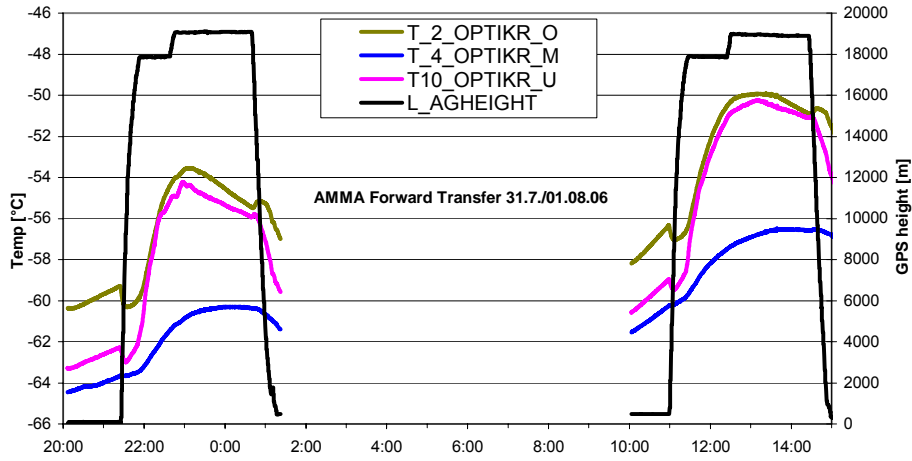
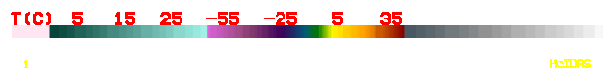
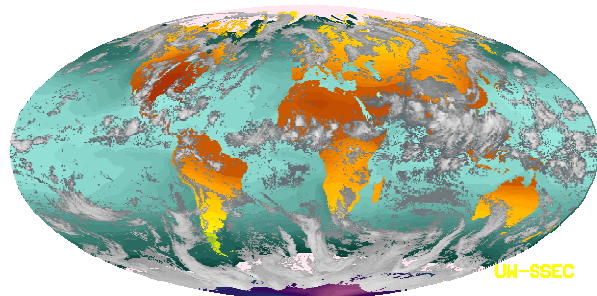


Abb.22: NESR in  $[nW/(cm^2 sr cm^{-1})]$  for Channels #1, #2 and #3 on ground and inflight.

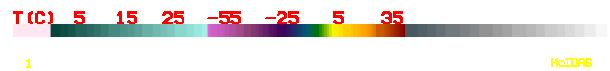
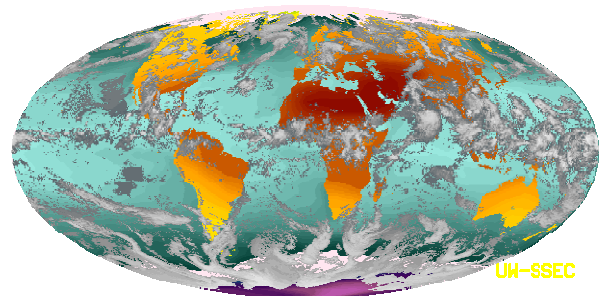
**NESR during forward transfer flight** was degrading by about 50%. This was most likely driven by the increase of instrument temperature and thus decreasing modulation efficiency, as can be seen in the pictures below:



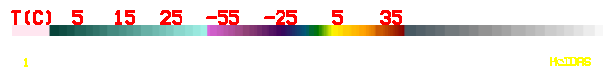
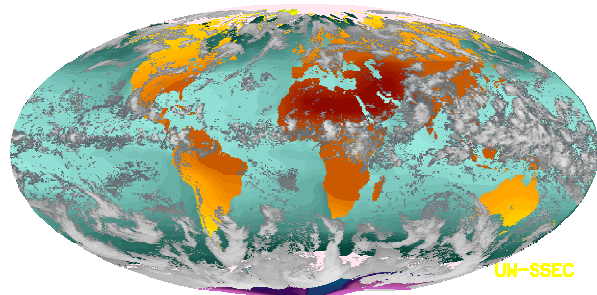
Cloud and temperature composites  
(source: <http://www.ssec.wisc.edu/data/composites.html>)



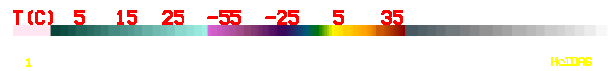
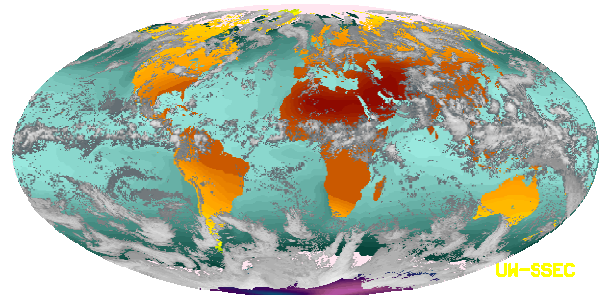
1  
August 01, 2006 00:00 UTC



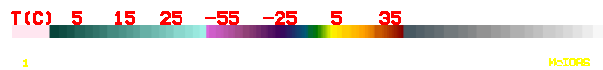
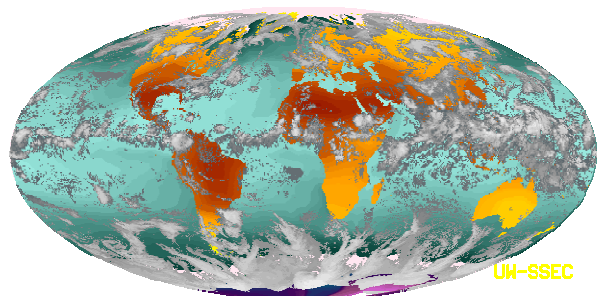
1  
August 04, 2006 12:00 UTC



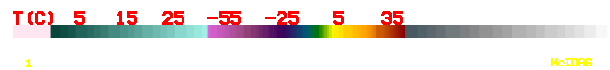
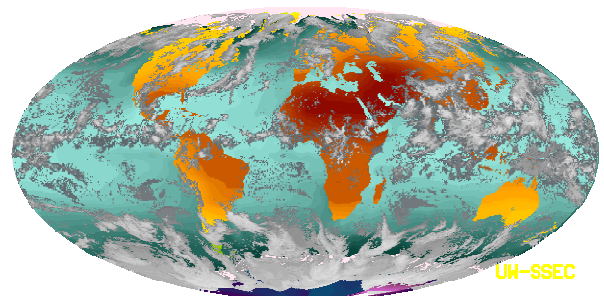
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August 07, 2006 12:00 UTC



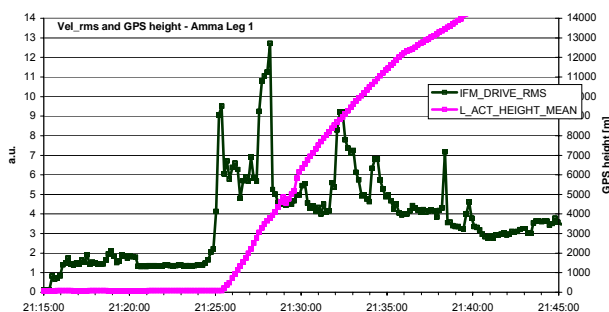
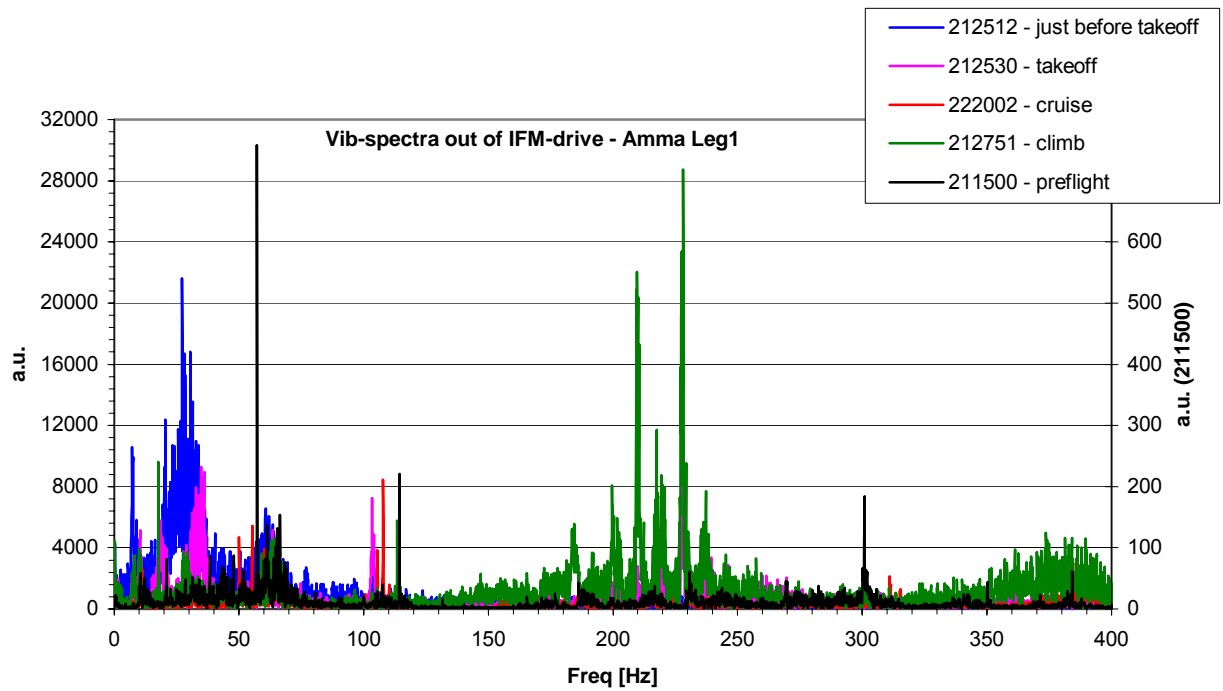
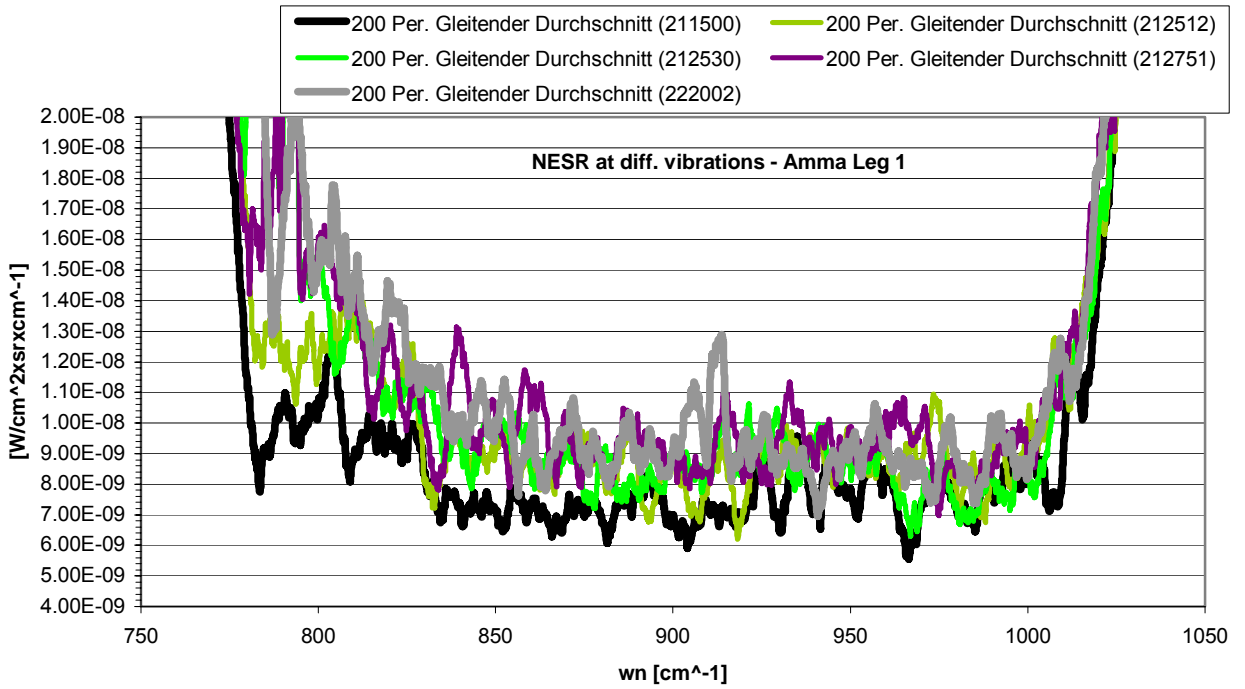
1  
August 08, 2006 12:00 UTC



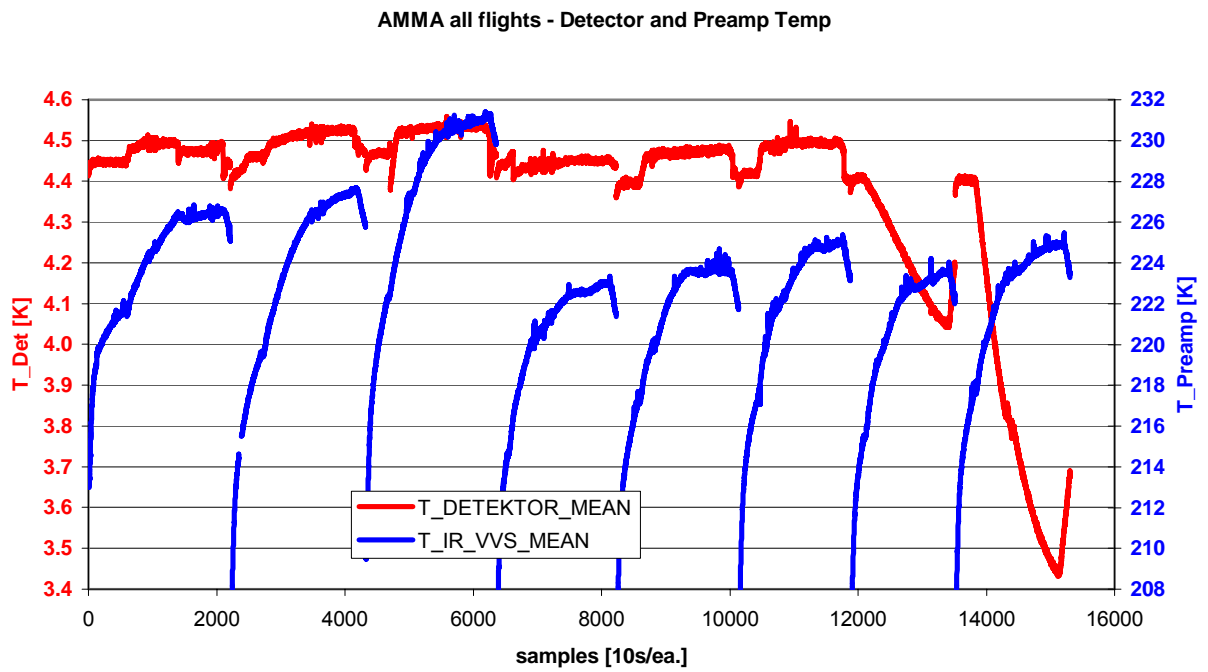
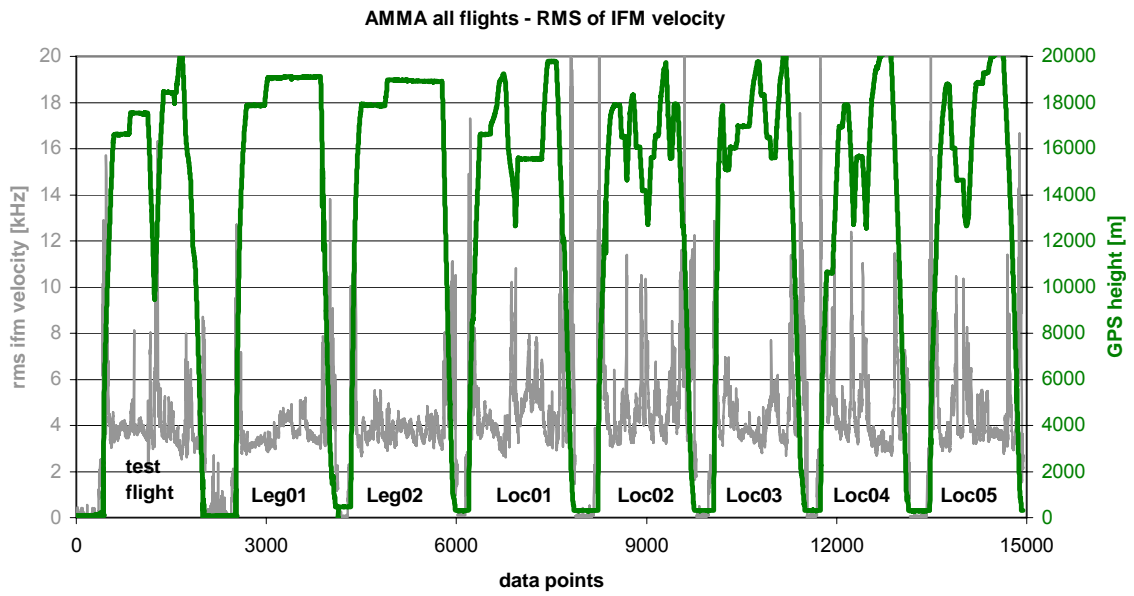
1  
August 11, 2006 18:00 UTC



1  
August 13, 2006 12:00 UTC

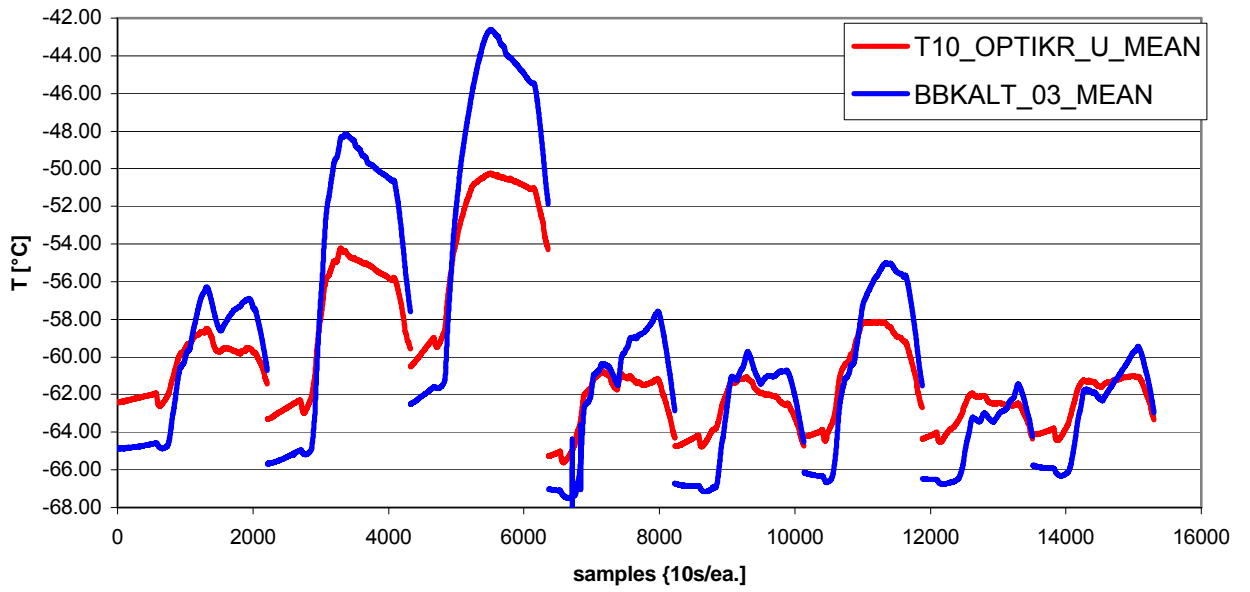


Amma transfer leg 1:  
 NESR calculations for different vibration levels – before engines on (black), on runway (blue), at take-off (mag), during climb (green) and at cruise altitude (red) – and the corresponding vibration spectra derived from the interferometer drive signal.  
 Left an overview of rms of IFM-drive vs flight altitude.

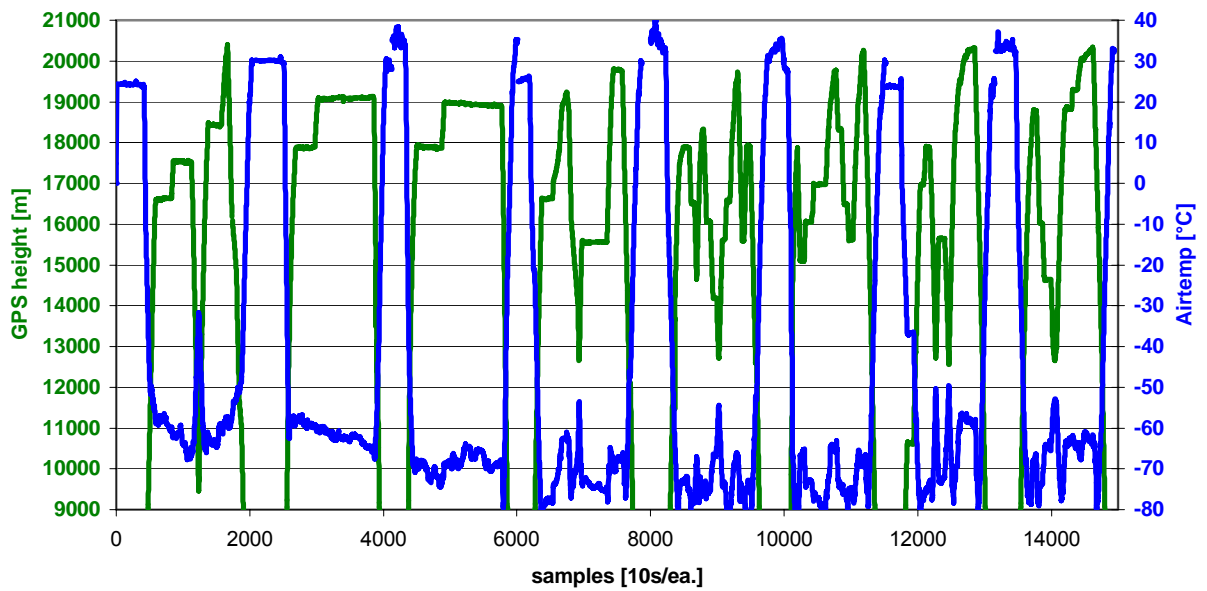




AMMA all flights - Temp BB and Instrument



AMMA all flights - Height and Airtemp



Impressions from Verona



Impressions from Ouagadougou

