

IGAS WP4-3rd Workshop Minutes



Venue: KNMI

Utrechtseweg 297
NL-3731 GA De Bilt
The Netherlands

Date: 12/13 November 2013

Attendees: Herman Smit (HS), Christoph Gerbig (CG), Julia Marshall (JM), Karin Thomas (KT), Armin Rauthe-Schöch (AR-S), Annette Filges (AF), Fabio Boschetti (FB), Shreeya Verma (SV), Johannes Staufer (JS), Philippe Nedelec (PN), Valerie Thouret (VT), Damien Boulanger (DB), Karl Beswick (KB), Geir Braathen (GB), Susanne Rohs (SR), Andreas Petzold (AP), Andreas Volz-Thomas (AV-T), Peter van Velthoven (PvV, only at 13Nov.)

Tuesday, 12.11.2013, 13:00-18:15

Notes taken by Julia Marshall

1.) Agenda introduced and adopted.

2.) Invited talk by Johannes Staufer (LSCE---IPSL, Paris): "Trajectory Matching: An effective tool to explore the consistency of different ozone data series"

HS: do you think such a comparison could be automated, given a database of ozonesondes and aircraft data. JS thinks this could be done fairly well automatically, as long as the wind fields are available. However the calculations do take some time. HS commented that the trajectories are already being calculated and stored.

AR-S asked about the availability of his thesis, which should be found online at ETHZ – JS also pointed out his two papers (currently in discussion at AMTD, Part 1 basically ready, Part 2 still being improved through review).

3.) Herman Smit (HS): Overview WP4 and Task4.1 (*Smit-IGAS-Overview-WP4 & Task4.1-1stAM-Nov2013.pdf*)

Implementation QA/QC different instruments in IAGOS

4.) Review of the Action Plan after the first WP4 meeting in Jena: Revised Action Plan (See Annex 1).

Action #1: DB prepared a factsheet about the error distribution/uncertainty of the location of the IAGOS-data and that of airports: *DONE*

(Documents in : *IAGOS_factsheet_latlon.xls & IAGOS_factsheet_latlon.doc*)

Apparently the errors are negligible, everything looks good. CG asked further about why things are disagreeing. One aircraft has both INS and GPS data available (not the other IAGOS aircraft, GPS is not available). DB will perform a comparison between these two different lat/lon measurements for this aircraft. New Action. Update on this (from the later discussion), DB points out that the GPS provides only the altitude information. AV-T asks if this could be used (at least for the one Cathay Pacific aircraft) to do a simple study, looking for a bias.

New Action 1A: Comparison of IAGOS location data obtained with INS (standard system) and GPS from one aircraft (e.g Cathay Pacific) (Lead: Damien Boulanger)

Action #2: Preparation of fact sheets on the performance of the aeronautical system of the A/C: Pressure, Temperature, Wind, Altitude, Position (lat/lon), GPS (lat/lon/alt)

Not much real progress made on this yet (although leads were determined at the meeting in January). HS is hesitant to put a hard deadline on this now, as there are higher priorities over the next couple of months.

CG asked under which task (in WP4) Action Item #2 (fact sheets about A/C measurements) falls under, i.e. who should feel responsible for this? There were no volunteers. AR-S suggested that for at least temperature and wind there are correction factors from Clemens Drüe's papers, as long as they're for the correct aircraft. AP mentioned that the EUFAR textbook contains the information about the various sensors that are used for different aircraft – surely the information is all there. CG suggested that the fact sheets don't require more than that – simply a document listing which systems are used for each IAGOS aircraft. AV-T seconded this position – it is necessary to collect and document these data. This information is needed along with all measurements. Still no one is volunteering for this. AV-T points out that PN would be a natural choice just to list what information is collected from the aircraft, which sensors are used. AR-S said that if PN provides these data sheets for the IAGOS aircraft, he would do the same for the CARIBIC aircraft. At very least PN and AR-S are going to check which information is being read from the A/C bus, to see if these are comparable. (CARIBIC is having position offset problems – MOZAIC aircraft not. Perhaps CARIBIC is reading information on the bus without INS corrections applied?)

Comparing the ARINC labels (done during the rest of the IGAS meeting) read by IAGOS and CARIBIC aircraft (PN & AR-S) showed that the same labels are read. However Dieter Scharffe (CARIBIC Team) suggested that there may be different ARINC buses on the aircraft. CARIBIC reads from the bus which is also used by the passenger information system. Maybe this ARINC bus carries uncorrected position data.

HS asks if PN can get this information from Airbus – this should have been done at the beginning of MOZAIC, but it wasn't. Airbus is not always easy to get information from. AP mentioned that it might be possible to get information about this from ICAO.

Action items, relating to Action Item #2 from the last meeting: AP will contact people from the FAA and from Airbus for specifications of aeronautic parameters. HS will contact Nico Seidel from LHT.

For time plan See Annex 1: Action #2

Action #3: Evaluation of performance of MOZAIC-T measurements made by A/C and FZJ (lead HS)

This is of particular importance for water vapour. There is some uncertainty about the internal processing of the A/C temperature sensor, and how it's corrected internally. Uncertainty now seems to be 0.5-1 K. This may not be able to improve without more information from the airline (such as True Air Speed(TAS), pressure (static & dynamic) measurements and possible corrections). Perhaps this information could be provided by the airline. CG asked about this from a traceability point of view – we need to know how these data are processed. Also, it depends on what the error is: is it purely transient during specific maneuvers, or is there some underlying difference, does the difference change when the airline updates its software, for example. AV-T turned the question around: does it matter for water vapour? HS is the PI for the water vapour instrument and the WP leader, he should decide if this is critical or not.

New time plan in Annex 1: Action #03

AV-T points out that the required temperature analysis is a precondition of the submission of the water vapour data, so the information should already be collected, even if it's not written up yet. SR says she can help him with this, and suggests dates.

Action #4: Preparation of SOPs for each IAGOS instrument by PIs

Time table has been revised (See also Annex 1: Action #04)

Parallel: Factsheets V1 as submitted just before IGAS kick-off meeting will be sorted out and give guidelines to harmonise the different factsheets (HS and MH).

Intensive discussion followed about exactly what this SOP should include – is this three or thirty pages? Is this really an operational manual, or describing the procedure for an expert audience? AV-T points out that this short SOP is sufficient for now, but at some point we'll need a more comprehensive document. For this more comprehensive document (Detailed Measurement/Processing Description) a new Action #04A with time plan created (See Annex 1: Action #04A)

Action #06 Preparation of “Guidelines for Data Storage & Archive”:

Discussion on:

Are the NRT data really deleted? GB says that yes, they generally disappear in a few days. Should these be stored as a preliminary dataset? Regarding each stored measurement data point containing a flag giving the state of processing/validation, reliability, etc. AR-S suggested instead that perhaps a flag for each timeseries would make more sense? SR said for water vapour at least, having a flag on each specific measurement makes more sense. HS asked about aerosol measurements: would there then be a flag on every bin? AP said that for aerosol data often it's sufficient to give total particle number and effective radius to describe the distribution: most users would only need this. If they want more information, they can contact the PI. KB agreed with this generally. Perhaps it would be better to have the raw data stored in the database. DB and VT confirmed that the raw data are currently stored in the database. AV-T brought up a broader question – shouldn't not only the raw data but also the scripts required to process them be stored in Toulouse? CG said that this would be ideal – the scripts should be there, and not just dumped but in a usable format, but this may well be beyond the scope of IGAS.

An intensive discussion on:

The sustainability of the IAGOS measurement systems in general: what happens when partners leave IAGOS? Are the measurements still traceable? Can these measurements still be reproduced through reprocessing? This seems to be a problem in the broader community – is there a database that gets it right? WDCGG stores only the final data, not the raw data with everything included to process them. AV-T says that as we're a small community who values long-term monitoring, perhaps we're in a position to actually do this. Perhaps the data processing should be reproducible based upon the SOP? CG says this is not possible for CO₂ – for this you need the values of the calibration tank before and after a measurement period. Shouldn't these values be stored as metadata anyhow? AV-T draws this as a stark question: does the data die with the provider? The current system says “trust me”. This is a problem for the sustainability of the data.

HS presented a brief introduction on “How to store/archive IAGOS-data” (See *IGAS-WP4-Guidelines for Data Storage & Archive.docx*). SR presented a proposal for flagging each measurement with a 3-character code. The proposed flagging system is applied by the GAW-GHG community.

There was much discussion of pros and cons. Below is a summary:

Pro: The system is already fairly well known, it would be easy enough to communicate IAGOS-specific alterations. Many modellers like this.

Con: Flags are not appropriate for IAGOS. Is large uncertainty really a problem? We'd have to communicate IAGOS-specific codes anyhow, so why not just use our own system? The middle “.” is misleading, implying that it's not sampling a plume or otherwise, as opposed to just being undetermined.

Note from 1st AM/WP4 session (Morning session at 14 Nov.2013):

“For some measurements (e.g. GHG's) a single value for the uncertainty of the measured value is insufficient to characterize the error properly, and so it is more useful to have instead a few different error terms to characterize different aspects of the error, some of which are

operating on different time scales. This seemed to make sense to some instrument PIs, but not to all – it was decided that each instrument PI should be able to determine their own error characterization, with the minimum being a single total error associated with each data point, and the number of extra error columns being instrument- and species-specific”.

Wednesday, 13.11.2013, 09:00-12:00

Notes taken by Susanne Rohs.

Task 4.2: QA/QC Procedure and its Traceability

(CG presentation: Gerbig_IGAS_1stAM & WP4 Workshop-Task4.2_Nov2013.pdf)

In preparation for each of the two evaluation meetings (@M24 and @M36) MPI-BGC will collect all QA/QC documentation of each IAGOS instrument from the respective PI responsible for the instrument. Content of QA/QC-documentation contains results from operational QA/QC following IAGOS-QA/QC procedures as determined and documented within IAGOS-ERI (including traceability of the instrument and its calibration) plus QA/QC results from internal consistency tests (Task 4.3) QA/QC results from external consistency tests (Task 4.4). After each deployment cycle: visual inspection, functional test, if needed part replacement, calibration (if relevant for prior deployment), if needed, part replacement, calibration. Important thereby is the documentation of each step into a protocol. It was decided that for the first “exercise” taking place in year 2 of IGAS we will start with existing instruments: O3, CO, H2O and NOY.

Task 4.3: “Evaluation of measurements on internal consistency”

(VT presentation -Task4.3_WP Workshop & 1stAM-13 & 14 Nov2013.ppt)

Automatic application of detection of 4D coincidences within IAGOS fleet. At present in Europe through 3 MOZAIC A/C and 2 IAGOS A/C coincidence in time now is very likely even without mapping tools. However, is this still valid because in future we don't have the main fleet in Europe anymore. Discussion on definition and validation concerning the appropriate methodology for each instruments: 2 hours, profiles, cruise altitude, Lagrangian tool, the appropriate score (number) or indicator (quality) over a time period.

Discussion on “What about the CARIBIC aircraft equipped with IAGOS-Core package?”

- High frequency internal consistency
- No doubt on the validity of the comparison (same air masses)
- Turn-around of all packages over the same routes
- 1 more aircraft in Frankfurt

Aspects to be considered:

- Possibility that the home base of CARIBIC airplane will move to Munich
- The CARIBIC airplane is old: What is the future of this aircraft.?
- Maybe moving the container to another aircraft

AVT: Installation will cost about 300.000 Euro. Even for only 2-3 years it would be low costs.

AP: We already have asked for one more aircraft on Lufthansa.

It would be a true evaluation

Christoph: It would be late for IGAS

AP: Discuss on next IAGOS-D mid term meeting with CARIBIC people

AP: there are risks but we never promised anything

Email from AP 5.12.2013: he spoke to Gerd Saueressig (LH): CARIBIC aircraft D-AIHE will probably only be in LH Service for another two years -> General agreement that this is too short to spend the money for IAGOS-core installation on D-AIHE.

Discussion back again on criteria of matching in time and space:

CG: include spatial limits, flags, classes for time and space differences

HS: in Year 2 of WP4 we have to find the bottlenecks, discuss these in the next WP4-annual meeting. Now it is time to get the QA/QC-procedures started, running them and then evaluate at the end of Year 2.

CG: we can implement trajectories but decide: Do we need them? Calculating transport is one uncertainty, but ignoring it there is the risk that one compare data from total different air masses (e.g. in case of passage of frontal system) is probably even much higher.

CG: How do we want to proceed. Concrete plan will be elaborated later in the final discussion.

Task 4.4: “Evaluation of measurements on external consistency”

(AR-S presentation-RautheSchoech_IGAS_WP4 Workshop_Task_4.4_Nov2013.pdf)

Based on CARIBIC AR-S presented some investigations of different Match scores by varying the from wide to more narrow criteria of coincidences in space and time

Discussion on Milestone MS45 : “Review of automatic application of detection of

Lead author: MPI-C Armin Rauthe-Schöch.

The document should report the current status of automated tool, and review first experiences with the tool and automated application to IAGOS data

MPI-C has the lead on this report on development of automated tool, but needs input from all partners of WP4 with following time plan (Annex 1: Action 10):

Similar time plan has been adopted by VT (UPS) for Milestone MS44 on internal consistency also due at M18 (July 2014). Here VT (UPS) will have the lead on this milestone report for Task 4.3 (Annex 1: Action 9).

Concluding discussions and update “Action Plan WP4 (Annex 1)

Action item 8: Report describing Concept QA/QC Evaluation.

HS present the outline of the outstanding deliverable report “Concept of QA/QC-Evaluation in IAGOS (CORE & CARIBIC)” (Annex-1: Action 8).

Action item 6 on data flagging:

AP: Flags have to be in a way, Flags can be understood and used => discussion WP2 and WP4 in next day’s breakout session (Annex-1: Action 6).

Action item 2 on factsheets of aeronautical parameters:

AP already got input (some information) from 1973 Temperature (in a guidance book for pilots), describes uncertainties (analyses)

Question to PN if he can extend the information of additional aeronautic parameters in the IAGOS-Core data, similar like the extended set of aeronautical parameters CARIBIC has at the present. PN:Technically possible, has to be checked with the parameters available on the ARINC-bus to which IAGOS Core can have (request to airlines) (See Annex 1: Action 2A)

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Annex 1:

Action Plan WP4 Revised November 2013

The WP4-action plan has been revised and update at the 3rd WP4 Meeting at De Bilt in November 2013 as follows

Action #01: *Damien Boulanger (DB) is going to check the location of the IAGOS data and that of airports, to see if this really isn't a problem. DB will prepare a factsheet about the lat/lon error distribution/uncertainty: **DONE***

Action #02: Preparation of fact-sheets on performance of aeronautical system of A/C to measure:

- a) Pressure
- b) Temperature
- c) Wind
- d) Altitude
- e) Geographical position (latitude and longitude)
- f) GPS (lat., long., and alt.

First draft, based on specifications presently available, will be prepared by Petzold **(01 January 2014)**

Contact Nico Seidel / LHT (Herman Smit) for LH-A/C specifications of aeronautic parameters
Contact AIRBUS and FAA (Andreas Petzold)

Date : 01 February 2014

Preparation factsheets for IAGOS-Core (Incl. MOZAIC) and for IAGOS-CARIBIC

To be done by:

1. IAGOS-Core (Incl. MOZAIC): **Lead=Smit/Petzold & Nedelec**
2. IAGOS-CARIBIC: **Lead= Rauthe-Schöch**

Time Table:

- a) Version 1 by **01 March 2014 (probably earlier)**
- b) Version 2 by **01 April 2014**
- c) Documents to be discussed (review: Andreas Volz-Thomas): Telecon for further actions

Action #2A: Select additional aeronautical parameters from ARINC data bus of A330/340

Herman Smit selects, send list to Philippe Nedelec and Armin RS to evaluate. **(15 January 2014)**

Action #03 : Evaluation of performance of MOZAIC-T measurements made by A/C and FZJ (Lead Smit)

1. Analysis and preparation of evaluation report March 2014
2. Distribution among IAGOS-PI's for comments etc. April 2014
3. Presenting and discussing results in **June 2014: Telecon when necessary**

Action #04: Preparation of SOP's for each IAGOS-Instrument by PI's

Each IAGOS-instrument PI is responsible to prepare his/her SOP-document (incl. Fact sheet)

Time table:

1. Draft SOP-document for one IAGOS-Instrument prepared by FZJ will be distributed among IAGOS-Inst-PI's: **01 December 2013** (By FZJ-Team: NOX, Aerosol, H2O)
2. Suggestions/comments for revisions on common template: 15 December 2013
3. Common template available at 22 December 2013
4. Preparation of first version SOP : **< 15. January 2014**
5. Internal review of SOP-V1: **< 01 February 2014**
6. **Telecon to get an update of the progress made with a list of external reviewers**
7. Preparation of second version SOP: **< 15 February 2014**
8. **External review < 15 March 2014**
9. SOP-V2 + Review reports will be put at IGAS-WP4 internal web page for IAGOS-Inst PI's
10. **< 15 March 2014**
11. SOP-V3 on the internal IGAS-WP4 web site. **< 01 April 2014**
12. SOP-V3 to be approved by IGAS **< 01 May 2014**

Parallel: Factsheets V1 as submitted just before IGAS-kick off meeting will be sorted out and give guidelines to harmonise the different factsheets (Lead: Smit + Hermann)

Action #4A: Detailed Measurement/Processing Guidelines of each IAGOS Component that should be supplied parallel to SOP-documents in its final form by the next annual meeting (Year 2)

1. **Draft 1: 01 July 2014**
2. **Draft 2: 01 October 2014**
3. **Final Version: IGAS-AM-2014 (November 2014)**

Action #05: Preparation of report on aspects of QA/QC of IAGOS (Lead: Smit) contributors: IAGOS-Instrument PI's)

DONE

List of IAGOS-Instrument-Observations , their PI's, Internal experts to review the draft SOP documents, incl. Fact sheets.

Instrument	PI	SOP	Internal Experts	Comments
I-Core-O3-UV	Nedelec		Zahn?	HS will ask AZ
I-Core-CO-IR	Nedelec		Gerbig	
I-Core-RH/T	Smit		Zahn?	HS will ask AZ
I-Core-BCP	Gallagher		Petzold	
I-Core-Aerosol-A/B	Petzold		Wiedensohler?/Hermann	AP will ask AW
I-Core-CO2-CRDS	Gerbig	One out of 4	Rauthe-Schöch	
I-Core-CH4-CRDS	Gerbig		Rauthe-Schöch	
I-Core-CO-CRDS	Gerbig		Rauthe-Schöch	
I-Core-H2O-CRDS	Gerbig		Smit	
I-Core-NOX/NOY-CL	Volz-Thomas		Ziereis	
I-Carb-O3-UV	Zahn		Smit	
I-Carb-O3-CL	Zahn		Smit	
I-Carb-H2O-CR2	Zahn		Smit	
I-Carb-H2O-PAS	Zahn		Smit	
I-Carb-CO-RF	Rauthe-Schöch		Gerbig	
I-Carb-CO2-WAS	Rauthe-Schöch		Gerbig	
I-Carb-CH4-WAS	Rauthe-Schöch		Gerbig	
I-Carb-Aerosols-A/B	Hermann		Wiedensohler?/Petzold	MH will ask AW
I-Carb-NOY	Schlager/Ziereis		Volz-Thomas	
<i>I-Carb-VOC</i>	<i>Zahn</i>		Volz-Thomas	

Action #06: Preparation of document „Guidelines to store IAGOS-measured data“

Time table of preparation of document „Guidelines to store IAGOS-measured data“:

- a) First draft version (V1) of document: **< 15. Nov. 2013** prepared by Smit
- b) Distributed among IAGOS-Core & CARIBIC PI's for comments, additions & suggestions **(01. Dec. 2013)**
- c) Second draft version (V2): **< 22 Dec. 013** edited by Smit
- d) Distributed among IAGOS-Core & CARIBIC PI's for comments, additions & suggestions (< 15 January 2013)**
- e) Completion of Final Version by **< 01 Feb. 2014** edited by Smit
- f) Guidelines put on the internal webpage
- g) Approval **< 15 Feb.2014**

Action #07: Who is doing what have been slightly changed. To avoid any misunderstandings Task leaders of WP4.3 and WP4.4 should harmonise the content of boths tasks :

DONE

Action #08: Preparation of a report describing the QA/QC concept of WP4 (=Deliverable 4.1).
Lead: Smit and contributions by WP4-task leaders

Outline on Deliverable Report (D4.1): “Concept of QA/QC-Evaluation in IAGOS (CORE & CARIBIC)”

Lead (FZJ, contributions MPG-BGC, UPS, MPG-C)

1. Introduction: **Task 4.1/FZJ**::
2. Routine QA/QC through protocols of : **Task 4.1/FZJ**::
 - a) Regular Calibration: Instrumental Uncertainty
 - b) Flight Data Validation: Overall Uncertainty, Flagging
3. Internal Consistency:: **Task 4.3/UPS**
4. External Consistency:: **Task 4.4/MPG-C**
5. Collecting QA/QC protocols:: **Task 4.2/MPG-BGC**
6. Evaluation of QA/QC protocols (by internal & external experts) :: **Task 4.1/FZJ**
7. Harmonisation:: **Task 4.1/FZJ**
8. Dissemination:: **Task 4.1/FZJ**

Contributions by Taskleaders: 6 December 2013

First Draft : 15 December 2013

Second Draft: 22 December 2013

Action #9: Preparation of Milestone report (MS43): “Review of automatic application of detection of 4D space coincidences within the IAGOS-fleet”

UPS (VT) has the lead on this report, but needs input from all partners of WP4 with following time plan:

1. Program automated tools and apply to IAGOS-core & CARIBIC data (15.03.2014, AR-S)
2. Provide CO & O3 & H2O & NOY PIs with first examples of matches for IAGOS internal matches including extracted data (31.03.2014, VT)
3. Collect PI experiences with matches and their results from instrument intercomparison (15.05.2014, AR-S, all IAGOS-instrument PIs involved in the QA/QC evaluation)
4. First draft of milestone report (25.05.2014, VT)
5. 1st revision of milestone report (07.06.2014, VT)
6. Submit report (25.06.2014, VT)

Action #10: Preparation of Milestone report (MS44): “Review of automatic application of detection of coincidences of IAGOS and other airborne platforms”

MPI-C has the lead on this report, but needs input from all partners of WP4 with following time plan:

1. Get NOAA GMD data and UPS trajectories (20.12.2013, CG, DB)
03.12.2013: UPS trajectories delivered by DB
2. Program automated tools and apply to IAGOS-core & CARIBIC data (15.03.2014, AR-S)
3. Provide CO & O3 & H2O & NOY PIs with first examples of matches for IAGOS internal matches including extracted data (31.03.2014, AR-S)
4. Collect PI experiences with matches and their results from instrument intercomparison (15.05.2014, AR-S, all IAGOS-instrument PIs involved in the QA/QC evaluation)
5. First draft of milestone report (25.05.2014, AR-S)
6. 1st revision of milestone report (07.06.2014, AR-S)
7. Submit report (25.06.2014, AR-S)