

GAIA-CLIM project report

September 29th 2016

Peter Thorne

With thanks to Richard Davy, Corinne Voces, Anna Mikalsen, Fabio Madonna, Karin Kreher, Jean-Christopher Lambert, Bill Bell, Joerg Schulz, Martine de Maziere



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 640276.

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GAIA-CLIM in one slide

- Aim is to improve use of non-satellite measurements to characterise, calibrate and validate satellite measurements
- Ensure best metrological practices followed in comparisons
- Principal user outcomes a Virtual Observatory tool and documentation of gaps in capabilities and remedies w/prioritisation



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Atmospheric focus

- Concentrate upon atmospheric domain as an exemplar
- Don't duplicate other projects (e.g. QA4ECV)
- Look at a subset of ECVs in which consortium have expertise
 - Temperature
 - Humidity
 - Ozone
 - Aerosols
 - Carbon Dioxide
 - Methane



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GAIA-CLIM scientific components

1. Mapping and assessing observational capabilities
2. Improving metrological characterisation of selected non-satellite measurements
3. Quantifying co-location mis-match effects
4. Using data assimilation as integrators of traceable measurements
5. Serving match-ups with uncertainties via a Virtual Observatory



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Which products/services have become operational or nearly operational during the course of the project?

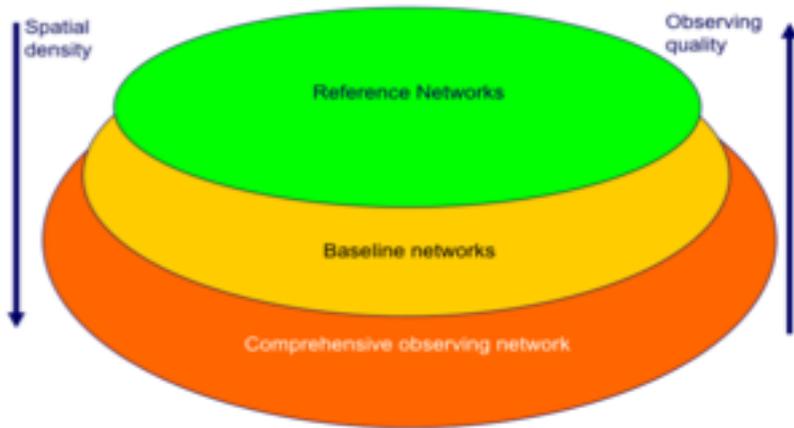
Editor's note: We are only half way through the project thus far and most products / services are envisaged for delivery in the second half ...



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1. Sub-orbital measurement maturity assessment and metadata



Defined three fundamental measurement quality tiers

Extension of CORE-CLIMAX CDR maturity assessment to assess measurement maturity

Measurement maturity assessment completed for >40 candidate high-quality networks

Discovery (WIGOS/ISO19115) and measurement (ESA CCI -CF / WIGOS) metadata collected

Metadata	Documentation	Uncertainty characterization	Public access, feedback and update	Usage	Sustainability	Software (optional)
Standards	Formal Description of Measurement Methodology	Traceability	Access	Research	Siting environment	Coding standards
Collection level	Formal validation report	Comparability	User feedback mechanism	Public and commercial exploitation	Scientific and expert support	Software documentation
File level	Formal measurement series user guidance	Uncertainty quantification	Updates to record		Programmatic support	Portability and numerical reproducibility
		Routine quality management	Version control			Security
			Long term data preservation			
Legend						
1	2	3	4	5	6	Not applicable



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1. Sub-orbital measurement maturity assessment and metadata

- Service available via CNR partner in restricted mode presently
- Service to be integrated into the Virtual Observatory
- Paper to be drafted in Q4 2016 on the tiered system, assessment approach and assessment results.

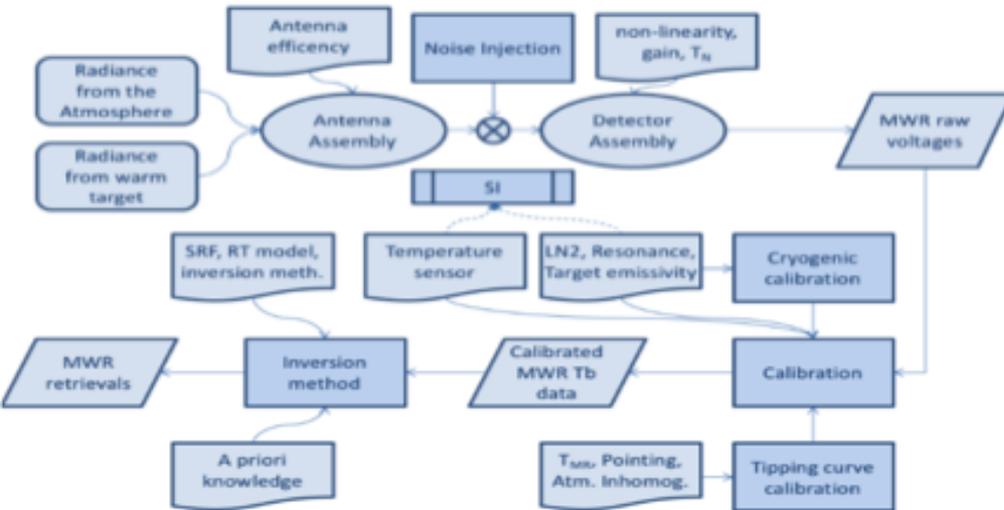


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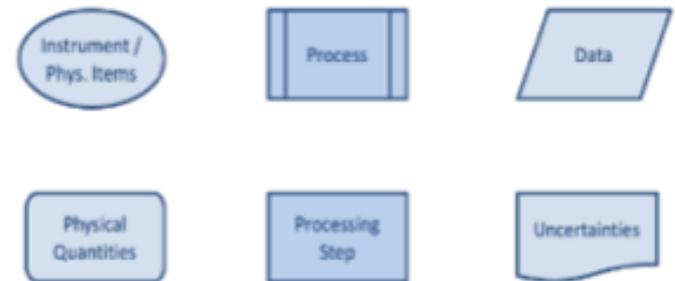
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2. Traceability chains

MWR measurement: Metrological Model Chain



GAIA-CLIM convention



As a first step to the production of metrologically traceable estimates traceability chains have been produced for: various lidars, MWR, FTS, UV/vis, MAX-DOAS / Pandora, and GNSS-PW

Working to make more interactive (would like to have some consistency w/QA4ECV and FIDUCEO in how presented and explorable – role for C3S to ‘operationalise’ provision?)

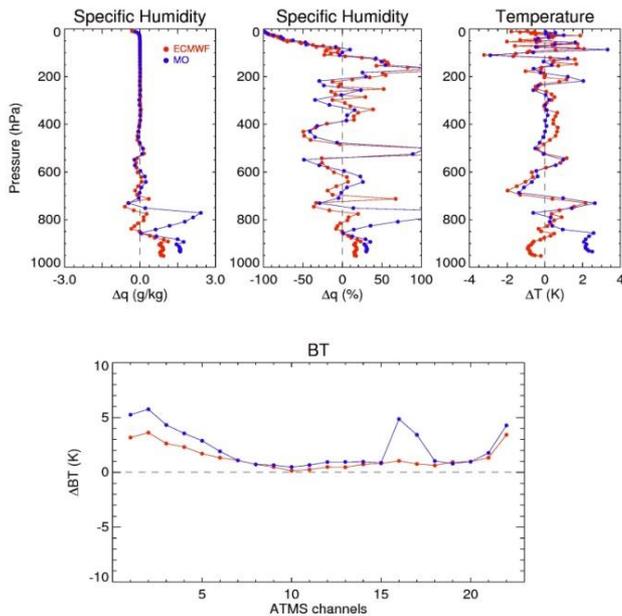


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3. GRUAN data processor

NWP-RS_{GRUAN} LAU 2015010618



Takes a GRUAN Vaisala RS92 radiosonde measured profile, which includes a metrologically traceable uncertainty estimate at every point in the profile.

Converts the profile and its uncertainty into an equivalent TOA radiative profile (level1b equivalent) and uncertainty (note assumptions about non-T,q,P components necessary).

Enables a comparison between the satellite and GRUAN measurement both at geophysical and radiance spaces.

Work with GRUAN ongoing to better account for systematic / random / structured random terms (c.f. FIDUCEO talk yesterday) in the GRUAN uncertainty.



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4. Gap Assessments and Impacts Document

Gap reference list

View Edit

Content Access:
Public Content

Gap reference list

This is the full list of gaps identified in GAIA-CLIM to date, with a SMART analysis of each gap. Details of how and when such *SMART* remedies may be addressed for each gap are included in the full descriptions. The gaps each have unique gap identifier numbers of the form: X.XX, and full descriptions can be found at gaia-clim.eu/wiki/gX.XX; or by following the links below:

Gap identifier	Gap name
G1.02	Unknown suitability of measurement maturity assessment
G1.03	Missing evaluation criteria for assessing existing observing capabilities

G1.02

View Edit Revisions

SUBMITTED BY RICHARD DAVY ON 8 AUGUST, 2016 - 18:01

G1.02 Unknown suitability of measurement maturity assessment

Gap detailed description

Ensure that the measurement maturity assessment prepared by GAIA-CLIM is readily applicable to all reference, baseline and comprehensive networks, and is beneficial to identify shortcomings in the practices applied by network operators. The maturity assessment involves assessing against 7 major strands such as metadata, uncertainty quantification and sustainability, as outlined in D1.3. This assessment, in the context of Task 1.2, has now been carried out for a number of target GAIA-CLIM networks and ECVs, but it should be applied more broadly to other ECVs and measurement domains if it is to extend its utility. Testing needs to be performed and may result in a subsequent need for revision of D1.3 accordingly either within or after the project.

Activities within GAIA-CLIM related to this gap

Task 1.2 has undertaken an assessment of the measurement maturity matrix for in excess of 50 measurement networks of relevance to GAIA-CLIM. These analyses are in the process of being analysed by Task 1.2 participants and shall be the subject of a deliverable due in M18 of the project.

Gap remedy(s)

Remedy

Specific remedy proposed

Application of the measurement maturity matrix exercise to a number of networks and domains to assess suitability for purpose and gain broader buy-in to the concept and its scientific value.

Measurable outcome of success

Living 'document'

Identifies and assesses gaps in knowledge, capabilities, governance etc. for non-satellite measurements to be useful for satellite characterisation

3rd version -> web-based and interactive

<http://www.gaia-clim.eu/page/gap-reference-list>

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Which products/services still require development work?



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Things yet to come

- Virtual observatory allowing users to explore and download co-locations between satellite and non-satellite measurements (initial version will be available in November at 2nd users workshop)
- Assessment of geographical gaps in the non-space observing system and their impacts
- Tools to quantify co-location mismatch effects for a range of ECVs and using a range of approaches to the problem
- Improved metrological characterisation of a range of instruments leading potentially to additional comparisons with satellite measurements



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What are the further research needs?



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Final deliverable: Prioritised recommendations

- Final output of the project shall be a prioritised set of recommendations as to future needs, including but not limited to, research needs.
- Will be driven off the version of the Gaps Assessment and Impacts Document as it stands at that time.
 - So, value in getting your input into the GAID document now!
- Drafting to start 3/17 (NUIM lead)
- Shall benefit from input on an advanced draft to be made available to a third user workshop to be held late in 2017



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Some needs already obvious

- Addressing issues around governance of non-satellite measurements
 - Includes instigating high-quality measures in the usual problematic areas
- How to use metrologically traceable measurements in a smart way in data assimilation
- Expansion to remaining atmospheric ECVs and other domains
- Further work on metrological characterisation of several non-satellite techniques to attain traceable uncertainties



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C3S / Copernicus contributions

- CNR led a proposal to recent C3S ITT under Lot 3 – provision of baseline and reference quality measurements to the CDS (decision pending)
- Within EUMETSAT-ECMWF Copernicus contract there is an option that could be exercised to make the Virtual Observatory operational (dependent upon deemed success or otherwise which will only be able to be determined late 2017/early 2018)
- Further exploration expected at joint day with FIDUCEO and Copernicus in week of 6/2/17 when both GAIA-CLIM and FIDUCEO will hold GAs in Reading (ECMWF to host our GA and the joint day) – details TBC



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User input

- User interactions are key if useful, useable outcomes to accrue
- Gaps assessment now online and shortly to have comments option enabled
- Virtual Observatory early version will be available at 2nd User Workshop late November
- 2nd User Workshop will focus on gaps document and VO.
 - Travel support available



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Thanks for your attention

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2nd User Workshop Nov 21st-24th, BESPAs,
Brussels

Register @ <http://events.oma.be/indico/event/16/>



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