

GAIA-CLIM gap analysis and prioritisation activity



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 project – the what

- Improving use of non-satellite data to characterise satellite data
- Aims to ensure best metrological practices followed
- Makes use of statistical, modelling and data assimilation tools
- Principal user outcomes
 - (1) A Virtual Observatory ('VO tool')
 - (2) Documentation of gaps and remedies with prioritization



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GAIA-CLIM scientific components

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



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Gaps assessment and associated recommendations in GAIA-CLIM

The Gaps Assessment

... serves to identify gaps and formulate potential *remedies* to a set of identified key user needs

The recommendations document

... serves to identify and communicate a set of key recommendations for future work arising.



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Gaps assessment and impacts document



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What is a gap?

Here we use gap in a holistic sense to describe any potentially resolvable factor which serves to limit our ability to use non-satellite records to characterise, calibrate and validate satellite measurements. Examples would include aspects such as:

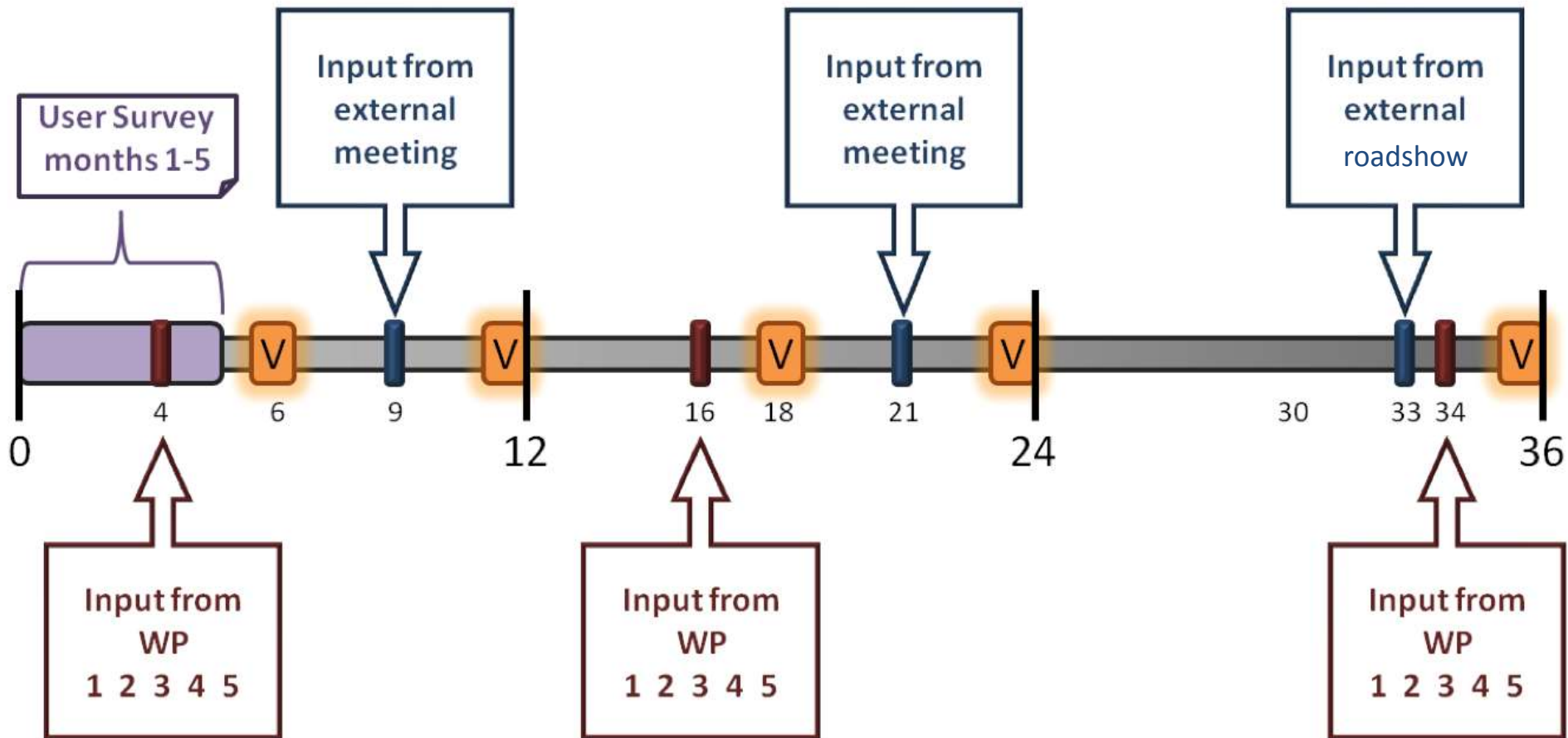
- Inadequate spatial or temporal data coverage
- Inadequate knowledge of data uncertainties
- Spectroscopic knowledge limitations
- Data provision and discovery challenges
- Shortage of necessary skills
- Inadequate user support



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Gaps co-creation



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Gaps assessment

The GAIA-CLIM gap assessment process has evolved over time

- Step 1 (2015)** Identification of unfulfilled user needs (gaps)
What are key issues for users of non-satellite measurements?
- Step 2 (2016)** The formulation of remedies
How to resolve these gaps practically?
- Step 3 (2017)** Review and consolidation of the user needs and the proposed remedies and further prioritization
Collection of reviews by stakeholders (NOW)



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Gaps assessment

GAID - Gaps Assessment and Impacts Document – A living document

<http://www.gaia-clim.eu/page/gaid>

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

⇒ The possibility exists to interact with the project team and provide your comments online on the formulated user needs and proposed remedies via the wiki function

Important Note A gaps assessment builds on the existing knowledge and infrastructure. Care should be taken not to accidentally create new gaps while resolving the identified gaps



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Cross-sections through the gaps and proposed remedies

As provided in GAID and catalogue

Gaps

- Gap Type
- Instrument technique
- ECV
- Validation aspects addressed

Remedies

- Remedy Type
- Relevance / Outcome of Success
- Scale of Work / Time bound / Costs
- Potential actor(s)



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Gap types and remedy types

As provided in GAID and catalogue

Gap types

- Gaps in Spatiotemporal Coverage
- Gaps in the Coverage of the Vertical Domain and/or in Vertical Resolution
- Gaps in the Measurement Uncertainty
- Gaps in the Comparator Uncertainty
- Technical gaps
- Parameter gaps
- Governance gaps

Remedy types

- Technical work
- Laboratory work
- Scientific research
- (Instrument) Deployment
- Governance
- Education/Training



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Example gaps with proposed remedies (1)

G1.10 - Relative paucity and geographical concentration of *reference* quality measurements, with limited understanding of uncertainty in remaining measurements, limits ability to formally close satellite to non-satellite comparisons

Remedies proposed (1 and 2)

(R1) Improved characterisation of high quality instrumentation (scientific)

Developments for the improved metrological understanding for a broad range of instrumentation

(R2) Steps to realise benefits of a system of systems approach to observing strategies (scientific)

Better propagating information across observing networks



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Example gaps with proposed remedies (1)

G1.10 - Relative paucity and geographical concentration of *reference* quality measurements, with limited understanding of uncertainty in remaining measurements, limits ability to formally close satellite to non-satellite comparisons

Remedies proposed (3 and 4)

(R3) Improved quantification of the impacts of geographical gaps (technical)

Robust scientific basis to assess the impacts of current gaps to aid decision makers in deciding how and where to expand reference network capabilities

(R4) Instigation and propagation of high quality reference network research infrastructures in data sparse regions (deployment)

Paucity of high-quality reference network observational infrastructures in many areas of the globe for reasons of logistics, skills, geopolitics, and funding etc.



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Example gaps with proposed remedies (2)

G6.12 - Under-capacity of workforce to exploit satellite data and satellite characterisation

Remedies proposed

(R1) Undergraduate, masters and doctoral training programs in Copernicus-relevant programs (Education/training)

The exploitation of Copernicus data and services requires the training of a competent workforce of data providers, analysts, managers and service provision experts

(R2) Instigate formal qualification of competency in provision of Copernicus services (Education/training)

Ensure that users can be confident of competency of service provider to deliver relevant information services



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Anatomy of a gap trace (1)

Gap title – self describing, clearly denotes a gap

Gap abstract – short summary of the principal nature of the gap

Part 1 – Gap description

- Primary gap type
- Other gap types (if applicable)
- ECVs impacted
- Users / application areas impacted
- Non-satellite instrument techniques involved
- Related gaps
- Detailed gap description (free text)
- Operational satellite missions or space instruments impacted
- Validation aspects impacted
- Expected status after GAIA-CLIM



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Anatomy of a gap trace (2)

Part 2 Benefits to resolution and Risks to non-resolution

- Table driven entries

Part 3 Gap remedies (repeated fields for each remedy)

- Primary gap remedy type
- Secondary gap remedy types
- Specific remedy proposed (free text)
- Relevance (free text)
- Measurable outcome of success (free text)
- Expected viability
 - including TRL if applicable
- Scale of work
- Time bound to remedy
- Indicative cost estimate
- Potential actors



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Questions to you, the users, on GAID

Gaps

- Are there missing gaps?
- Are there gaps which are not true gaps?
- Is there a better formulation of key user needs?

Remedies

- Are remedies appropriate?
- Are there additional potential remedies which should be catalogued?
- Other suggestions for potential actor(s)



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Feedback offline later

Your feedback invited directly in the *online* catalogue of gaps

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



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Towards a final set of recommendations for subsequent work arising from GAIA-CLIM



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What is this and who is it for?

- The funding call explicitly requested a set of recommendations for future work be delivered to the Commission
 - Should be useful more broadly to other funders, space agencies, science community
- Recommendations should constitute actionable and justified suggestions for future work in the domain of GAIA-CLIM
- Document should be accessible and traceable to the underlying Gaps Analysis and Impacts Document process



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Timeline

- Presently in process of creating a draft for use in a planned outreach activity (if you want us to visit your institution to discuss with colleagues over Sept – Nov let us know)
- During this outreach activity we shall gather feedback on the set of recommendations and approach and change as necessary
- Internal to project discussions and redrafting Dec – Feb
- Delivery to Commission of a final set of recommendations in Feb 2018



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The starting point ... GAIDv4

We have earlier discussed the Gaps Analysis and Impacts Document which constitutes an attempt at comprehensively cataloguing remaining challenges in use of non-satellite data to characterise satellite data.

- 43 gaps
- >50 proposed remedies
- Structured by various cross-sections which enables exploration and exploitation

BUT ...


- No explicit prioritisation of what should happen next
- No attempt to pull out common threads



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Options for drafting

- Show all 50-odd remedies contained in the GAID, perhaps reordered and clustered
 - Unwieldy
 - No prioritisation
- 
- Elevate solely a subset of the proposed remedies within the GAID
 - Retains a direct trace to the GAID
 - Requires some way to prioritise that is defensible
 - Will leave many aspects covered in the GAID without a place at the recommendations table
 - Attempt to synthesize gaps and remedies to a smaller subset of recommendations
 - Less direct trace to GAID
 - Larger proposed units of work
 - Draws out potential common strands



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For now ... synthesis approach

- 11 common strands have been identified and pulled out as the basis for a set of recommendations
- Trace to GAID underlying gaps clearly documented
- Each recommendation presently 'capped' at two pages
 - Move these to appendix and replace with even shorter syntheses?
- Minimum amount of front and back matter required to justify the recommendations and approach taken



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Recommendations (1)

Recommendation title	Pertinent GAID gap traces
Education and training	
Maintaining and further developing a workforce competent in EO data characterisation and downstream applications to support Copernicus activities	G6.12
Non-satellite data quality and availability	
Improve the metrological characterisation of a range of non-satellite measurement techniques: Striving for traceable, reference quality, measurement series	G1.10, G2.08, G2.11, G2.12, G2.13, G2.18, G2.22, G2.26, G2.27, G2.30, G2.31, G2.34, G2.36, G5.07
Augment and reconcile existing spatial coverage of reference quality observational networks to be more globally representative, including a range of surface types and climate zones	G1.10, G2.06, G2.10, G6.02
Better match non-satellite and satellite scheduling coherency to minimise co-location uncertainty effects, and ensure timely exchange of match-ups	G5.11, G6.03, G6.06
Instigate and sustain access to a comprehensive set of harmonised reference data and metadata holdings under a common data model and open data policy that enables interoperability for applications	G1.06, G5.01, G6.07



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Recommendations (2)

Observational network governance	
Take steps to reassess, improve coordination of, and rationalise the ecosystem of, high quality observing networks	G6.01, G6.07
Understanding of geophysical to radiance measurements	
Improve knowledge of fundamental spectroscopy and undertake associated innovations in Radiative Transfer modelling	G2.26, G2.27, G2.37
Improve quantification of the effects of surface emissivity to reduce uncertainties in satellite data assimilation and satellite to non-satellite data comparisons	G4.08, G4.09, G4.10
Development and provision of tools that convert non-satellite reference quality measurements to TOA radiance equivalents with associated rigorously quantified uncertainties	G4.01, G5.09
Understanding and quantifying irreducible co-location effects	
Improved basis required for assigning co-locations and quantifying rigorously the associated uncertainties, including steps towards operational provision of co-location uncertainties	G3.01, G3.02, G3.04, G3.05, G3.06
Provision of user tools that enable exploitation	
Operationalise a co-location match-ups visualisation and extraction tool, such as the GAIA-CLIM Virtual Observatory, to ensure user accessibility to satellite to non-satellite match-ups	G1.05, G5.01, G5.06



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Structure of each recommendation

Title

Underlying GAID trace

Issue to be addressed

Risks to non-resolution

Benefits to resolution

Possible pathways to resolution (multiple entries permitted)

Resolution title

Free text description

Viability

Scale

Timebound

Investment

Potential funding actors

Potential actionees



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What do we need from you?

Feedback!

Are those issues that are important to you and your work captured within the proposed set of recommendations?

Are there work programs raised to recommendations that, in your view, are either already being done elsewhere or are unnecessary?

Are the recommendations structured in a way that reflects the scientific needs and may be used to inform future funding decisions?

Should we reconsider the approach adopted to bridging between the underlying GAID and the recommendations document?



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