H2020 GAIA CLIM

WP2 – Product traceability uncertainties & nomenclature guidance document

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Activity summary

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- First iteration of the traceability chains on GAIA CLIM website
- Second version of the guidance document circulated
  - Practical guidance on the product traceability uncertainty document
  - Contribution element table template
  - Product traceability uncertainty summary
  - Impact of traceability confidence assessment
- GRUAN RS92 example in preparation
- Go/No Go criteria for VO inclusion

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Types of uncertainty chain

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- **Physical Model** – This model considers the real-world physics situation or instrument processing chain to L0 instrument raw data
- **Processing Model** – This model considers how the raw L0 data collected is processed to provide the end product, through calibration to the final geophysical parameter
- **Metrological Model** – This model considers the calibration, or linkage, of a measurement or processed data to a reference

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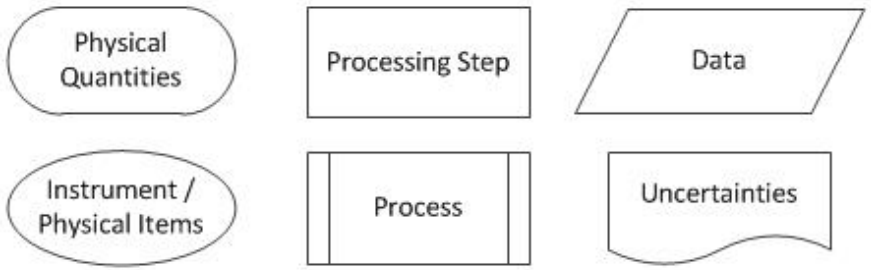
Traceability chain

- The Product Traceability Uncertainty (PTU) chain is a single chain, pulling together all the elements and information from the 3-model method
- A single PTU chain is to be presented in the product uncertainty document
- Representation of the chain



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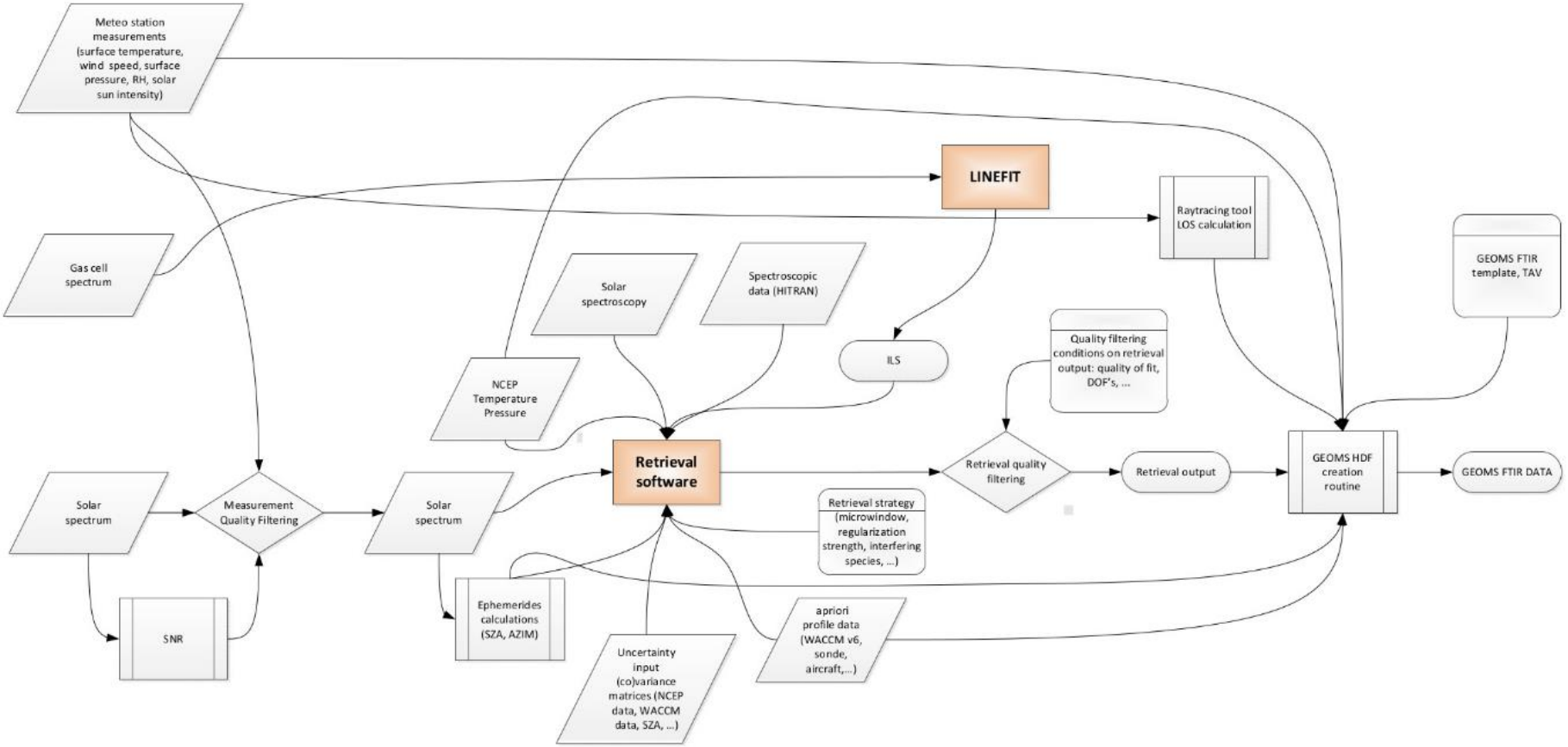
FTIR example



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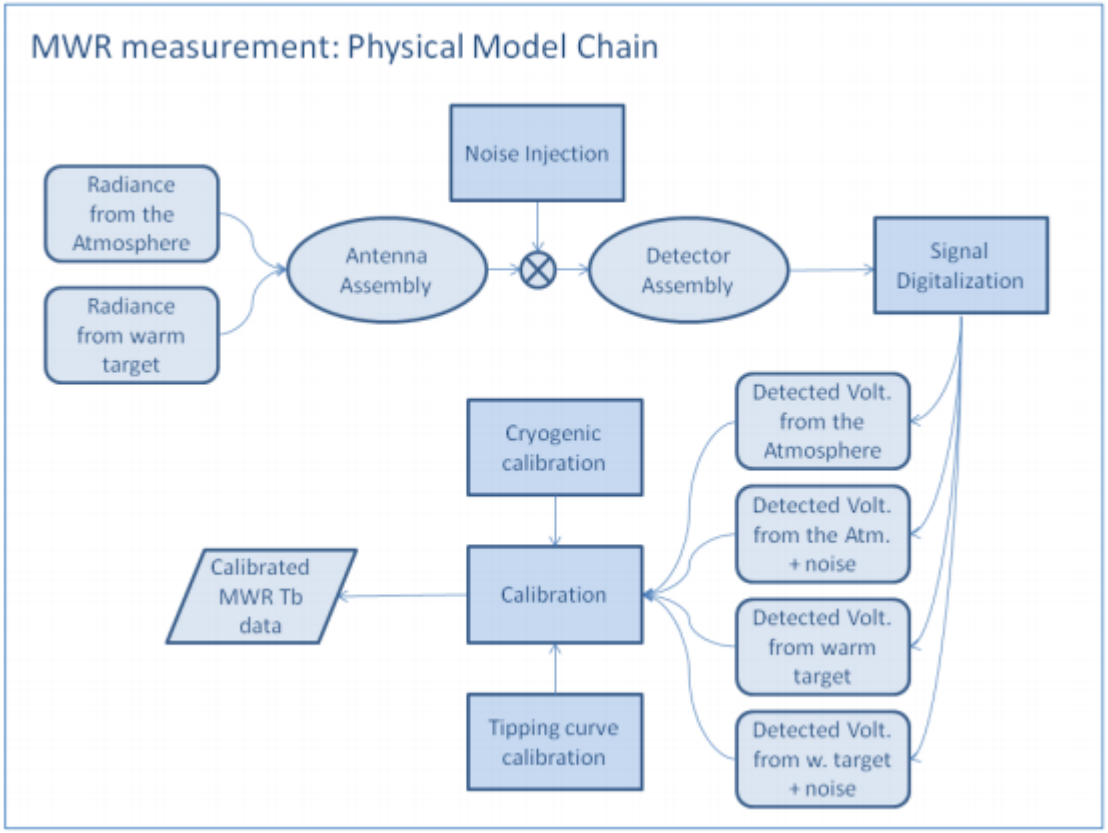
MWR example



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GAIA CLIM traceability chains – identify product

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Product name: In-situ radiosonde RS92
Product technique: Capacitive temperature sensor
Product measurand: Temperature
Product form/range: profile (ground to 30km, 1sec sampling)
Product dataset: GRUAN Reference level sonde dataset
Site/Sites/Network location:

- Lindenberg, Germany 52.2100 °N, 14.1200 °E, 98.0 m
- Sodankylä, Finland, 67.3700 °N, 26.6300 °E, 179.0 m

Product data range: Jan 1 – Dec 31, 2014
Providing Institution: Meteorologisches Observatorium Lindenberg & Ilmatieteen laitos
Contact name/email: Paul Green, paul.green@npl.co.uk

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Product traceability uncertainty chain assessment

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- Reference to previous work/documentation should be made where relevant, but this should not detract from the independence of the GAIA CLIM measurement document. The PTU document needs to be stand alone, so understood if read in isolation from the referenced material.
- Identify any site-to-site or user-to-user variation in procedure and observing practice from nominally identical instruments. Therefore, make an assessment of comparability through usage.
- Each element should have a summary table of knowledge and traceability including an estimate of contribution magnitude.

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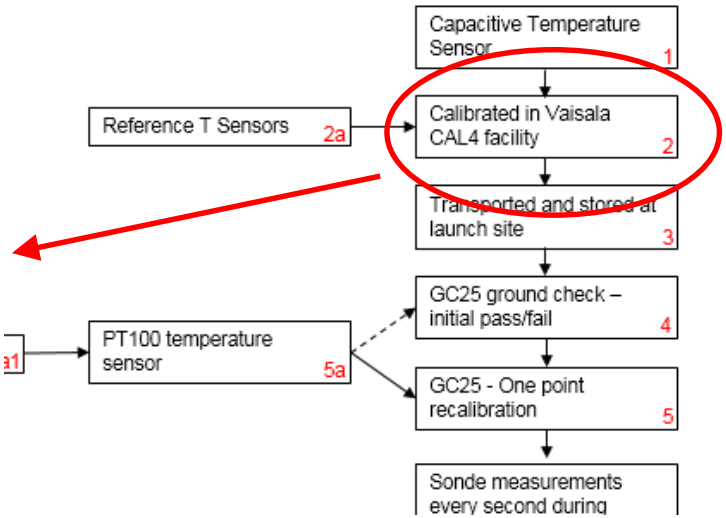
Element contribution table example

5.2 **Calibrated in Vaisala CAL4 facility (2)**

The CAL4 contains PTU reference sensors that are recalibrated at regular intervals against standards that are traceable to NIST (for pressure and temperature) and its Finnish equivalent, MIKES (for humidity). The respective operating ranges and accuracies of the PTU sensors are 3 (±0.6) to 1080 (±1) hPa, –90 (±0.5) to 60 (±0.5) °C, and 0 (±5) to 100 (±5) % RH, respectively (Vaisala, 2007).

See [1]

Information / data	Type / value / equation	Notes / description
Name of effect	Vaisala CAL4 facility calibration	
Contribution identifier	2	
Measurement equation parameter(s) subject to effect	Temperature product	
Contribution subject to effect	Temperature product	
Element correlation form	none	
Time correlation form	none	
Units element correlation	K	
Units time correlation	K	
Scales element correlation	1	
Scales time correlation	1	
Uncertainty PDF shape	Normal	
Uncertainty	±0.15	
Uncertainty units	K	
Sensitivity coefficient	1	
Correlation(s) between affected parameters	None	
Cross-contribution correlation(s)	None	
Element/step common for all sites/users?	Yes	
Traceable to …	2a - reference T sensor	
Validation	Inter-comparison studies.	



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PTU chain summary table

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Element identifier/ name	Uncertainty contribution magnitude	Traceability level (L/M/H)	random, structured random, quasi-systematic or systematic?	Correlated to? (Use element identifier)
2	±0.15K	H	random	none
3	$(\Delta T_{GC25}/3)^2$	H	Systematic (over ascent)	5a
2&3	$\sqrt{u_c(\mathrm{cal})^2 + (\Delta T_{GC25}/3)^2}$	H	Systematic (over ascent)	none
8b2	±0.05K	M	quasi-systematic	2
9a1	< 0.03K	M	quasi-systematic	2
1	Std deviation	H	random	none
8a1	$2 \cdot \Delta T/\sqrt{3}$	M	random	none
8a2	$\frac{1}{2\cdot\sqrt{3}}\lvert I_a^{\text{clear sky}} - I_a^{\text{cloudy}}\rvert$	M	Systematic (over ascent)	none
8a2	$\Delta T \cdot u_c(I_a)/I_a$	M	Systematic (over ascent)	none
8a4	±1 m/s	M	quasi-systematic	Altitude product
8a4	$\Delta T \cdot u(v)/v$	M	quasi-systematic	Altitude product
9a2	<0.2K	M	Systematic (over ascent)	none
TOTAL				

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Impact of traceability confidence calculation

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- Traceability level: A description of the traceability associated with this element

Traceability Level	Descriptor	Multiplier
High	SI traceable or globally recognised community standard	1
Medium	Developmental community standard or peer-reviewed uncertainty assessment	3
Low	Approximate estimation	10

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Impact of traceability confidence calculation

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2&3	$\sqrt{u_c(cal)^2 + (\Delta T_{GC25}/3)^2}$	H	Systematic (over ascent)	none
8b2	±0.05K	M	quasi-systematic	2
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1	Std deviation	H	random	none
8a1	$2 \cdot \Delta T/\sqrt{3}$	M	random	none
8a2	$\frac{1}{2\cdot\sqrt{3}} \lvert I_a^{\text{clear sky}} - I_a^{\text{cloudy}} \rvert$	M	Systematic (over ascent)	none
8a2	$\Delta T \cdot u_c(I_a)/I_a$	M	Systematic (over ascent)	none
8a4	±1 m/s	M	quasi-systematic	Altitude product
8a4	$\Delta T \cdot u(v)/v$	M	quasi-systematic	Altitude product
9a2	<0.2K	M	Systematic (over ascent)	none
TOTAL				

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GAIA CLIM Product VO Go/No-Go checklist

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GAIA CLIM Product VO Go/No-Go checklist

This document acts as a checklist of the essential requirements of a product needed to attain reference-grade status. Its completion, and independent verification, is a necessary milestone in demonstrating is suitable for inclusion in the GAIA CLIM VO.

Product name: .....
Product technique: .....
Product measurand: .....
Product form/range: .....
Product dataset: .....
Site/Sites/Network location: .....
Product data range: .....
Providing Institution: .....
Contact name/email:.....

Checklist version:.....

Checklist item	Completed Yes/No	Reference/Link/Comment
Complete specific product traceability chain (§2)		
Assess product traceability chain (PTU) according to the GAIA CLIM guidance (§3)		
Produce paper describing contributing uncertainties.		
Produce technical document describing how to make the measurement		
Identify sites using this specific method and the data period covered.		
Has the impact of traceability confidence of the element uncertainties been assessed, according to the guidance?		

Checklist completed by: .....date .....

Checklist reviewed by: .....date .....

Accepted for VO	

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Timescales

- D2.5 report due Feb 2017
- T2.1.x first drafts of PTU for mid-March 2017
- Potential visits to T2.1.x partners March/April 2017
- T2.1.x final drafts of PTU & Completed Go/NoGo assessment for end May 2017
- Feed to WP5 VO June 2017
- D2.6 for December 2017.

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