GAIA-CLIM GA Feb 2017
Plenary Discussion #3

How do we present uncertainties ?

Arndt Meier + many ideas from other people

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

Levels of detail & sophistication

- WP2 has set the scene for the instrument or observation method and instrument scientists by and large speak the same language and it is fairly straightforward to decide what needs to be done even if this is often difficult to do **right** and to go the whole nine yards…

- WP3 has set the scene for all the additional aspects of uncertainties when we are comparing apples with pears, i.e. when we compare observations from different instrument (types) that do not coincide exactly in space and time.

- …and as if this wasn't enough already, WP5 throws yet another spanner into the wheel

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

Levels of detail & sophistication

- What level of detail do we want to provide to the user?
- How and how far can we “dumb it down” that even a non-specialist can use VO products without mis-interpreting them?
- We may not be able to make it fool-proof and that may not be a desirable goal anyway
- but for an at least half-intelligent investigator do we want to provide
    - total uncertainties
    - statistical and systematic errors
    - and if yes, how do we handle structured random errors?
    - the full detail of error budgets?
    - or grouped by source: reference, satellite, and collocation?
    - or grouped differently? Instrument signal, spectroscopic data, inversion model used, other auxiliary data (pT profile), …. ?

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

And how do we visualise this?

- if we have total columns with say statistical and non-statistical errors then we can plot time series with shaded envelopes of certain levels of confidence
- if we have 20 different sources of errors then this might give a crowded graph that may not be easy to read or even usable
- and if we are dealing with profiles, then graphs become more complicated
- do we plot altitude ranges where there is no sensitivity? Or do we just flag that or shade it?
- what vertical grid do we use ? Interpolated to “standard” levels? The levels of the reference instrument? And if the latter is not the same across all measurements of this type?
- What “standard” levels do we adopt? The same for all instruments or ECVs?
- Or are we better off using splines as shown by FF?

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

And how do we visualise this?

- Do we want geographical mapping ability? Per site? Per latitude band?
- 3D visualisation where colour reflects the magnitude of uncertainties?
- The user can make smart interpretations by selecting his or her data set in a smart way; e.g. to compare dusk versus dawn observations, wind directions, inside/outside polar vortex etc.
- Uncertainty becomes just another dimension of the data'... so how difficult it is to visualise depends on how many dimensions you already have...

- Water vapour: we do not have beautiful LUTs from OSSMOSE – so how do we get reliable uncertainty information in this case?
  - Do we grab 5 time steps from the NWP centered around the reference observation on a 10x10 degree area around it so we can derive some kind of estimate based on the variability of humidity fields?

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

And how do we visualise this?

- More ideas?
- Use colour saturation as an indicator of overall confidence ?

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