Some comments and questions to network design for atmospheric monitoring in ICOS RI

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What are the main questions to be answered by ICOS RI from the perspective of

1. Observers
2. Modellers
3. Politicians & the public

1. Observers:

- What are the signals that we are interested to monitor at the measurement stations (e.g. clean marine or continental reference levels (coastal, high mountain), large scale "natural" ecosystem fluxes, regional scale managed ecosystem fluxes, fluxes from urban areas, fluxes from industrial areas, others)?
- What is the main (e.g. 80%) footprint of the station, possibly depending on height a.l.g.?
- Can one station serve to monitoring more than one influence area?
- How accurate and compatible do observations need to be?
- How can different source influences be separated within one single record or combining different trace substances?
- Others …

Practical:

- How to choose optimal (national) sites from a suite of M out of N potential (M<<N) stations, and, at the same time, serve best the goal of optimal European coverage?
- What are the best height levels to sample (vertical resolution)?
- What is the best strategy for discrete/integrated sampling (e.g. of isotopes) for source apportionment?
- Others …

2. Modellers:

- How can we monitor all major European fluxes with an optimal (i.e. cost effective) network of observations?
- What are the optimal height levels to be sampled?
- How well do recent models perform at the individual stations?
- Which additional observations are needed to validate model performance (e.g. mixing height, radon or other transport tracers, …)?
- Which additional tracers must be implemented in the models for (carbon, others?) source apportionment?
- How accurate do model-derived flux estimates need to be?
- Which spatial and temporal resolution of a priori emissions inventories are required for forward or inverse modelling?
- How dependent are the model results from a priori information?
- How do observational biases translate into biases of the estimated fluxes?

3. Politicians & public (Stakeholders):

   - What is the advantage of the top-down approach (compared to the currently applied bottom-up (UNFCCC) reporting praxis)?
   - What is the accuracy of current national bottom-up inventories?
   - What is the accuracy of national inventory estimates from current and future top-down estimates based on the ICOS atmospheric observational network?
   - How accurate can emissions *changes* be estimated from a top-down approach?
   - What is the perspective of this approach for the next 5-10 years (i.e. for 2020, when e.g. Germany committed itself to 40% GHG emission reductions wrt. 1990)?