

# Common Technologies for Environmental Research Infrastructures



**In Theme 1 research infrastructures (RIs) work collectively on a number of research and technology activities related to the “hardware” of RIs.**

Environmental research infrastructures (RIs) participating in ENVRIplus have more in common – in the way they conceive, develop, operate and upgrade their systems – than appears to the naked eye. As we are all working on a daily basis to develop innovative solutions to our specific problems, we may lose sight of the big picture. Beyond the shared environmental scope of our RIs, we also have in common many technical and scientific aspects.

For example, most RIs are distributed networks of observatories (be it drifting buoys, geophysical observatories, ocean-bottom stations, or atmospheric measurements sites) with needs for remote operations. Most RIs have to deal with calibration and standardization issues. RIs use a variety of measurements technologies, but this appar-

ent variety is based on a small, common set of physical principles. All RIs have set their own research and development priorities, and developed their own solutions to their problems. However many problems are common across RIs, and some are more advanced than others on resolving a particular issue. Finally, RIs may overlap in terms of scientific perimeter, and we might find out that some of the scientific objectives that we have set for ourselves are shared by others.

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In Theme 1 of ENVRIplus we aim, for the first time, to identify common opportunities for innovation, to support common research and development across RIs on challenging issues, and more generally to create a forum to disseminate state of the art techniques among participants.

During the ENVRI project, it became clear that a cluster of infrastructures could become valuable to individual participating RIs, simply by the virtue of creating a network of experts or, at least, of correspondents. ENVRIplus now suggests going further and to work collectively on a number of research and technology activities related to the “hardware” of RIs.

These activities include 1) Measurement technologies: where are the common types of measurement for which we can share expertise or a common development? 2) Metrology: how do we tackle together the diversified challenges of quality assurance and standardization? 3) Remote operations: can we address collectively the need for autonomy, robustness and distributed data handling? And 4) Joint operations for research: are we able to demonstrate that together, RIs are better able to provide relevant information to support excellent research?

Behind the federative wording, we can illustrate the starting point of these activities



with a couple of examples. For instance, drones. On the one hand, marine infrastructures operate buoys, which are essentially unmanned marine vehicles. On the other, terrestrial ecosystems, and the atmospheric composition, amongst others, can be conveniently observed by unmanned aerial vehicles. The constraints on the operations of drones in an observatory context are thus shared across these RIs, and ENVRplus will aim to find out how common platform control technologies, access issues and best practices can emerge, and how RIs can collectively take up this new technology. Another example to better appreciate the role of Theme 1 is

methane, the second most important anthropogenic greenhouse gas, and in particular seafloor methane emissions. Several RIs consider methane emissions to be part of their mission. ENVRplus will ensure that observations from the seafloor, the ocean column, its surface, and into the atmosphere are relevant for scientists tackling this crucial climate science question. Of course, new common techniques and new common scientific questions are expected to emerge as we progress.

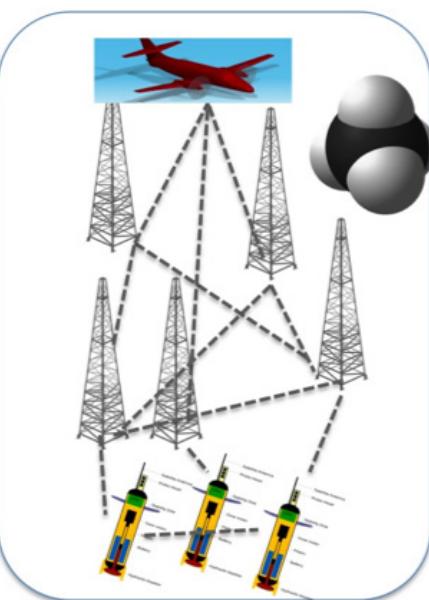
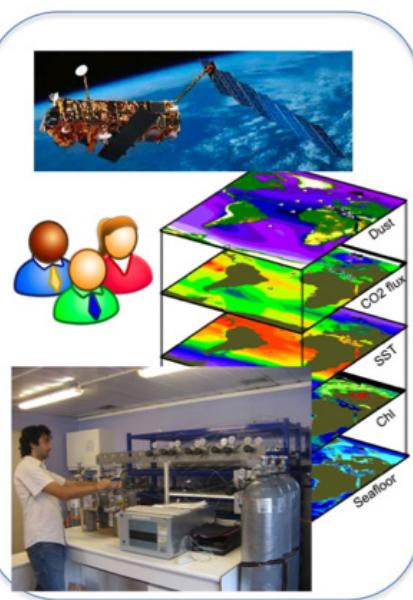
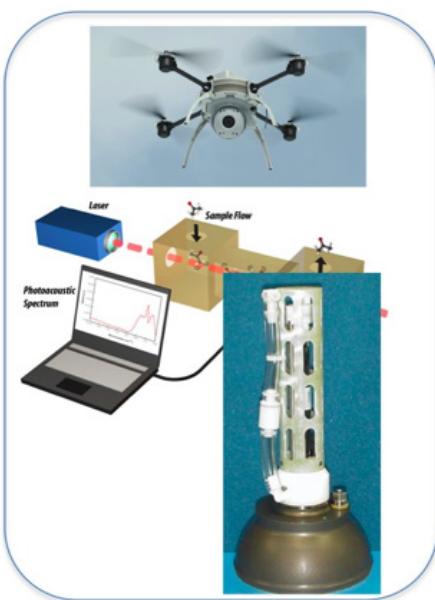
In this process we need to nurture an ecosystem of key players. Can we involve all the key technology experts of the European RIs for a greater

mutual benefit? Can we pave the way for a growing common market for innovative European SMEs, with a common programmatic approach conducive to targeted R&D? Can we develop a common metrological language adapted to the observation of our environment? In ENVRplus we aim at creating a space for exchanging information on the “hardware” issues of our networks of observatories; a forum that allows fast transmission across RIs of best practices and state of the art technology; a laboratory for joint research and co-development, where research infrastructures and their communities join efforts on well-identified objectives.

## Sensors

## Metrology and harmonization

## Network integration



## Technologies for autonomy

