Integration of Long term experiments on terrestrial ecosystem in AnaEE-France Research Infrastructure : concept and adding value

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Continental ecosystems represent a critical zone that provide key ecological services to human populations like biomass production, that participate to the regulation of the global biogeochemical cycles and contribute and contribute to the maintenance of air and water quality. Global changes effects on continental ecosystems are likely to impact the fate of humanity, which is thus facing numerous challenges, such as an increasing demand for food and energy, competition for land and water use, or rapid climate warming. Hence, scientific progress in our understanding of the continental critical zone will come from studies that address how biotic and abiotic processes react to global changes. Long term experiments are required to take into account ecosystem inertia and feedback loops and to characterize trends and threshold in ecosystem dynamics. In France, 20 long-term experiments on terrestrial ecosystems are gathered within a single Research Infrastructure: ANAEE-France (http://www.anaee-s.fr), which is a part of AnaEE-Europe (http://www.anaee.com/). Each experiment consist in applying differentiated pressures on different plot over a long period (>20 years) representative of a range of management options. The originality of such infrastructure is a combination of experimental set up and long-term monitoring of simultaneous measurements of key ecosystem variables and parameters through a multi-disciplinary approach and replications of each treatment that improve the statistical strength of the results. The sites encompass gradients of climate conditions, ecosystem complexity and/or management, and can be used for calibration/validation of ecosystem functioning models as well as for the design of ecosystem management strategies.

Gathering those experiments in a single research infrastructure is an important issue to enhance their visibility and increase the number of hosting scientific team by offering a range of services. These are:

• Access to the ongoing long term experiments to implement novel observational systems. Through active collaboration with the teams in charge of the experiments, users will take advantage of the site characterization, historical data, monitoring setup and access to different treatments experimental field with differentiated properties induced by repeated treatment.

• Access to soil and vegetation samples collected at different dates that may be reanalyzed a posteriori to take profit of technological progress.

• Delivery of reference data on ecosystems subjected to a gradient of anthropogenic and climatic pressures.

The research infrastructure level is appropriate to implement a harmonization policy for the measurement and observation protocols. Moreover it offers the possibility of developing an ambitious strategy in integrating data and models. These can contribute to the experimental process for protocol design or data quality control. Moreover, they offer an efficient way for promoting data reuse thus giving a strong added value to the existing data bases. Therefore, building interoperability between models and experimental platform data bases is an important objective to improve the quality of experimental infrastructure and provide users with seamless and integrated information systems. We present how this is operated in AnaEE-France with different tasks as the development of a controlled vocabulary, tools to annotate data and model variables with metadata based on ontologies and the development of webservice to harvest data from the data base to the modelling platform environment.

Finally some examples of key results taking profit of the range of experiments are provided.