



Research Networking Programmes

Short Visit Grant or Exchange Visit Grant

(please tick the relevant box)

Scientific Report

The scientific report (WORD or PDF file – maximum of eight A4 pages) should be submitted online within one month of the event. It will be published on the ESF website.

Proposal Title: Attendance of the 1st ICOS International Conference on Greenhouse Gases and Biogeochemical Cycles

Application Reference N°: 6833

1) Purpose of the visit

I applied to an ESF short-visit grant to attend the 1st ICOS International Conference on Greenhouse Gases and Biogeochemical Cycles, held in Brussels during 23rd-25th September, 2014. The main purposes of attending this conference were to: (i) present and discuss my ongoing work; (ii) to learn about ICOS Research Infrastructure and the current state of research about greenhouse gases (GHGs) and the carbon cycle.

2) Description of the work carried out during the visit

(i) I presented my work about “The role of the North-Atlantic Oscillation and East-Atlantic pattern in the inter-annual variability of the European CO₂ sink” at the General Session of the conference on Thursday 25th September.

This work attempts to better understand the inter-annual to decadal variability of the continental CO₂ balance in Europe, highlighting the impact of large-scale atmospheric circulation patterns such as the North-Atlantic Oscillation (NAO) and the East-Atlantic Pattern (EA). Despite NAO being the main large-scale atmospheric circulation pattern over Europe, known to impact vegetation dynamics, recent works have proposed that the East-Atlantic Pattern (EA) modulates NAO location and strength, affecting NAO impact on European weather (Comas-Bru & McDermott, 2013, QJRMS) and, therefore, ecosystem activity. Using land CO₂ fluxes computed from transport model inversions and from Dynamic Global Vegetation Models (DGVMs) we show that NAO and EA have a significant impact on the inter-annual variability of the European carbon sink, but

also that the different combinations of these two patterns are related to a multi-annual variability pattern, with phase change in the early 2000s leading to a decrease in European CO₂ uptake.

(ii) ICOS conference covered a broad range of topics related to CO₂ and other GHGs. Of particular relevance for my PhD were the presentations related to inter-annual variability of the carbon fluxes in land and ocean, as well as the future behaviour of the land-sink. Alessandro Cescatti (JRC Ispra, Italy) suggested that analysing separately CO₂ uptake and release periods of ecosystems may provide useful insights about the processes and drivers of the variability observed on the overall annual fluxes, and suggested that intrinsic variability of the ecosystem may contribute more than climate to inter-annual variability of the carbon fluxes. Marcos Fernández-Martínez (CREAF, Spain) suggested that nutrient availability drives the global patterns of the carbon balance in forests, while Sigrid Dengel (University of Helsinki, Finland) and Mats Öquist (SLU, Sweden) have shown the relevance of climate variability on the ecosystem activity on the local scale. Mathias Herbst (Thünen Institute, Germany) pointed that incomplete information about the weather conditions in which a dataset was acquired may lead to erroneous interpretations about the drivers of inter-annual variability of vegetation activity and Emanuel Gloor (University of Leeds, UK) highlighted the importance of fire on the carbon balance of the Amazonian forests, associated to drier than average years. Christopher Williams (Clark University, USA) summarized the current discussion about the relative importance of climate vs land-use fertilization in determining the future behaviour of the land-sink, while Stephanos Mystakidis (ETH Zurich, Switzerland) showed that constraining outputs from Earth-System Models with present observations of carbon balance may improve projections of the future land-sink, suggesting a consistent decrease of the land-sink by the end of the 21st century.

Finally, I attended a meeting organized by Grant Allen (University of Manchester, UK) for Early Career Scientists about finding funding after the PhD, which was followed by a quite interesting discussion with a panel of scientists about the different career options as well as the life vs science balance.

3) Description of the main results obtained

After my presentation I had the opportunity to discuss these results with other scientists. Particularly some had previously observed the abrupt change in ecosystem activity during the early 2000s. The discussion with other scientists who have observed, on the local scale, of some of the phenomena I report on the continental scale was particularly useful and provided new pathways to complete the analysis. Furthermore, I was able to meet some senior scientists with whom I have been collaborating with and discuss specific questions about a paper in preparation about this analysis, namely Ivan A. Janssens (University of Antwerp, Belgium), Christian Rödenbeck (MPI-Jena, Germany) and Philippe Ciais (LSCE, France).

The talks highlighted above are directly related to my PhD workplan: relationships between climate variability and ecosystems' carbon uptake. I had the chance to discuss with some of the authors their results and perspectives on the topic. Other presentations also contributed to my general knowledge about GHGs monitoring, for instance the several presentations about the role of isotopic measurements in improving the estimates of fossil fuel emissions. This allowed me to better understand the

caveats of the monitoring systems and the datasets that I use, as well as the possibilities for improvements.

4) Future collaboration with host institution (if applicable)

5) Projected publications / articles resulting or to result from the grant (*ESF must be acknowledged in publications resulting from the grantee's work in relation with the grant*)

I am currently writing a paper about the results I presented at the conference. Attending the conference was also an opportunity to discuss some details with other co-authors.

6) Other comments (if any)