Inverse modelling estimate of European NEE using ICOS and pre-ICOS observations (EUROCOM project)

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Terrestrial ecosystems play a dominant role in moderating the increase of atmospheric CO2 due to human activities. Indeed, they are thought to absorb more than 1/4 of the anthropogenic CO2 emissions [1]. Within the framework of the Paris agreement, several European countries have pledged reductions of their net CO2 emissions that rely on increased negative emissions, i.e. an increased carbon uptake by Terrestrial ecosystems. Yet, current bottom up estimates of the net ecosystem exchanges (NEE) in Europe differ significantly [1, 4], which makes it very difficult to assess the reality of the countries pledges.

Atmospheric inversions can in theory provide a reliable estimate of the current (and past one or two decades) NEE across Europe, which should help calibrating the bottom-up models. Yet, there again the current estimates from global coarse-grid inversions range from a small source to a sink of more than 1 PgC/yr during the last decade [2,3,4]. The origin of these discrepancies isn't entirely clear as there are large differences in the inversion setups (different transport models, different prior and observational constraints, different optimization algorithms, etc.).

The EUROCOM project is a collaborative effort involving modellers from six European research institutes to provide a robust, inverse-modelling derived estimate of the European NEE over the period 2006-2018, based on observations from ICOS (and pre-ICOS) atmospheric sites. The presentation will provide an overview of the main intercomparison outcomes, with a specific focus on the Nordic regions and on the 2018 drought.

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[3] Chevallier, F., P. I. Palmer, L. Feng, H. Boesch, C. W. O'Dell and P. Bousquet, 2014: Toward robust and consistent regional CO_2 flux estimates from in situ and space-borne measurements of atmospheric CO_2. *Geophys. Res. Lett.*, 41,1065–1070, doi:10.1002/2013GL058772

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