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Report on carbon balance mappings

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Action
Action 10: Generation of carbon assessment end-products

LIFE+ PROJECT NAME or Acronym
SNOWCARBO

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Table of contents

1 Introduction	3
2 CO2 balance maps.....	3

List of abbreviations

FMI	Finnish Meteorological Institute
JSBACH	Jena Scheme for Biosphere-Atmosphere (model describing biosphere-atmosphere interaction)
REMO	Regional climate model
NEE	Net exchange of CO ₂ in between the atmosphere and a ecosystem
GPP	Gross primary production, i.e. CO ₂ uptake in photosynthesis
NPP	Net primary production, i.e. effective CO ₂ uptake by plants when both photosynthesis and autotrophic respiration has been taken into account
TER	Total ecosystem respiration includes both autotrophic respiration due to growth and maintenance of living plants and heterotrophic respiration due to decomposition of organic material

1 Introduction

This action have produced the digital carbon balance maps covering years from 2001 to 2009. The maps of highest degree of detail have been produced with the land cover based on the

National Corine data (Action 11). The raw data from the model are given in the rotated latitude-longitude grid with resolution of 0.167 degrees. The time resolution of the raw data is one hour and it comprise all the predicted variables of JSBACH model and a wide selection of 2D and 3D meteorological variables predicted by REMO. The carbon balance related JSBACH output fields, such as GPP, NPP and soil respiration have been stored in daily resolution in the original rotated grid. These files are available for the scientific community by demand.

For public, monthly and yearly the CO₂ balance mapped data have been transformed into non-rotated latitude-longitude grid. This have been provided to Action 12 that made the data accessible via Erdas Apollo database. Furthermore, a table of monthly and yearly CO₂ balance values for Finland have been produced for comparison with the National GHG inventories.

2 CO₂ balance maps

In the following the CO₂ balance mappings in rotated grid are shown both in yearly (Fig. 1) and monthly (Fig 2.-10.) time resolutions. The color scheme of the figures have been selected to distinguish between sink and sources of CO₂ that are shown in green and red, respectively. The units are given either in grams of carbon per square meter (g(C)/m²) or in million tons of CO₂ per country. These units are in accordance with conventional practice of research in atmospheric sciences and forestry, on one hand, and GHG inventory reportings on the other. The sign convention is conventional for NEE: negative values indicate removal from the atmosphere by surface sinks and positive values indicate release of CO₂ to the atmosphere. From the yearly maps (Fig 1) it can be seen that the balance vary strongly both from year to year and among different regions. The strong variation is because NEE is a balance in between two big terms - net assimilation by plants and soil respiration – whose responses to climatic variables are non-linear and response times vary among processes. The impact of climatic drivers have been discussed in Demonstration report by FMI of Action 8.

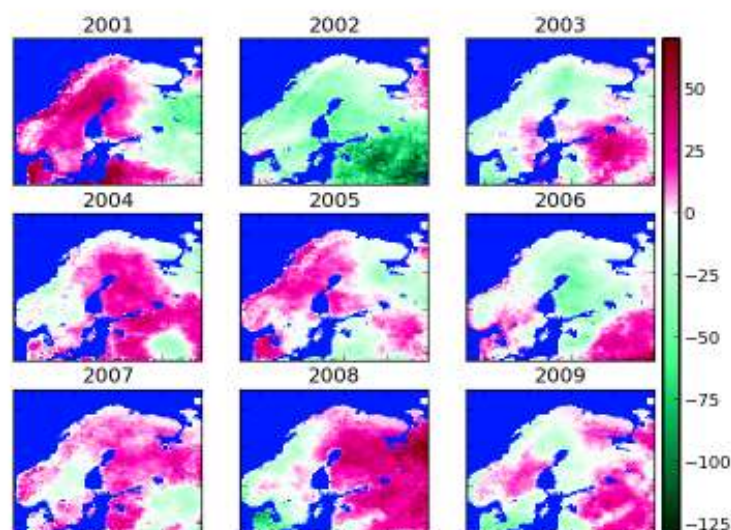


Fig 1. Yearly CO2 balance of years 2001-2009 in the original model grid with the resolution of 0.167 degrees. Ecosystem sources of CO2 are indicated in red and sinks in green. The values are given in terms of grams of carbon per area ($\text{g(C)}/\text{m}^2$).

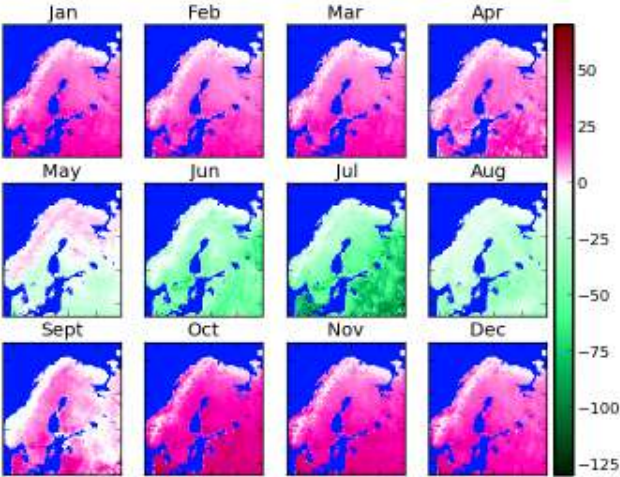


Fig 2. Monthly CO2 balance in 2001. The domain specifications, color scheme and units same as in Fig 1.

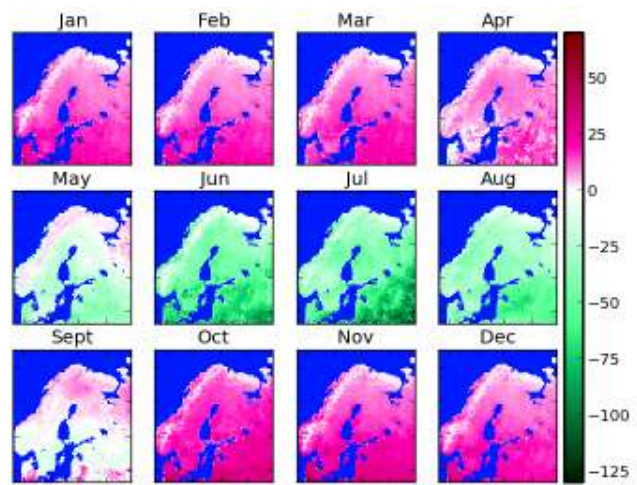


Fig 3. Monthly CO2 balance in 2002. The domain specifications, color scheme and units same as in Fig 1.

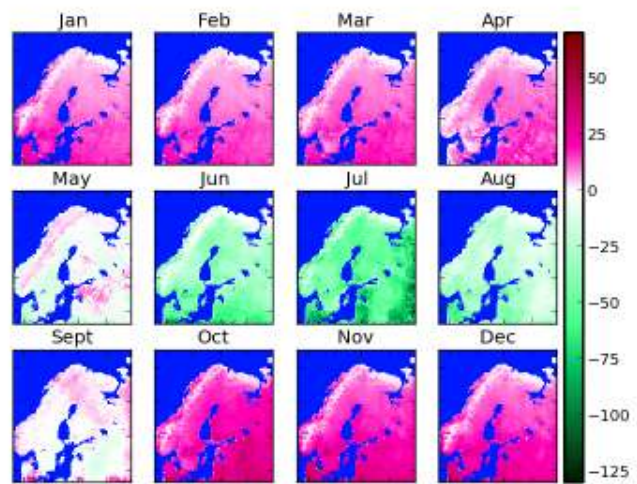


Fig 4. Monthly CO2 balance in 2003. The domain specifications, color scheme and units same as in Fig 1.

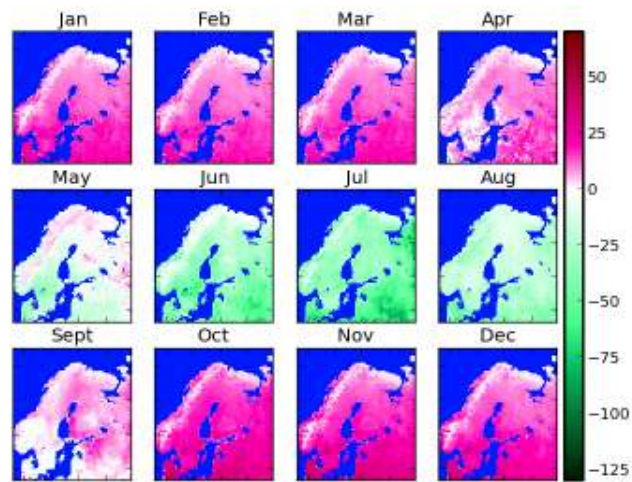


Fig 5. Monthly CO2 balance in 2004. The domain specifications, color scheme and units same as in Fig 1.

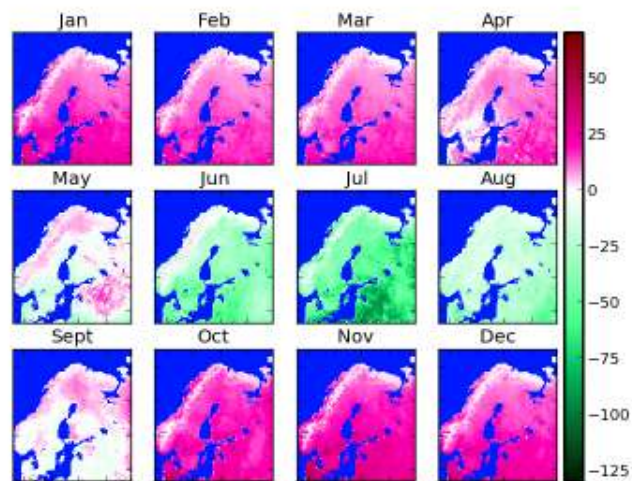


Fig 6. Monthly CO2 balance in 2005. The domain specifications, color scheme and units same as in Fig 1.

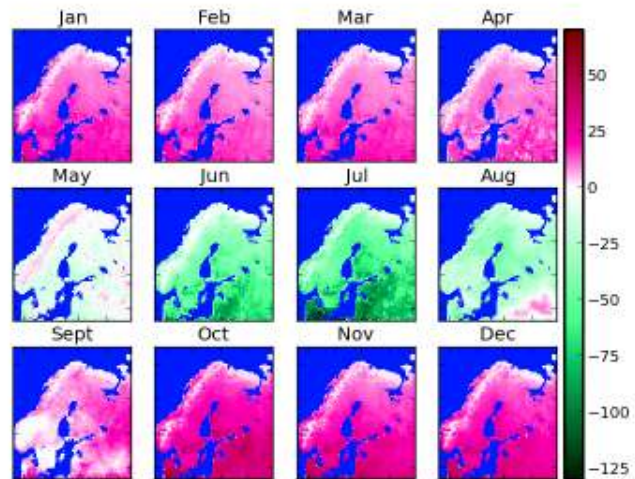


Fig 7. Monthly CO2 balance in 2006. The domain specifications, color scheme and units same as in Fig 1.

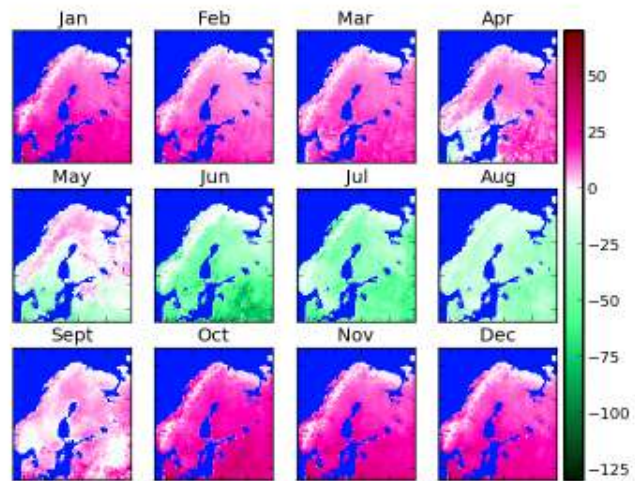


Fig 8. Monthly CO2 balance in 2007. The domain specifications, color scheme and units same as in Fig 1.

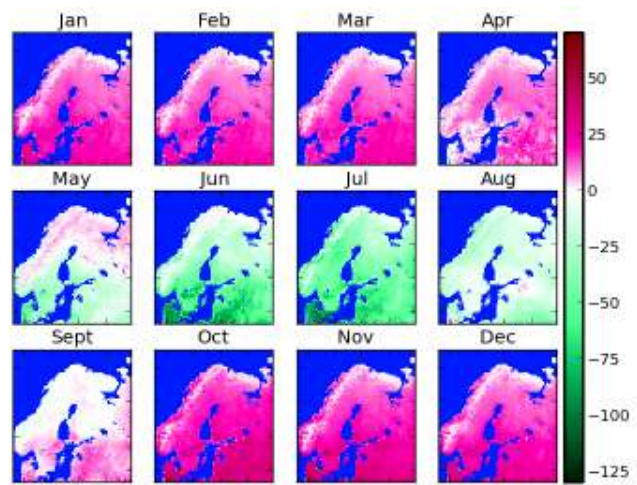


Fig 9. Monthly CO2 balance in 2008. The domain specifications, color scheme and units same as in Fig 1.

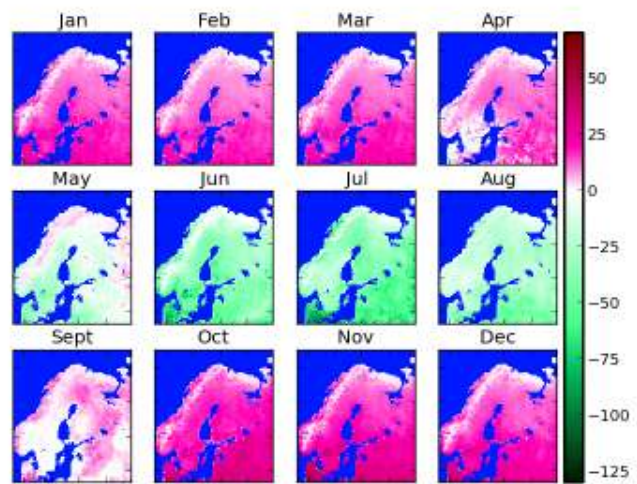


Fig 10. Monthly CO2 balance in 2009. The domain specifications, color scheme and units same as in Fig 1.