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A. Johannes Dolman • Riccardo Valentini
Annette Freibauer
Editors

The Continental-Scale Greenhouse Gas Balance of Europe

Springer

Editors
A. Johannes Dolman
VU University
Amsterdam
The Netherlands

Riccardo Valentini
University of Tuscia
Viterbo
Italy

Annette Freibauer
Max Planck Institute for Biogeochemistry
Jena
Germany

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Preface

The human interference with the climate system, the perturbation of the carbon cycle through massive release of greenhouse gases, caused by fossil fuel burning and land-use change, is threatening society and represents a key challenge for research and policies in the twenty-first century. Growing evidence of human-induced climate change has raised public concern calling for urgent international policy actions. Initiatives culminated in the establishment of the United Nations Framework Convention for Climate Change (UNFCCC) and the Kyoto Protocol (1997), where Parties for the first time agreed on legally binding commitments to reduce greenhouse gas emissions. It is worth noting that the unfinished 'sink' business, the Articles in the Kyoto Protocol dealing with terrestrial biospheric carbon dioxide sources and sinks, gave carbon cycle research a real boost. In the 1990s, the regional carbon balance and how the different ecosystems contribute at different timescales under different environmental conditions were hardly known.

During the fourth Framework Programme (1994–1998), the European Union supported more than 20 research projects studying the components of the carbon cycle. These projects provided a solid basis for a more integrated attempt to tackle the research challenges and demands imposed by the Kyoto Protocol at European scale.

Both the European Commission and the scientific community felt that it was time to develop an integrated carbon cycle research programme taking the new challenges on board. Since an international science plan was lacking, the European Commission initiated an international workshop in Orvieto, 24 June 1998, in order to discuss the current status of research and find ways to overcome the European research fragmentation in this area. The CarboEurope idea was then presented for the first time.

The fifth Framework Programme (FP5, 1998–2002), Key Action: 'Global Change, Climate and Biodiversity', was focusing on applied research, with the specific aim to support the implementation of international conventions. Naturally, carbon cycle research received high priority. During the lifetime of FP5, the CarboEurope concept was implemented through a cluster of research projects, and also became a blueprint for other regional carbon programmes of the International Global Carbon Project (GCP).

During the sixth Framework Programme (2002–2006), and within the context of the European Research Area, a higher level of integration was achieved through the utilisation of specially designed funding instruments such as Integrated Projects (IP). This new funding instrument allowed the creation of large-scale consortia targeting research questions of strategic nature over periods of 5 years, the original concept now being implemented through the CarboEurope-IP.

The CARBOEUROPE-IP (2004–2008) brings together more than 60 research institutes and universities with the objective to assess the European Terrestrial Carbon Balance. The implementation of dual constrain concept (bottom–up, top–down) and the integration of long-term observations at different scales through modelling, followed over the past years, proved to be of great value for understanding and verifying sources and sinks at regional and continental scales. As a result, Europe has currently the densest and best integrated research network of in situ observations of ecosystem carbon and nitrogen fluxes and trace gas concentrations. These observations have discovered surprises in the ecosystem functioning and response to climate-related extremes and helped the further development of complex models. They also show that both scientific and societal questions about the carbon cycle can only be resolved by an integrated approach combining modelling with sustained long-term observations of key carbon variables. In the context of the seventh Framework Programme (2007–2013), integrated research on carbon cycle remains one of the key priorities under the Environment Programme.

We congratulate the authors for the present publication which provides an integrated assessment of our current capacity to observe the continental carbon cycle, understand the processes and quantify the uncertainties involved. It provides, with no doubt, a valuable contribution to the important ongoing scientific debate on carbon cycle and climate change.

Claus Bruening and **Anastasios Kentarchos**
Climate Change and Environmental Risks Unit
Environment Directorate,
Directorate General for Research
European Commission
Brussels
Belgium

Contents

Contributors

Gwenael Abril
Environnements et Paléoenvironnements OCéaniques (EPOC), Université de Bordeaux 1. CNRS-UMR 5805, Avenue des Facultés, F-33405 Talence, France

Peter Bergamaschi
European Commission Joint Research Centre, Institute for Environment and Sustainability, Ispra, Italy

Alberto V. Borges
University of Liège, Interfacultary Center for Marine Research (MARE), Chemical Oceanography Unit, Institut de Physique (B5), Allée du 6 Août, 17, B-4000 Liège, Belgium

Philippe Bousquet
Laboratoire des Sciences du Climat et del'Environnement (LSCE), Gif sur Yvette, France

Joseph G. Canadell
CSIRO Marine and Atmospheric Research, Canberra ACT 2601, Australia

Torben R. Christensen
GeoBiosphere Science Centre, Physical Geography and Ecosystems Analysis, Lund University, Sweden

Galina Churkina
Max-Planck-Institute for Biogeochemistry P.O. Box 10 01 64, 07701 Jena and Hans-Knoell-Strasse 10, 07745 Jena, Germany

Philippe Ciais
Laboratoire des Sciences du Climat et de l'Environnement, IPSL/LSCE CEA-CNRS-UVSQ, F-91191 Gif sur Yvette, France

Mathias Disney
NERC Centre for Terrestrial Carbon Dynamics and University College London, 26 Bedford Way, London WC1H0AP, UK

A. Johannes Dolman
Department of Hydrology and Geo-Environmental Sciences, VU University Amsterdam, Boelelaan 1085, 1081 HV Amsterdam, Netherlands

Matthias Drösler
Department of Vegetation Ecology, Technical University of Munich, Freising, Germany

Gerd Folberth
School of Earth and Ocean Science (SEOS), University of Victoria, Victoria, Canada

C. Mary R. Fowler
Department of Geology, Royal Holloway, Egham TW20 0EX, UK

Annette Freibauer
Max-Planck-Institute for Biogeochemistry, P.O. Box 10 01 64, 07701 Jena and Hans-Knoell-Strasse 10, 07745 Jena, Germany

Thomas Friborg
Department of Geography and Geology, University of Copenhagen, Denmark, tfj@geogr.ku.dk

Christoph Gerbig
Max-Planck-Institute for Biogeochemistry, P.O. Box 10 01 64, 07701 Jena and Hans-Knoell-Strasse 10, 07745 Jena, Germany

Margriet Groenendijk
Department of Hydrology and Geo-Environmental Sciences, VU University Amsterdam, Boelelaan 1085 1081 HV Amsterdam, Netherlands

Didier Hauglustaine
Laboratoire des Sciences du Climat et de l'Environnement, IPSL/LSCE CEA-CNRS-UVSQ, F-91191 Gif sur Yvette, France

Martin Heimann
Max-Planck-Institute for Biogeochemistry, P.O. Box 10 01 64, 07701 Jena and Hans-Knoell-Strasse 10, 07745 Jena, Germany

Dimmie Hendriks
Department of Hydrology and Geo-Environmental Sciences, Boelelaan 1085, 1081 HV, VU University Amsterdam, Netherlands

Ivan A. Janssens
Department of Biology, Universiteit Antwerpen, B-2160 Antwerpen, Belgium

Thomas Kaminski
FastOpt GmbH, Schanzenstr. 36, 20357 Hamburg, Germany

Ute Karstens
Max-Planck-Institute for Biogeochemistry, P.O. Box 10 01 64, 07701 Jena and Hans-Knoell-Strasse 10, 07745 Jena, Germany

Thomas Lauvaux
Météo-France CNRM/GMME, Toulouse, France
LSCE, Paris, France

Aleksi Lehtonen
Finnish Forest Research Institute, Unioninkatu 40 A, FI-00170 Helsinki, Finland, aleksi.lehtonen@metla.fi

Ingeborg Levin
Institut für Umweltphysik, University of Heidelberg, Heidelberg, Germany

Philip Lewis
NERC Centre for Terrestrial Carbon Dynamics and University College London, 26 Bedford Way, London WC1H0AP, UK, plewis@geog.ucl.ac.uk

Raisa Mäkipää
Finnish Forest Research Institute, Unioninkatu 40 A, FI-00170 Helsinki, Finland, raisa.makipaa@metla.fi

Michel Meybeck
SISYPHE, Université Paris VI Jussieu, F-75005, Paris, France

Franco Miglietta
CNR IBIMET, Florence, Italy

Euan Nisbet
Department of Geology, Royal Holloway, University of London, Egham TW20 0EX, UK

Joel Noilhan
Météo-France CNRM/GMME, Toulouse, France

Mikko Peltoniemi
Finnish Forest Research Institute, Unioninkatu 40 A, FI-00170 Helsinki, Finland, mikko.peltoniemi@metla.fi

Gorka Pérez-Landa
CEAM, Valencia, Spain

Heiko Pfeiffer
Institute of Energy Economics and the Rational Use of Energy, University of Stuttgart, Hessbruehlstrasse 49a, 70565 Stuttgart, Germany

Phillip O'Brien
Department of Geology, Royal Holloway, Egham TW20 0EX, UK

Tristan Quaife
NERC Centre for Terrestrial Carbon Dynamics and University College London, 26 Bedford Way, London WC1H0AP, UK

Shaun Quegan
NERC Centre for Terrestrial Carbon Dynamics and the University of Sheffield, Hicks Building, Hounsfield Road, Sheffield, UK

Michael R. Raupach
CSIRO Marine and Atmospheric Research, Canberra ACT 2601, Australia

Peter J. Rayner
LSCE/IPSL, Laboratoire CEA-CNRS-UVSQ, Bat. 701 LSCE - CEA de Saclay Orme des Merisiers, 91191 Gif/Yvette, France

Stefan Reis
Centre for Ecology and Hydrology, Bush Estate, Penicuik, EH26 0QB, UK, srei@ceh.ac.uk

Gareth Roberts
Department of Geography, Kings College London, Surrey Street Strand, London, UK, gareth.j.roberts@kcl.ac.uk

Aodhagan Roddy
Department of Physics, Galway University, Galway, Ireland

Christian Rödenbeck
Max-Planck-Institute for Biogeochemistry, P.O. Box 10 01 64, 07701 Jena and Hans-Knoell-Strasse 10, 07745 Jena, Germany

Yvonne Scholz
Deutsches Zentrum für Luft und Raumfahrt e.V. (DLR) in der Helmholtzgemeinschaft, Institut für Technische Thermodynamik, Pfaffenwaldring 38-40, 70569 Stuttgart, Germany

Ingo Schöning
Max-Planck-Institute for Biogeochemistry, P.O. Box 10 01 64, 07701 Jena and Hans-Knoell-Strasse 10, 07745 Jena, Germany

Marion Schrumpf
Max-Planck-Institute for Biogeochemistry, P.O. Box 10 01 64, 07701 Jena and Hans-Knoell-Strasse 10, 07745 Jena, Germany

Ernst-Detlef Schulze
Max-Planck-Institute for Biogeochemistry, P.O. Box 10 01 64, 07701 Jena and Hans-Knoell-Strasse 10, 07745 Jena, Germany

Jens Schumacher
Max-Planck-Institute for Biogeochemistry, P.O. Box 10 01 64, 07701 Jena and Hans-Knoell-Strasse 10, 07745 Jena, Germany

Jean-François Soussana
INRA, UR874 Agronomie, Grassland Ecosystem Research, 234 Av. du Brézet, Clermont-Ferrand F-63100, France

Jochen Theloke
Institute of Energy Economics and the Rational Use of Energy, University of Stuttgart, Hessbruehlstrasse 49a, 70565 Stuttgart, Germany

Lieselotte Tolk
Department of Hydrology and Geo-Environmental Sciences, VU University Amsterdam, Boelelaan 1085, 1081 HV Amsterdam, Netherlands

Riccardo Valentini
Department of Forest Science and Environment, University of Tuscia, Via S. Camillo de Lellis 01100 Viterbo, Italy

Michel van der Molen
Department of Hydrology and Geo-Environmental Sciences, Boelelaan 1085, 1081 HV, VU University Amsterdam, Netherlands

Martin Wooster
Department of Geography, Kings College London, Surrey Street Strand, London, UK, martin.wooster@kcl.ac.uk