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Novel Earth Observation products to characterise wetland extent and methane dynamics: the ESA ALANIS-Methane Project

Garry Hayman (1), Annett Bartsch (2), Catherine Prigent (3), Felipe Aires (3), Michael Buchwitz (4), John Burrows (4), Oliver Schneising (4), Eleanor Blyth (1), Douglas Clark (1), Fiona O'Connor (5), and Nicola Gedney (6)

(1) Centre for Ecology and Hydrology, Maclean Building, Crowmarsh Gifford, Wallingford, Oxfordshire, OX10 8BB, UK (garr@ceh.ac.uk, emb@ceh.ac.uk, dbcl@ceh.ac.uk), (2) Institute of Photogrammetry and Remote Sensing, Vienna University of Technology, Gusshausstrasse 27-29, A 1040 Vienna, Austria (ab@ipf.tuwien.ac.at, ww@ipf.tuwien.ac.at), (3) Estellus SA, 93 Boulevard de Sébastopol, 75002 Paris, France (catherine.prigent@obspm.fr, filipe.aires@estellus.fr), (4) Institute of Environmental Physics, University of Bremen FB1, P O Box 330440, Otto Hahn Allee 1, D-28334 Bremen, Germany (Michael.Buchwitz@iup.physik.uni-bremen.de), (5) Climate, Chemistry, and Ecosystems Team, Met Office Hadley Centre, FitzRoy Road, Exeter, EX1 3PB, UK (fiona.oconnor@metoffice.gov.uk), (6) Joint Centre for Hydrometeorological Research, Met Office Hadley Centre, Maclean Building, Crowmarsh Gifford, Wallingford, Oxfordshire, OX10 8BB, UK (nicola.gedney@metoffice.gov.uk)

The role of wetlands in the global methane cycle is the subject of much current interest [1,2]. Wetlands are generally accepted as being the largest, but least well quantified, single source of methane (CH4), with emission estimates ranging from 100-231 Tg yr-1 [3,4]. Since the late 1970s, there have been significant inter-annual variations in the growth rate of atmospheric methane, which has been linked to the variability in wetland CH4 emissions [5,6].
Although the emissions of methane from the wetlands and lakes of the boreal region are smaller than those from tropical wetlands, the size and remoteness of the boreal region pose a significant challenge to the quantification of both terrestrial ecosystem processes and their feedbacks to regional and global climate. In recent years, Earth Observation (EO) data have demonstrated the potential to become a major tool for characterizing the main processes and estimating key variables governing the land-atmosphere interface. To this end, the European Space Agency (ESA) has initiated the Atmosphere-LANd Interactions Study (ALANIS), in collaboration with the Integrated Land Ecosystem-Atmosphere Processes Study (iLEAPS). One of the three ALANIS themes is investigating wetland dynamics and methane emissions (denoted ALANIS methane, www.alanis-methane.info).
The ALANIS methane project has a focus on the boreal Eurasia region. There are two main goals: (1) to produce a suite of relevant datasets derived from Earth Observation (EO):
• a regional wetland extent dynamics product characterizing spatial changes of inundated areas over time at low spatial resolution and high time frequency;
• a local wetland extent dynamics product characterizing spatial changes of lake and wetland surface over time at high/medium spatial resolution and low time frequency;
• a snowmelt onset/duration/end product suitable for determining when methane emissions from wetland restart after the winter season;
• a freeze onset product suitable for determining when lake/wetland methane emissions stop after the summer season; and,
• atmospheric column CH4 concentrations.

and (2) to use these (and other) EO products to evaluate and improve the Joint UK Land Environment Simulator (JULES, http://www.jchmr.org/jules), a state-of-the-art land surface model.
An overview of the project and example results will be given.

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