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# Using novel Earth observation products to characterise wetland extend and methand dynamics in the Jules Land surface model: the ESA ALANIS-Methane Project

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The role of wetlands in the global methane cycle continues to be the subject of much current interest [1-3]. Wetlands are generally accepted as being the largest, but least well quantified, single source of methane ($CH_4$), with emission estimates ranging from 105-278 Tg $yr^{-1}$ [4]. 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.

Earth Observation (EO) data have become an important tool for characterizing the main processes and estimating key variables governing the land-atmosphere interface. To that end, the European Space Agency (ESA) initiated the *A*tmosphere-*LAN*d *I*nteractions *S*tudy (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;
    - a local wetland extent dynamics product characterizing spatial changes of lake and wetland surface over time at high/medium spatial resolution;
    - a snowmelt onset/duration/end product suitable for determining when methane emissions from wetlands 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 $CH_4$ concentrations.
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 will be given together with examples of how the ALANIS methane EO products have been used to assess the performance of the JULES model in both its offline configuration and as the land surface scheme in the HadGEM2-ES climate model with atmospheric chemistry [7].

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