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Mapping peatland pools to improve estimations of carbon store on a boreal peatland in Canada

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The total global spatial extent of peatlands is small ranging between 4 - 6% of the terrestrial environment but they contain up to 33% of the global soil organic carbon (SOC) stock. Current total stocks are estimated to be 547 Gt of C. Therefore on a meter for meter basis peatland store more carbon than any other terrestrial ecosystem. The long-term rate at which carbon accumulates (LORCA, the total carbon per unit area divided by the time since the beginning of accumulation) shows large variability with values ranging from 3.4 to 70.6 g C m^{-2} yr^{-1}. These rates are dependent on factors such as the balance between temperature and precipitation or on growing season length and net photosynthetically active radiation.

The estimated amount of carbon stored in peatlands is, in many cases, based on spatial extrapolations of carbon content values from peat core analysis or modelled from peat depth measurements. However, these estimations ignore fine scale features that occur in peatlands, such as small open water features (pools $<$1km^2) which can occupy up to 30% in peatlands of the Hudson's Bay Lowland and up to 77% in minerotrophic peatlands located high boreal Quebec (Canada). Small open water feature extent is in general poorly documented over regional and larger scales. These pools may be up to or greater than 2m in depth and store much less carbon per unit area than in adjacent vegetated areas. Studies on the west Siberian peat carbon pool identified water bodies larger than 1 km^2 and applied a lower carbon density to these surfaces. However, not accounting for the presence of pools smaller than 1 km^2 (and often only several meters across) in a peatland could lead to an overestimation of LORCA and lead to errors in the calculation of the carbon store. To our knowledge, no study presenting C accumulation rates in peatlands have corrected their estimation nor mentioned the presence of pools, even if they covered large portion of their site.

In this research, an object oriented approach was used to detect and map pool features on a patterned peatland in Quebec, Canada. A Worldview2 geo- and orthorectified multispectral image (panchromatic spatial resolution 0.50cm) was acquired on 27^{th} of May, 2012. It covers $\sim$5.5 km^2 of the Grande Plée Bleue raised peatland. Feature Analyst, an object oriented extension in ArcGIS, was used to select training data which is used to extract the pool features. An iterative process allows the user to correct the results. Preliminary results and visual analysis indicate that this process may be useful in detecting all but the smallest open water features. The resulting spatial data could be incorporated into models to improve estimations of global peatland carbon stocks.