Monitoring peatland from Earth and space

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A team of UK scientists led by Dr. Karen Anderson (University of Exeter) has developed a new technique for monitoring the condition of peatlands. The team used a combination of images captured from Earth and space to measure spatial patterning in peatland surfaces as an indicator of their condition. This new method uses a novel coupled approach, using satellite images from space and airborne laser scanning data, and has resulted in improved peatland mapping products.

This new method could help monitor the damage that is being done to peatlands through human activity. Such disruption is contributing to global warming, as peatlands can release the carbon they absorb and store if they are damaged by drainage or peat extraction processes. This research, which appears in the January-February 2010 issue of Journal of Environmental Quality, reports that airborne laser scanning instruments are capable of measuring fine-scale peatland structures such as hummocks and hollows that typically measure less than four meters in size.

Lowland rainfed peatlands are recognized as being a globally important environmental resource because they absorb and store carbon. Their unique plant communities and their inherent wetness control their ability to act as carbon stores, but when human disturbance disrupts their surface structure, greenhouse gases are released instead. Many peatlands across the world are affected by drainage, peat removal and ecological disturbance so scientists have been working to develop a robust spatial method for monitoring peatland condition. Remote sensing techniques (where images from satellites in space are analyzed) provide a likely route for this.

The research team used data from an airborne "LiDAR," a laser-scanning instrument, alongside data from the IKONOS satellite. They showed that when LiDAR data were combined with optical images collected from satellites, a powerful method for spatial mapping of peatland quality could be achieved. The paper shows how use of a structural-based approach improved capabilities for mapping and monitoring peatland condition with an improvement in accuracy from 71.8% (without structural estimates) to 88.0% when airborne LiDAR data (which had been spatially preprocessed using a technique called semivariogram analysis) were used. This new approach offers an improved, physically based method for automated peatland condition mapping.

As Dr. Anderson, who led the study, noted, "This work is the first to demonstrate that peatland structures, which are linked to hydrological status and condition, can be measured using remote sensing techniques. Our approach enabled us to draw out the differences in surface pattern across the peatland and resulted in an improved mapping product which is useful for scientists, peatland managers, statutory conservation agencies, and for policy makers."

More information: View the abstract at jeq.scijournals.org/cgi/content/abstract/39/1/260 .

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