Maps of forests, fields and soils to aid climate change forecasts

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Credit: Wikipedia.

Detailed maps of the world's natural landscapes could help scientists to better predict the impacts of future climate change.

The complex charts of forests, grasslands and other productive ecosystems provide the most complete picture yet of how carbon from the atmosphere is reused and recycled by Earth's natural habitats.

Although it is well known that these landscapes absorb and process massive amounts of carbon dioxide, little is known about where exactly the carbon is stored or how long it remains there.

Using satellite images and field study data covering a 10-year period from 2000 to 2010, researchers have constructed maps that show where - and for how long - carbon is stored in plants, trees and soils.

Understanding how carbon is stored will allow researchers to more accurately predict the impacts of climate change.

The maps reveal that the biological properties of leaves, roots and wood in different natural habitats affect their ability to store carbon, and show that some ecosystems retain carbon for longer than others.

Large swathes of the dry tropics store carbon for a relatively short time owing to frequent fires - while in warm, wet climates carbon is stored for longer in plants than in soils.

To build the maps, researchers used a computer model to analyse huge amounts of satellite and field data. To generate values for each of the 13,000 cells on each map, a supercomputer at the Edinburgh Compute and Data Facility ran the model approximately 1.6 trillion times.

The study made use of existing global maps of plant and fire activity, which were produced from measurements taken on-board the NASA Terra, Aqua, and ICESat satellites.

New data can be added to the maps as it becomes available. The impact that major events - such as forest fires - have on ecosystems' ability to store carbon can be determined within three months of them occurring, researchers say.

The study, published in the journal *Proceedings of the National Academy of Sciences*, was funded by the Natural Environment Research Council. The research was carried out in collaboration with Wageningen University, and part of the work took place at NASA's Jet Propulsion Laboratory, managed by the California Institute of Technology.

Dr. Anthony Bloom, Caltech Postdoctoral Scholar at the NASA Jet Propulsion Laboratory, who conducted the study, said: "Our findings are a major step towards deciphering how carbon flows through the Earth's natural habitats from satellite images. These results will help us understand how the natural carbon balance will respond to human disturbances and climate change".

Professor Mathew Williams, of the University of Edinburgh's School of GeoSciences, who led the study, said: "Recent studies have highlighted the disagreement among Earth system models in the way they represent the current global carbon cycle. Our results constitute a useful, modern, benchmark to help improve these models and the robustness of global climate projections."

More information: The decadal state of the terrestrial carbon cycle: Global retrievals of terrestrial carbon allocation, pools, and residence times, A. Anthony Bloom, DOI: 10.1073/pnas.1515160113 , www.pnas.org/content/early/201 … /1515160113.abstract

Provided by University of Edinburgh

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