ETH zürich

CROWTHER LAB

Factsheet – AAAS 2019

Predicting Climate Change

Understanding Carbon Cycle Feedbacks to Predict Climate Change at Large Scale

Climate Change: Understanding Feedback from Nature, Culture and Society
Saturday, February 16, 2019; 3:30 PM - 5:00 PM; Marriott Wardman Park, Delaware Suite

Image credit: Andrew Coelho, Unsplash

Thomas Crowther identifies long-disappeared forests available for restoration across the world. He will describe how there is room for an additional 1.2 trillion new trees around the world that could absorb more carbon than human emissions each year. Crowther also describes data from thousands of soil samples collected by local scientists that reveal the world's Arctic and sub-Arctic regions store most of the worlds carbon. But the warming of these ecosystems is causing the release of this soil carbon, a process that could accelerate climate change by 17%. This research is revealing that the restoration of vegetation and soil carbon is by far our best weapon in the fight against climate change.

The living parts of the planet make it unique from all other parts of the solar system, and they drive every aspect of biogeochemical cycling. It is essential that we represent these living processes into our

understanding of current and future biogeochemical cycles in order to understand and predict climate change.

In their research, the Crowther Lab uses the largest global dataset of forest inventory data (the Global Forest Biodiversity Initiative), measured by people on the ground in over 1.2 million locations around the world combined with satellite observations, to get a mechanistic understanding of the global forest system. The lab also uses an equivalent database for below-ground ecology - the Global Soil Biodiversity Initiative. This initiative, with tens of thousands of soil samples that describe the global patterns in the biomass and the diversity of the global soil microbiome, paired with satellite data generates a first glimpse at the billions of below-ground species that determine soil fertility, atmospheric composition and the climate.

Using this combination of above ground and below ground data the research team can identify regions of high priority for biodiversity conservation. Additionally, they can finally start to understand the feedbacks that determine atmospheric carbon concentrations over the rest of the century. They now understand that, as the soil warms, carbon emissions from the soil will increase, particularly in the high-latitude arctic and sub-arctic regions.

Under a business-as-usual climate scenario the Crowther lab model suggests that warming would drive the loss of ~55 gigatons of carbon from the upper soil horizons by 2050. This value is around 12–17 per cent of the expected anthropogenic emissions over this period. These are the 'climate change feedbacks' that Crowther discusses in his session, and understanding these processes is critical to effectively managing natural systems in order to combat climate change.

More information

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> *Understanding Carbon Cycle Feedbacks to Predict Climate Change*
> https://aaas.confex.com/aaas/2019/meetingapp.cgi/Paper/23744

Links to more information, animations, video, and image material
Crowther Lab website: https://crowtherlab.com/ (current publications and research)
Geospatial mapping and its application to reforestation and climate change mitigation efforts:

- Recorded presentation for ESRI conference - https://www.youtube.com/watch?v=M--Itgriptc
- Interview - https://youtu.be/oOsyBmvDCt4
- ESRI podcast - https://www.esri.com/about/newsroom/podcast/on-the-business-of-battling-climate-change/
- Blog - https://www.esri.com/about/newsroom/blog/on-battling-climate-change/

More information on the research - http://science.sciencemag.org/content/354/6309/aaf8957
Founding and maintenance of the Global Forest Biodiversity Initiative (GFBI) - http://www.gfbinitiative.org/

Contacts

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