BLUE CARBON

Sinking to the deep

Ecol. Monogr. https://doi.org/10.1002/ecm.1366 (2019).

Credit: AHS Photography — Alex Schregardus/ Moment/

Coastal marine environments such as mangroves and marshes accumulate carbon through plant growth, which can then be buried in sediments and sequestered over longer timescales. Macroalgae fix more CO_2 than other large marine plants, yet grow predominately in rocky areas where burial is limited. Much of this carbon is therefore exported further offshore, and the amount that is ultimately sequestered in deeper sediments is not well known.

Ana Queirós, from Plymouth Marine Laboratory, UK, and colleagues investigated the role of macroalgal biomass in carbon fluxes to deep coastal sediments. Using genomic and isotopic methods combined with process measurements, they found that the net flux to deep sediments was nearly 60 gC m^{-2} yr^{-1}, approximately 25% of the carbon sequestration in mangroves. Macroalgae represented about 15% of this flux and played an important role in supporting the benthic food web.

These findings indicate that both coastal sediments and macroalgae may play a greater role in marine carbon storage than previously considered. The results provide important constraints on carbon flow between the land and ocean. *AF*

https://doi.org/10.1038/s41558-019-0594-6

CARBON CYCLE

Lake emissions rise

Limnol. Oceanogr. Lett. https://doi.org/10.1002/lol2.10117 (2019).

Lake productivity will increase with warmer temperatures. Biomass breakdown increases CO_2 emissions to the atmosphere, relative to carbon burial into lake sediments. At the same time as warming, lakes losing transparency (via increased nutrients and organic runoff), and how this interacts with warming to affect carbon emission and burial, is unclear.

To address this, Maciej Bartosiewicz, of the University of Basel, and co-authors consider observational data, alongside output from a 1D model. These are extrapolated to predict potential emissions and burial for temperate and boreal lakes.

They find that stratification causes lakes to warm at the surface but remain cold at depth, reducing respiration and increasing sediment carbon storage. For shallow lakes, additional burial could store up to 4.5 Tg C yr^{-1}, 9% more than current estimates. But reduced mixing causes anoxic conditions at depth, resulting in greater methane production (8% increase). These effects result in an overall net increase of 8 Tg CO_2e yr^{-1}, as methane has a greater warming potential, highlighting the need to look at the whole picture when considering warming effects. *BW*

https://doi.org/10.1038/s41558-019-0598-2

ENVIRONMENTAL PSYCHOLOGY

Who you say you are taxing matters

J. Environ. Psychol. https://doi.org/10.1016/j.jenvp.2019.101342 (2019).

The public is often in favour of policies to limit carbon emissions, but less willing to support carbon taxation. Although different policy options may have similar final costs, the way a policy is framed can have implications for public acceptance.

David Hardisty and colleagues, at the University of British Columbia, Canada, and the Environmental Defense Fund, USA, examine consumer perceptions of 'upstream' carbon regulations (at the point of extraction) versus 'downstream' (on the usage of goods) in the international aviation sector. In three studies, they find that consumers had a preference for carbon regulation when it was framed as an upstream offset in which aviation fuel producers and importers purchased offsets to reduce emissions, rather than a downstream offset paid by airlines and their customers. Offset schemes were preferred over policies described as taxes, and downstream taxes were particularly disliked, even when the total cost to the consumer was the same. This preference is attributed to participants' perception of the upstream offset as having a greater impact on climate change and its effectiveness at holding carbon polluters directly accountable. *AY*

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HYDROCLIMATE

Shifting moisture source

J. Clim. https://doi.org/10.1175/JCLI-D-19-0145.1 (2019).

Credit: Gino's Premium Images / Alamy Stock Photo

Land precipitation is vital to populations and ecosystems worldwide. Globally, terrestrial precipitation has two main sources: evaporation off the ocean surface or via 'recycled' moisture from evaporation (and transpiration) over land.

Kirsten Findell, from the Geophysical Fluid Dynamics Laboratory in Princeton, USA, and colleagues in the US and the Netherlands use climate models, reanalysis datasets and a moisture tracking algorithm to estimate historical patterns and future changes to moisture recycling. Historically, they find that around 55% of terrestrial evaporation is recycled and precipitates back on land, while about 40% of land precipitation originates as land evaporation.

The researchers estimate that moisture recycling will decrease 2–3% per °C increase, despite expected global increases in precipitation and evaporation. These results, coupled with inherent moisture limitations of the land surface, imply that the importance of the ocean as a moisture source to land will increase with warming. This is consequential for rain-fed agricultural regions, where crops that rely on recycled precipitation will become increasingly soil-moisture limited. *BL*

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