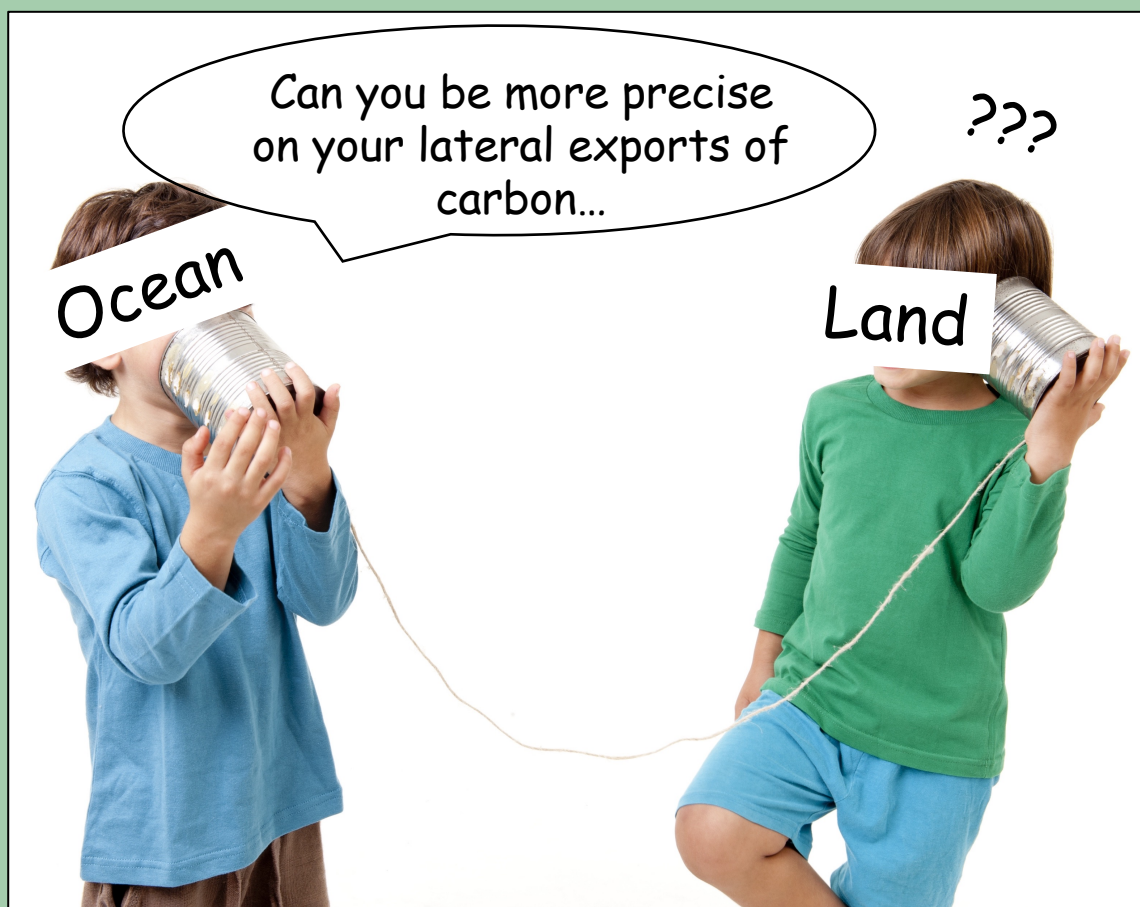


# Building bridges between land and ocean carbon budgets

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## This is the "state of the art"!



Large amounts of carbon and nutrients transit from land to the ocean.

Two main pathways of lateral exports of carbon:

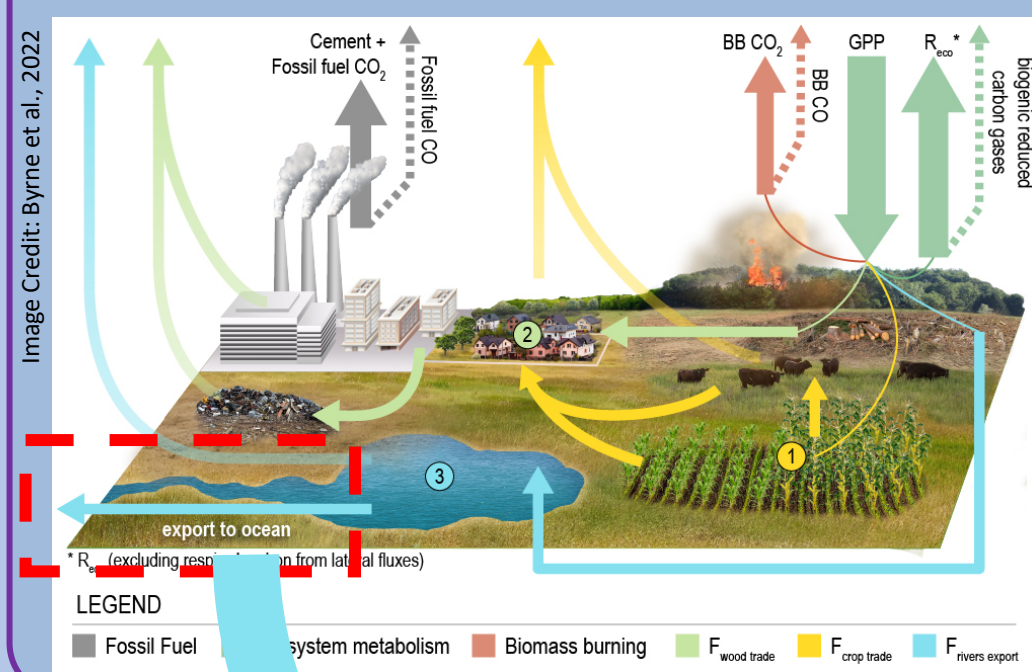
- Rivers: ~ 1 Pg C yr<sup>-1</sup> (Li et al., 2017)
- Coastal wetlands: ~ 2 Pg C yr<sup>-1</sup> (Duarte et al., 2005) = the Land-to-Ocean Aquatic Continuum (LOAC)

The LOAC contribution to the ocean carbon cycle is underrepresented in Earth System Models and global ocean biogeochemistry models (Ward et al., 2020)

How land and ocean carbon currently communicate in models.

## We aim to unify land and ocean carbon into an ocean biochemistry model ...

### Land carbon budget



**Key development:** First spatial inter- and intra-annual variability of lateral exports of carbon and nutrients from rivers, globally.

### Building bridges: the Land-to-Ocean Aquatic Continuum

#### Regions of interest:

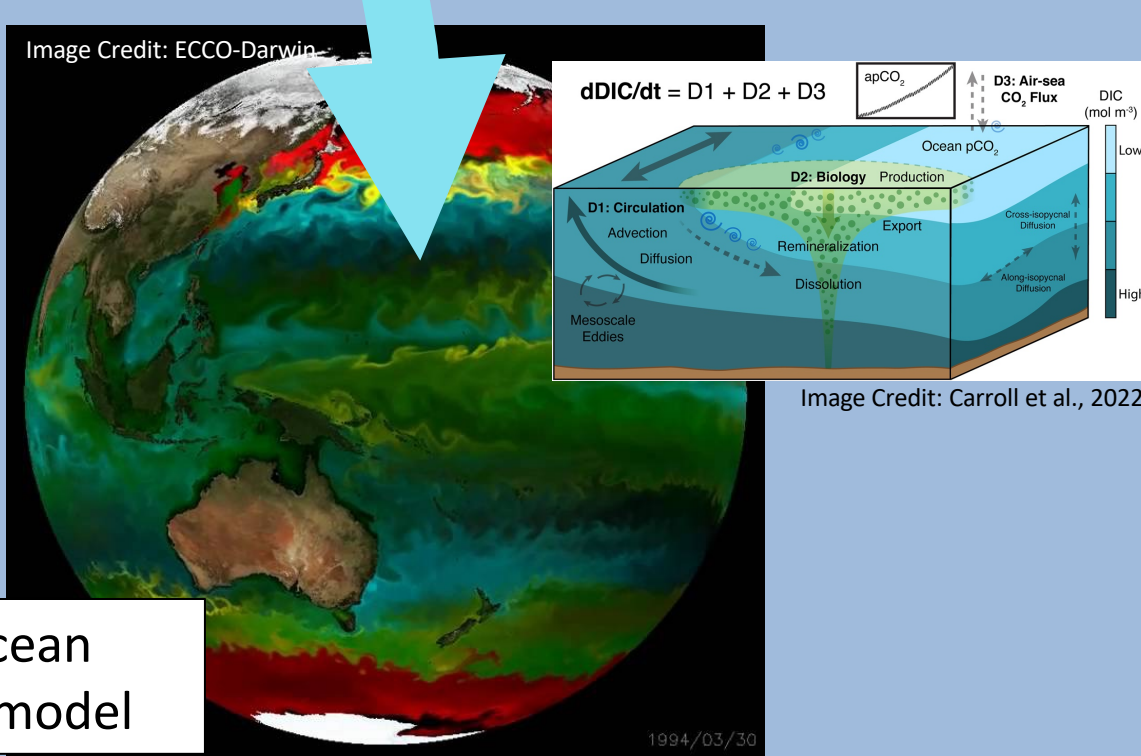
- Blue carbon ecosystems (mangroves, marshes, seagrass...)
- Coastal waters



**Key development:** First globally-resolved diffuse lateral exports of carbon from coastal wetlands.

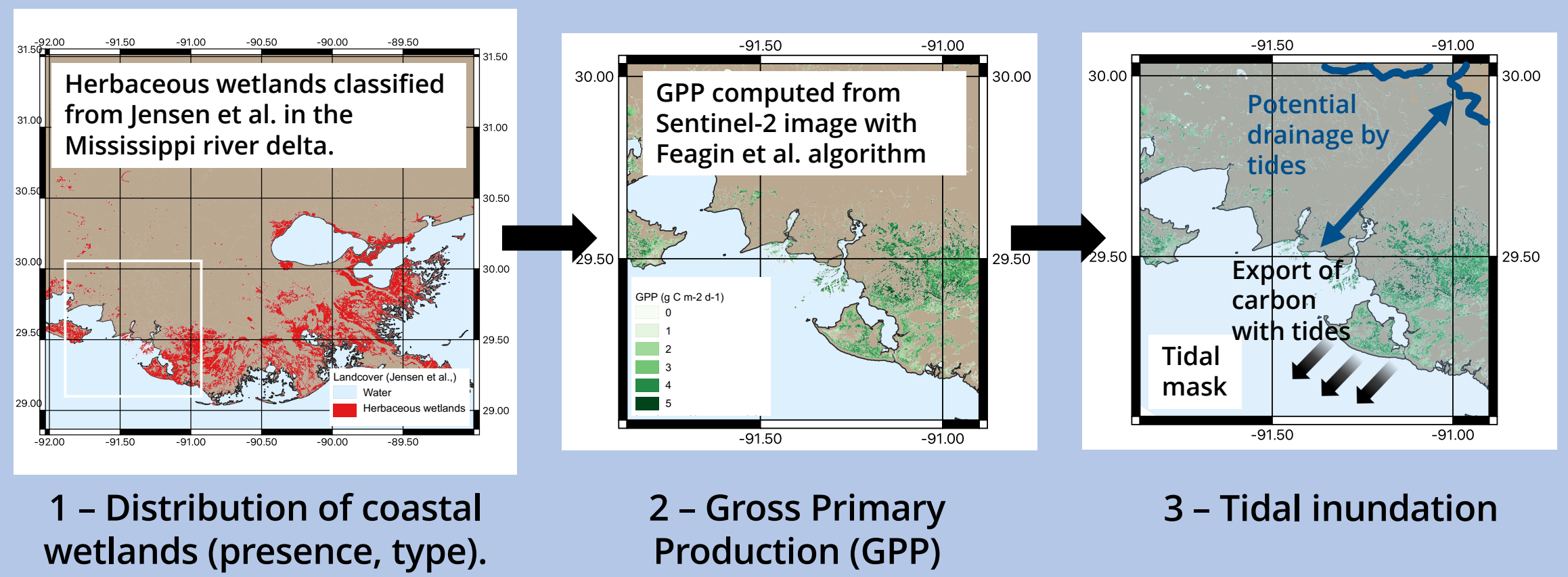
### Ocean model

**Key development:** First non-adhoc estimate of the sensitivity of the ocean carbon cycle to time and spatially-resolved exports from land.



ECCO-Darwin ocean biogeochemistry model

## ... by improving estimates of lateral exports of carbon from coastal wetlands ...

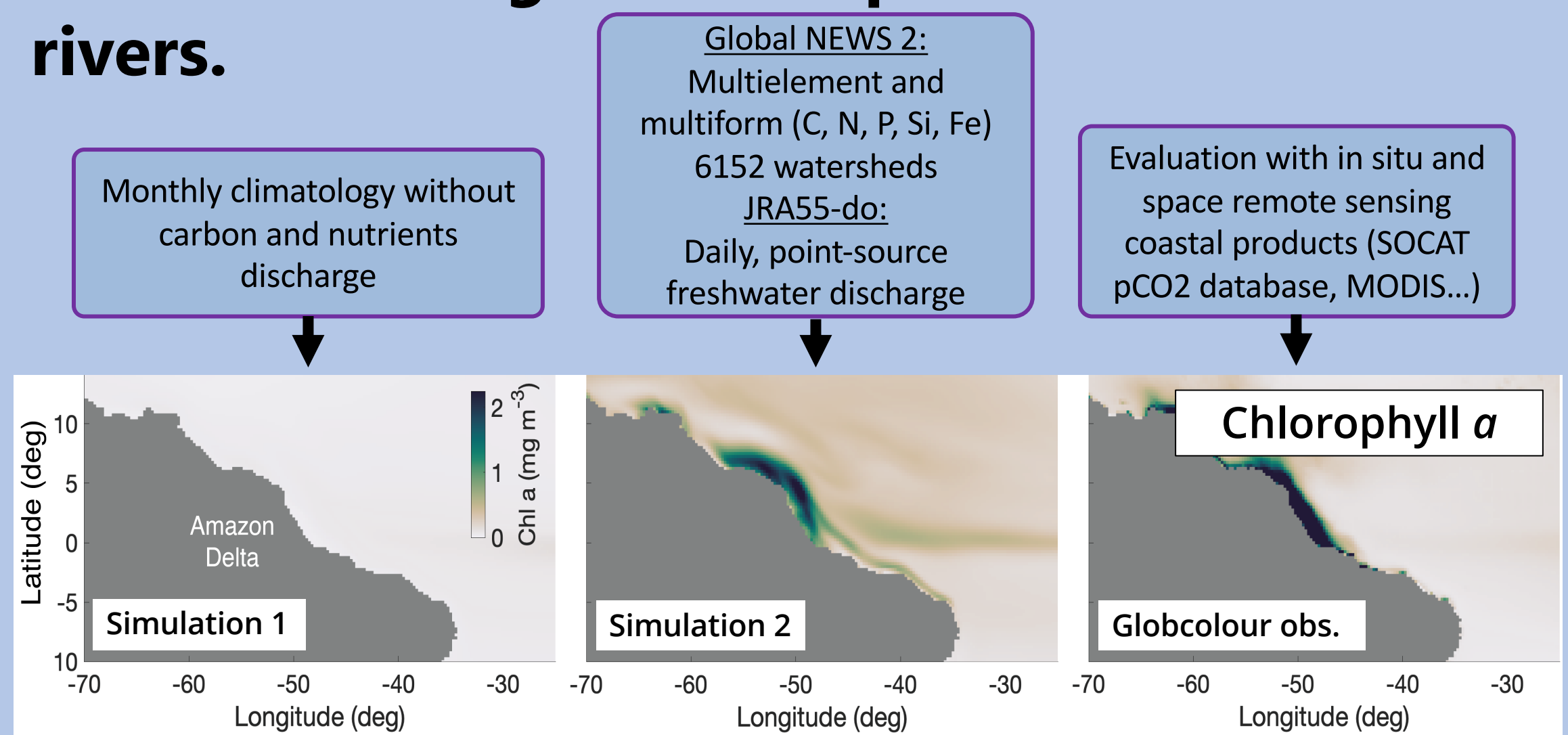


1 - Distribution of coastal wetlands (presence, type).

2 - Gross Primary Production (GPP)

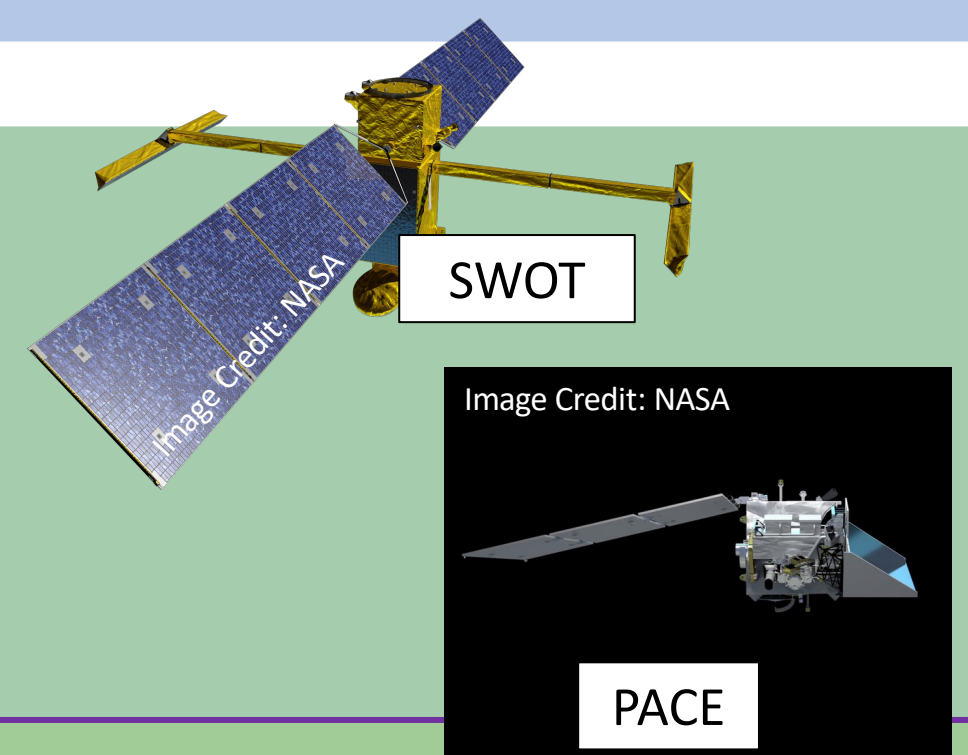
3 - Tidal inundation

## ... and resolving lateral exports of carbon from rivers.

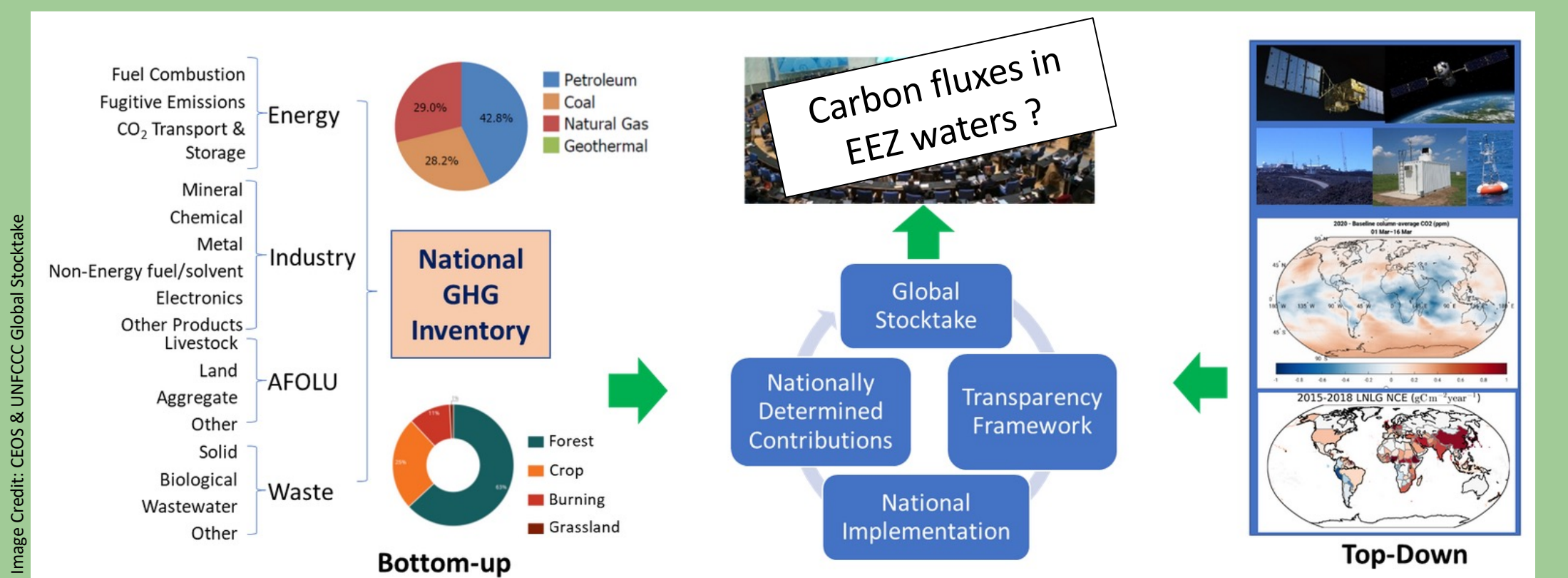


## Future perspectives

**Future missions:**  
 SWOT (river discharge, tides)  
 PACE (phytoplankton communities)



### Key application:



How will more precise accounting of lateral exports of carbon from land and considering the carbon cycle of coastal waters (**Exclusive Economic Zone**) will change National Green House Gases Inventory ?

### Publications:

Savelli, R., Menemenlis, D., Simard, M., Carroll, D., Bloom, A., Manizza, M., Dutkiewicz, S., Zang, H., (*in prep*), Global ocean carbon sensitivity to time and spatially-resolved carbon and nutrient exports from rivers.

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