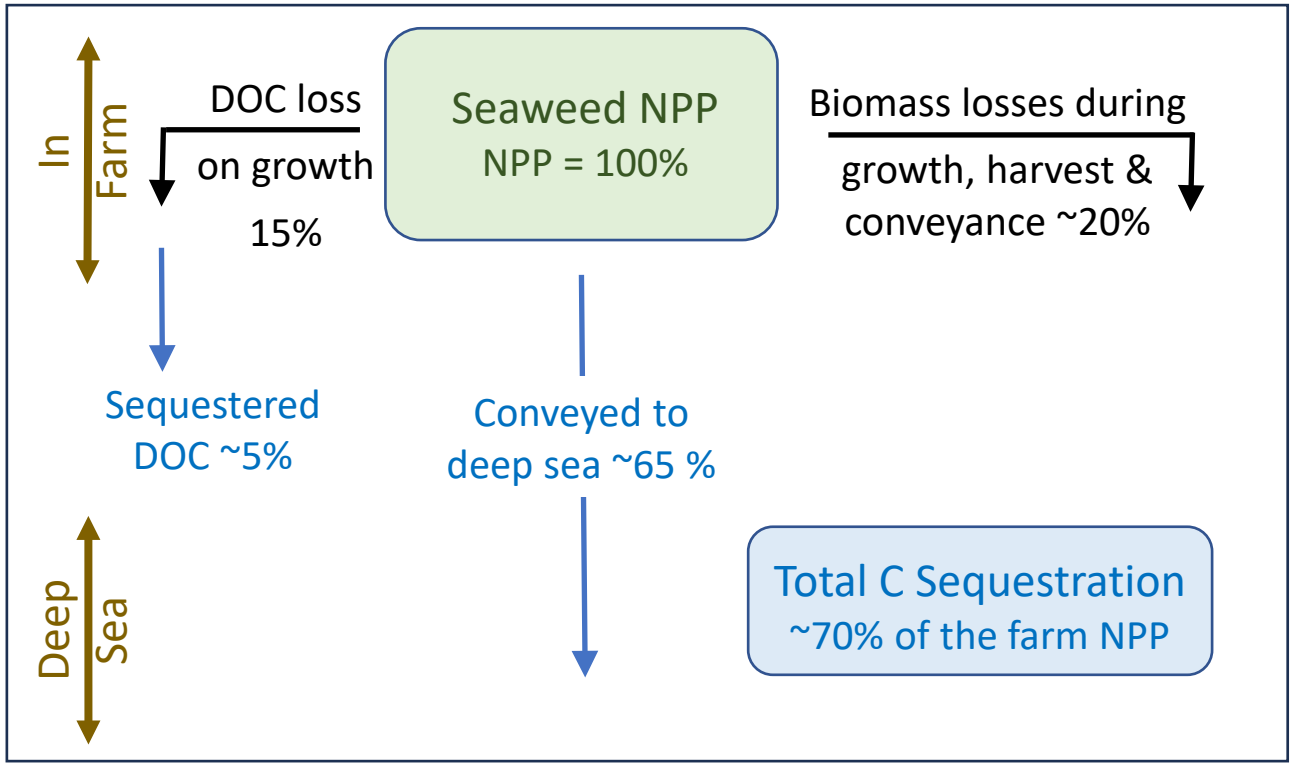

Source: Natural History Photography, Phil Colla

Can kelp help?

A current take on seaweed-based climate solutions.

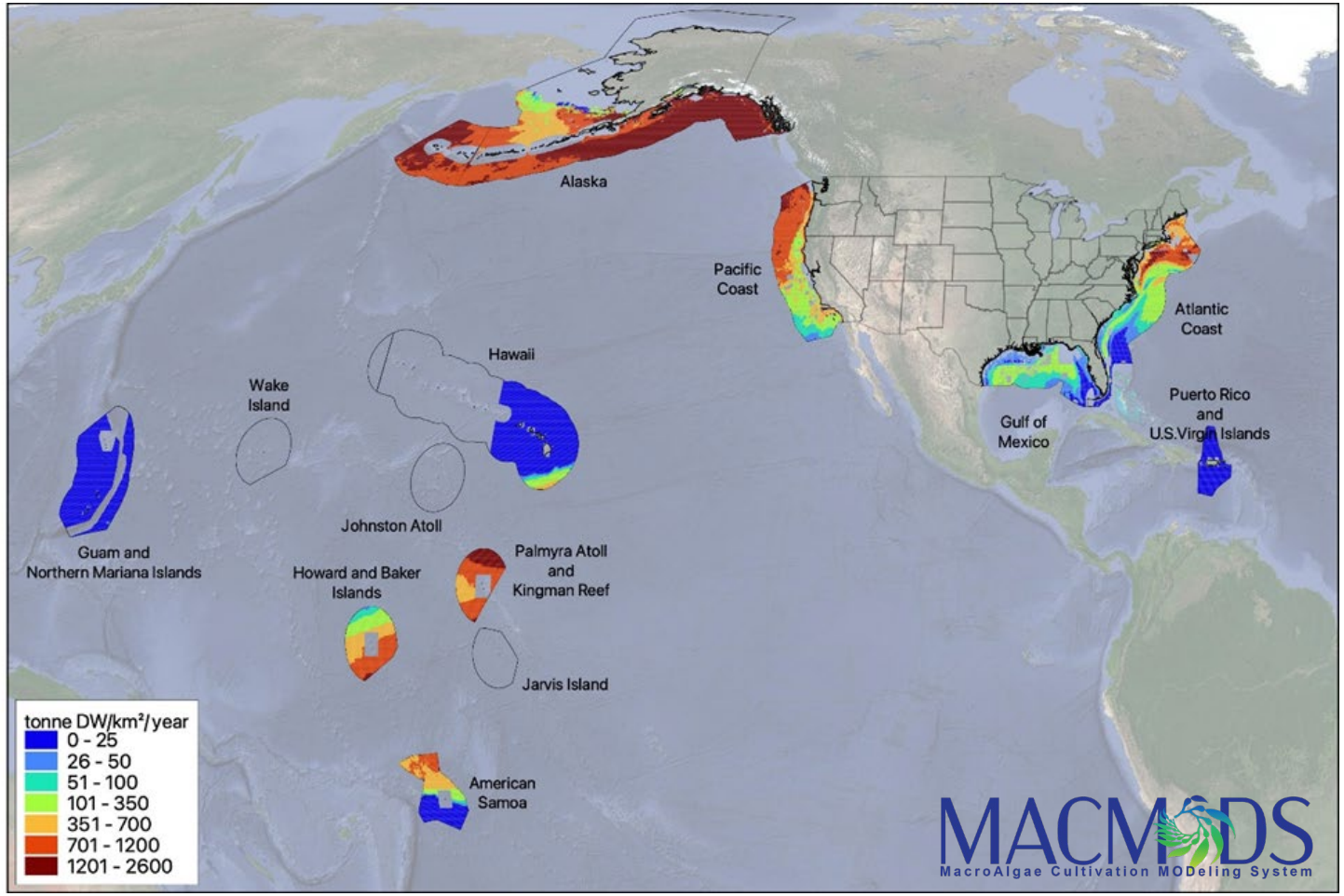
Kristen Davis, *Stanford University*

Hypothetical C budget for farmed seaweed:



(figure from Dave Siegel, UCSB)

What do we know?



Estimated Seaweed Biomass Yield from the DOE 2023 Billion Ton Report (US EEZ)

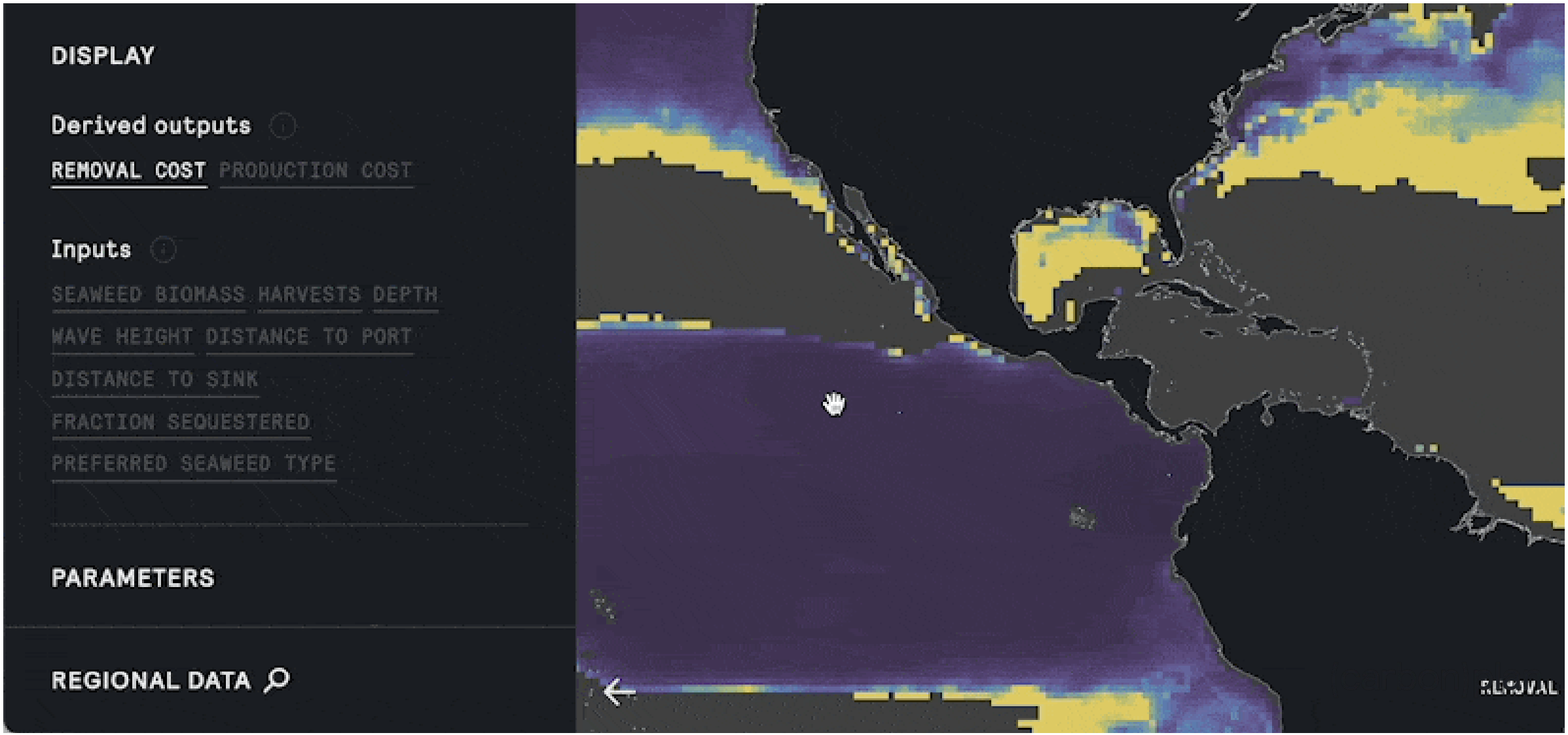
- **Seaweed can grow quickly and have a C:N ratio higher than phytoplankton,** which make them advantageous for carbon sequestration.

- **Models suggest we can harvest >1Gt of seaweed carbon annually in global EEZs.** But this would require farming over 1 million km^2 of the most productive ocean regions.

Arzeno-Soltero et al. (2023)
Wu et al. (2023)
DeAngelo et al. (2023)

Mapping seaweed farming potential for CDR and biomass products

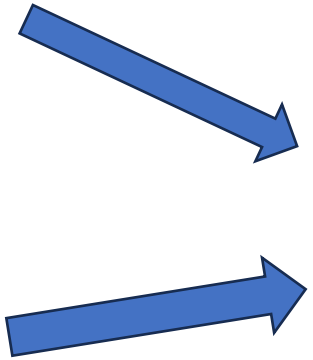
https://carbonplan.org/research/seaweed-farming



What do we need to know?

- **Permanence -** fate of exported biomass and recalcitrance of seaweed-derived DOC compounds

- **Environmental feedbacks –**
  - Upper ocean: how does nutrient drawdown or shading influence food-web changes and the biological pump (plankton)?
  - Deep ocean: how would sinking biomass change benthic ecosystems and biogeochemical cycling?



Field Trials!

- **MRV –** efficient methods for tracking biomass growth and burial.

Faroe Islands Summer 2025

OCEAN RAINFOREST
SUSTAINABLE NORDIC SEAWEED

References:

Arzeno-Soltero, I. B., Saenz, B. T., Frieder, C. A., Long, M. C., DeAngelo, J., Davis, S. J., & Davis, K. A. (2023). Large global variations in the carbon dioxide removal potential of seaweed farming due to biophysical constraints. Communications Earth & Environment, 4(1), 185.

DeAngelo, J., Saenz, B.T., Arzeno-Soltero, I.B., Frieder, C.A., Long, M.C., Hamman, J., Davis, K.A. and Davis, S.J. (2023). Economic and biophysical limits to seaweed farming for climate change mitigation. Nature plants, 9(1), 45-57.

Wu, J., Keller, D. P., & Oschlies, A. (2023). Carbon dioxide removal via macroalgae open-ocean mariculture and sinking: an Earth system modeling study. Earth System Dynamics, 14(1), 185-221.