## Toward marine ecosystem prediction with a global ESM

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Earth system models (ESMs) are vital tools to understand and predict Earth' s interacting physical-biogeochemical system. Efforts to extend current physical climate predictions to global marine biogeochemistry predictions using ESMs, however, have been hampered by uncertainties in the model and initialization procedures. This study shows that newly developed ESM-based marine biogeochemical predictions can skillfully predict satellite-derived seasonal to multiannual chlorophyll fluctuations in many regions. Prediction skill arises from successfully simulating the chlorophyll response to the El Nino-Southern Oscillation and capturing the reemergence of subsurface nutrient anomalies by winter mixing, which subsequently affect spring and summer chlorophyll concentrations. Further investigations of the utility of biogeochemical predictions show that annual fish catches in large coastal ecosystems are significantly predictable up to 1-2 year in advance, suggesting a role for ESM-based marine biogeochemical predictions in dynamic marine resource management efforts.

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