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TITLE: Observing climate change trends in ocean biogeochemistry: when and where

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ABSTRACT:

Abstract Understanding the influence of anthropogenic forcing on the marine biosphere is a high priority. Climate change?driven trends need to be accurately assessed and detected in a timely manner. As part of the effort towards detection of long?term trends, a network of ocean observatories and time series stations provide high quality data for a number of key parameters, such as pH , oxygen concentration or primary production (PP). Here, we use an ensemble of global coupled climate models to assess the temporal and spatial scales over which observations of eight biogeochemically relevant variables must be made to robustly detect a long?term trend. We find that, as a global average, continuous time series are required for between 14 (pH) and 32 (PP) years to distinguish a climate change trend from natural variability. Regional differences are extensive, with low latitudes and the Arctic generally needing shorter time series (<~30 years) to detect trends than other areas. In addition, we quantify the ?footprint? of existing and planned time series stations, that is the area over which a station is representative of a broader region. Footprints are generally largest for pH and sea surface temperature, but nevertheless the existing network of observatories only represents 9?15% of the global ocean surface. Our results present a quantitative framework for assessing the adequacy of current and future ocean observing networks for detection and monitoring of climate change?driven responses in the marine ecosystem.

SOURCE: Global change biology

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