



## **The role of the upper ocean short-term periodic and episodic mixing events in the global primary and new production**

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The potential importance of short-term periodic and episodic events for seasonal or annual plankton productivity has been debated in recent years both by observationalists and modellers. Although time series observations indicate significant responses of ecosystems to such events, the data coverage in terms of frequency of measurements makes it difficult to conclude whether this variability is important as regards properties such as primary production integrated over longer time periods.

Most contemporary basin-scale and global model simulations are run using slowly varying monthly climatological forcing or with simplistic UML schemes that are unable to capture short-term variability in the UML. Here, we use a 3-D General Circulation Model, with an embedded NPZDA (Nitrate, Phytoplankton, Zooplankton Detritus, Ammonium) ecosystem model to investigate the impact of variability in short-term upper ocean mixing on predicted ecosystem dynamics and global estimates of the primary and new production.

The use of 6h, daily, weekly and monthly atmospheric forcing resulted in dramatically different predictions of plankton productivity. Resolving the diurnal cycle of atmospheric variability by use of 6h forcing, and hence also diurnal variability in UML depth, produced the largest difference, reducing predicted global primary and new production by 25% and 10% respectively relative to that predicted with daily and weekly forcing.