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Planetary waves and biogeochemistry in the North Atlantic Ocean

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Planetary waves play a major role in the dynamics of the oceans, but their role is not limited to the physics. In fact, several studies (e.g. Machu et al., 1999; Cipollini et al., 2001; Uz et al., 2001; Charria et al., 2006) have shown that these waves have a distinct signature on surface chlorophyll concentration. These observations, made possible by the advent of remotely sensed ocean colour data, prompt several important questions:

- How do planetary waves influence surface chlorophyll concentrations? Which vertical or horizontal coupled processes are involved?
- Have planetary waves a measurable influence on primary, new and exported productions?
- Is that influence significant within the global ocean carbon cycle?

Two recent and complementary lines of investigation will be presented, with examples over the North Atlantic. The first approach is the use of remotely sensed data combined with theoretical modelling of the various processes, and then the adoption of a statistical decomposition of the observed signal; this allows an initial assessment of the relative importance of the processes that could explain the chlorophyll signature of planetary waves (Killworth et al., 2004; Charria et al., 2006). The second approach, based on 3D coupled physical/biogeochemical modelling, allows investigating in a more quantitative way the processes involved and the impact of these waves on primary, new and exported production. Finally, the temporal variability (in both amplitude and phase) of the wave signature in chlorophyll is compared to major climatic indices like ENSO and NAO, in order to investigate any correlations.