Geophysical Research Abstracts, Vol. 9, 01469, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-01469

Determination and prediction of the temporal and spatial variability in plankton production and respiration in the Atlantic Ocean

C. Robinson (1), N. Gist (1), P. Serret (2), E. Fernandez (2), E. Teira (2), G. Tilstone (1), V. Perez (2), M. Woodward (1)

(1) Plymouth Marine Laboratory, Prospect Place, Plymouth PL1 3DH, UK. (carol.robinson@pml.ac.uk / Fax: +44 (0) 1752 633101 / Phone: + 44 (0) 1752 633462), (2) Departamento de Ecologia y Biologia Animal, Universidad de Vigo, 36200 Vigo, Spain

Euphotic zone plankton gross production (P), primary production (PP) and respiration (R) were determined from the *in vitro* flux of dissolved oxygen and incorporation of ^{14}C during eight latitudinal transects of the Atlantic Ocean, as part of the Atlantic Meridional Transect (AMT; www.amt-uk.org) programme. The transects traversed the North and South Atlantic Subtropical Gyres in April- June and September- November 1998, 2000 and 2003-2005. These data were combined with those from a global dataset www.amt-uk.org/data/respiration.xls to assess the seasonal variability of P, R and P/R in the N and S gyres, and to compare the rates of P and R in the previously unsampled N gyre centre with the more frequently sampled eastern edge of the gyre. Overall, the N gyre was heterotrophic (R>P) and the S gyre was balanced, but the metabolic balance of both gyres changed with season. Without a more temporally representative dataset, we are unable to confirm whether production between November and April in the N gyre is sufficient to support the heterotrophy measured between April and November. The N gyre was less heterotrophic than previous estimates suggested, and R decreased from the eastern edge to the centre of the N gyre, possibly indicative of an allochthonous organic carbon source to the east of the gyre. The positive relationship between net heterotrophy and nutrient stress suggests a positive feedback of increasing CO_2 emissions caused by increased stratification predicted in model climate change scenarios. In order to extend the temporal and spatial estimates of P/R we tested an empirical approach to predict net community production (NCP = P-R) from satellite derived estimates of PP and measurements of PP and NCP from

two spatially contrasting AMT cruises. Geographic and annual patterns of NCP were adequately predicted only when an empirical NCP:PP relationship was used which included data relevant to the importance of local versus distant sources of organic carbon in the modelled region. The paucity of open ocean P/R data has led to the estimation of global NCP from P/R relationships which unsystematically incorporate all available data. The regionally specific approach validated here suggests that such a generalised relationship cannot be adequately used to derive global NCP. This assertion will be further tested using the more recently collected AMT P/R measurements.