



Biogeochemical variations at the Porcupine Abyssal Plain Sustained Observatory (PAP-SO) in the northeast Atlantic Ocean

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We examine high-resolution autonomous measurements of carbon dioxide partial pressure $p(\text{CO}_2)$ taken in situ at the FixO₃ Porcupine Abyssal Plain sustained observatory (PAP-SO) site in the northeast Atlantic (49° N, 16.5° W; water depth of 4850 m) for the period 2010 to 2012. Measurements of $p(\text{CO}_2)$ made at 30 m depth on a sensor frame are compared with other autonomous biogeochemical measurements at that depth (including chlorophyll a-fluorescence and nitrate concentration data) to analyze weekly to seasonal controls on $p(\text{CO}_2)$ flux in the inter-gyre region of the North Atlantic. Comparisons are also made with in situ regional time-series data from a ship of opportunity and mixed layer depth (MLD) measurements from profiling Argo floats. There is a persistent under saturation of CO₂ in surface waters throughout the year which gives rise to a perennial CO₂ sink. Comparison with an earlier dataset collected at the site (2003 to 2005) confirms seasonal and inter-annual changes in surface seawater chemistry. There is year-to-year variability in the timing of deep winter mixing and the intensity of the spring bloom.