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# Modelling the non steady state downward flux of particles at the PAP site in 2009

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The biological carbon pump, mediated principally via the sinking of organic matter from the surface ocean, is a significant term in the global carbon cycle. It transfers annually 5-15 GT C yr-1 out of the photic zone, an amount comparable to the annual accumulation of $CO_2$ in the atmosphere driven by anthropogenic processes, and mediates a storage of $CO_2$ in the ocean interior without which atmospheric $CO_2$ would be much larger than it is today. Yet most of the material exported from the photic zone does not penetrate the deep ocean, instead it is mineralised in the twilight zone with fluxes in the thin 100m thick layer under the photic zone being extremely rapidly attenuated. The shape of this attenuation varies in time and space yet appears to be a critical determinand over atmosphere – ocean $CO_2$ partitioning. Attempts to predict this attenuation using independent measures of heterotrophic activity have often not yielded the observed pattern of attenuation implying substantial uncertainties in one or more of the terms that enter into the comparison. In this talk we will describe direct estimates of particle flux made using drifting neutrally buoyant traps at the PAP site in 2009. We show that although we can make substantial progress towards closing the mid water C budget we still have a significant excess of carbon consumption over supply. We believe that this is due to erroneous steady state assumptions, a hypothesis we explore via simple numerical models.