Interannual variations in primary productivity in the North Pacific western subarctic gyre (WSG), assessed by using settling particle delta N-15

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Stable delta N-15 of particles trapped at 500 m of station K2 showed higher values in winter and lower in summer. This pattern would reflect mainly seasonal change in surface layer ammonium delta N-15 due to isotopic fractionation by light-controlled nitrification and the subsequent ammonium assimilation by phytoplankton. As a result, particle delta N-15 variations at K2 were significantly correlated with primary productivity (PP) (R^2= 0.94), which is attributable to their respective dependencies on light condition in the upper mixed layer. By applying this relationship to the time-series particle delta N-15, we here constructed monthly mean PP at K2 during 2010–14. The estimated PP ranged from 89 to 790 mg m^{-2} d^{-1} (in carbon equivalents) with the annual maximums appeared in Jun to Aug. As for the seasonal means in each year, we found an increasing trend of spring PP (Apr–Jun) while summer PP (Jul–Sep) decreased with time. If this indicates that the initiation timing of phytoplankton bloom became earlier during 2010–14, it would result from less light limitation in spring 2013–14 than before due to a reducing upper ocean mixing. With data in 2015–2019, interannual variations in the WSG productivity are addressed further.

Keywords: North Pacific western subarctic gyre, Primary productivity, Sediment trap, Stable nitrogen isotope

