Reconstruction of spatiotemporal change of anthropogenic fixed nitrogen in the western North Pacific

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We constructed parameterizations for the estimation of ocean fixed nitrogen (N) in the western North Pacific. Parameterizations (N_p), determined as a function of temperature (T), potential density (sigma-theta) and dissolved oxygen (DO), provided strong correlations with direct measurements for ocean nitrogen (N_p = −2.24T −4.70sigma-theta −0.0970DO + 182.2; the coefficient of determination (r^2) = 0.988; the root mean square error (RMSE) = 1.25 umol kg^{-1}). Predicted N values were consistent with previous independent hydrographic observations, generally within the above error. By applying T, sigma-theta and DO time-series data from ship observations to our parameterization, large seasonal variations in N were demonstrated in detail. Using the parameterization technique along with the time series of observed N (N_{obs}) found the significant increasing rate of oceanic anthropogenic fixed nitrogen (N_{anth}) in the past four decades in the western North Pacific subtropical region.

Keywords: anthropogenic fixed nitrogen, western North Pacific, parameterization

