Total Zn and Cd uptake was calculated using Eq. (3) and Eq. (4), respectively. $^{110}Cd_{Sample}$ and $^{67}Zn_{Sample}$ are the particulate ^{110}Cd and ^{67}Zn measured by ICP-MS analysis of the 3μm sample filter, normalized to the total culture volume (275 mL) and 24hr of incubation. $^{110}Cd_{Sample}$ and $^{67}Zn_{Sample}$ already in the particulate fraction (that is, the pCd and pZn that existed in the water column upon collection of the raw seawater samples) was accounted for by subtracting the particulate blank, $^{110}Cd_{Blank}$ and $^{67}Zn_{Blank.}$ $^{110}Cd_{Blank}$ and $^{67}Zn_{Blank}$ will hereafter be referred to as "pre-existing particulate ^{110}Cd and ^{67}Zn". The pre-existing particulate blank value for ^{110}Cd was obtained from incubation bottles that had Zn added, but no Cd spike. Likewise, the pre-existing particulate blank value for ^{67}Zn was obtained from incubation bottles that had Cd added, but no Zn spike. The ^{67}Zn spike solution was confirmed to contain virtually no ^{110}Cd, ^{111}Cd, ^{114}Cd. The ^{110}Cd spike was likewise confirmed to contain virtually no ^{67}Zn, ^{64}Zn, ^{66}Zn. As a result, we assumed that the added ^{67}Zn spike did not affect the pre-existing Cd, nor did the ^{110}Cd spike affect the pre-existing Zn. It is assumed that the pre-existing particulate blank was in steady state, i.e. that it represented the Cd or Zn already in the particulate fraction and any possible natural uptake that could occur during incubation for 24h was negligible. The total dissolved pool of each metal isotope (denominator of each equation) is the sum of the dissolved ^{110}Cd or ^{67}Zn added as the spike ($^{110}Cd_{Spike}$, $^{67}Zn_{Spike}$) plus the natural, pre-existing dissolved ^{110}Cd or ^{67}Zn that was in the raw seawater ($^{110}Cd_{Natural}$, $^{67}Zn_{Natural}$) collected at each depth. To calculate $^{110}Cd_{Natural}$ and $^{67}Zn_{Natural}$, the total dissolved Cd or Zn measured by isotope dilution-ICP-MS (Cd_{Total}, Zn_{Total}) was multiplied by the natural abundance of ^{110}Cd and ^{67}Zn (12.49% and 4.10%, respectively). Dividing the particulate ^{110}Cd and ^{67}Zn by the total dissolved ^{110}Cd and ^{67}Zn yields the fraction of these metal isotopes that moved from the dissolved pool to the particulate pool per day.

$$\text{Cd}_{\text{total}}\ \text{Uptake Rate}\ (\text{pmol L}^{-1}\,\text{d}^{-1}) = \frac{\left[^{110}\text{Cd}_{\text{Sample}}\,(\text{pmol L}^{-1}\,\text{d}^{-1}) - {}^{110}\text{Cd}_{\text{Blank}}\,(\text{pmol L}^{-1}\,\text{d}^{-1})\right]}{\left[^{110}\text{Cd}_{\text{Spike}}\,(\text{pmol L}^{-1}) + {}^{110}\text{Cd}_{\text{Natural}}\,(\text{pmol L}^{-1})\right]}\ \text{X}\ \text{Cd}_{\text{total}}\,(\text{pmol L}^{-1}) \quad (3)$$

$$\text{Zn}_{\text{total}}\ \text{Uptake Rate}\ (\text{pmol L}^{-1}\,\text{d}^{-1}) = \frac{\left[^{67}\text{Zn}_{\text{Sample}}\,(\text{pmol L}^{-1}\,\text{d}^{-1}) - {}^{67}\text{Zn}_{\text{Blank}}\,(\text{pmol L}^{-1}\,\text{d}^{-1})\ \right]}{\left[^{67}\text{Zn}_{\text{Spike}}\,(\text{pmol L}^{-1}) + {}^{67}\text{Zn}_{\text{Natural}}\,(\text{pmol L}^{-1})\ \right]}\ \text{X}\ \text{Zn}_{\text{total}}\,(\text{pmol L}^{-1}) \quad (4)$$