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Deviation of B concentration from predictions using salinity in coastal environments

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Accurate data on boron (B) concentration (mg kg–1) are critical for seawater thermodynamic calculations, including the interconversion between total alkalinity ($[HCO_3^-] + 2[CO_3^{2-}] + [B(OH)_4^-]$ + others) and carbonate alkalinity ($[HCO_3^-] + 2[CO_3^{2-}]$). These conversions are made using the dissociation constant of boric acid and the total B concentration, derived from chlorinity (Cl, in ‰; calculated from salinity) and the ratio of B to Cl chlorinity (derived from open ocean data). The established B/Cl ratio implicitly assumes a zero B concentration in river discharges entering coastal seas, and thus does not reflect riverine B concentrations. The consistent ratio of B to Cl concentrations found in coastal waters of the Yellow and East China, and East seas provides compelling evidence that the poorly studied processes (e.g. ocean biology, atmospheric deposition, and river discharges) have non-detectable impacts on the ocean B concentration, and thereby do not change the B/Cl ratio established for the open ocean environments. The low B concentration (mean of 3 umol kg^{-1}) measured in all major rivers flowing into the East China, Yellow and East seas, along with the low degree of dilution in these areas, supports use of the B/Cl ratio of 0.2414 reported for the open ocean environments.