

Interactive comment on “Salinity/temperature ranges for application of seawater S_A -T-P models” by G. M. Marion et al.

G. M. Marion et al.

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Here are my comments with respect to Reviewer #3 arranged by his/her numbers. 1. I changed the title to “Precipitation of Solid Phase Calcium Carbonates and Their Effect on Application of Seawater S_A -T-P Models”; 2. Eqs. 1-4 do not deal with the precipitation of pure CaCO_3 (calcite). The equilibrium constant $K(\text{calcite})$ is for pure calcite, but only as a reference point. But the $\text{IAP}(\text{CaCO}_3)$ is based on experimental measurements of seawater CaCO_3 that likely contained Mg^{2+} and could have been either aragonite or calcite. The $\omega(\text{calcite})$ refers to calcite only because the reference state is pure calcite. These formulations could also have been represented as $\omega(\text{aragonite})$ by dividing $\text{IAP}(\text{CaCO}_3)$ by the pure aragonite equilibrium constant. In the revision, I rewrote Eq. 3 to show the calcite-aragonite relationship. 3. I rewrote the paper to present MPa as the dominant pressure term, except for atmospheric val-

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ues that I prefer to represent as 956 atm . But whenever different terms for pressure are given in the text, I added parentheses that list the alternative terms. For example, 0.1-100 MPa (= 1 to 1000 bars). 4a. PCO_2 was kept constant at 385 atm . The listed values in Table 1 can only lead to minor changes as T or PCO_2 change. Nevertheless, while alkalinity remains fairly constant, the components of alkalinity (now defined in a footnote in Table 1) can significantly change. So this can cause a small change in salinity, but this is minor (0.04%). This point is now described in more detail in Section 2.2 (Seawater Properties). 4b. The only strong point in support of these extrapolations is the fact that the model accurately predicts the transition from calcite to ikaite at 3°C , which is in excellent agreement with the literature. I embellished my discussion on this subject in Section 4. 5. I rewrote the line as suggested by the reviewer. 6. 450 atm is correct. Gypsum starts precipitating sometime between 2008 and 2100, approximately when the PCO_2 reaches 450 atm . I changed the wording to clarify. 7. I reworded as suggested by the reviewer. 8. I added PCO_2 to Figure 2. I now mention in Section 2.2 how I deal with PCO_2 and fCO_2 in this paper.

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