Geoscientific
Model Development
Discussions

Interactive comment on "The mathematics of the total alkalinity–pH equation: pathway to robust and universal solution algorithms" *by* G. Munhoven

M. Follows (Referee)

mick@ocean.mit.edu

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The manuscript carefully lays out general algorithms to define the total alkalinity for an arbitrary set of proton donors/acceptors for which the equilibrium constants are known. Some useful mathematical properties of the system are highlighted. Solutions for [H+] are discussed for simplified forms are discussed as well as several iterative methods for solving more complete definitions. A robust method for selecting values to bracket the root is discussed. The author presents a new method (for which code can be obtained) which though not always fastest to converge on a solution is very efficient and extremely robust across a very wide range of likely application scenarios.

In my view this is a very valuable contribution. First of all it's great to see a comprehensive and systematic discussion of how to formulate the underlying alkalinity definition.

Secondly, the careful and systematic discussion of the approaches to solution is illuminating. Finally, there is a compelling argument for adopting the new scheme because of its robustness.

If I have any suggestion, it is that the discussion of free vs seawater pH is rather terse and without introduction - it may be unclear to some readers without prior knowledge of the issues alluded to. This is a very minor point ...

I really enjoyed this manuscript. It is clear and I learned alot. As well as introducing an improved solver, it provides a great reference on the topic as a whole.

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