Ocean Science

Discussions

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Interactive comment on "Circulation of the Turkish Straits System between 2008–2013 under complete atmospheric forcings" *by* Ali Aydoğdu et al.

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I read the paper of AydoĂ§du and co-authors with great interest. I find some problems in the interpretation of previous results

1. The criticism of the paper of Stanev et al. (2017) is mostly off the mark. Below are their texts: ' Stanev et al. (2017) used an implicit advection scheme for transport to handle a wide range of Courant numbers (Zhang et al., 2016) while satisfying the stability of the solution. However, the computational burden of using an implicit scheme imposed a coarser model resolution with 53 vertical levels at the deepest point of the Black Sea. I note that this limitation may, particularly in the Bosphorus, lead to exces-

sive vertical mixing or a widened interface thickness, which are crucial for the intrusion of the Mediterranean origin water into the Black Sea. This can be seen in their Figures 11c and 11d, for example.'

I want to bring to the attention of authors that: a) 53 vertical levels in the Bosporus, which in some places is ∼30 m deep, is less than 1 m vertical resolution with the used vertical coordinates, that is better than the resolution used by authors. They say "The vertical resolution is 1 m in the first 50 m". The conclusion is that authors have to spend some time to reading carefully what other scientist have published. b) SCHISM uses explicit Eulerian-Lagrangian approach for momentum advection (which is unconditionally stable). It also uses an implicit scheme for terms in the momentum and continuity equations that place most stability constraints (pressure gradient, divergence, vertical viscosity). Most importantly, the size of matrix from the implicit scheme is determined by number of horizontal nodes, not this times number of levels. In fact we have used 92 levels in one version of our Kuroshio simulation and it went fine. So it's not a fundamental problem for us to use a large number of levels - it's just a practical consideration given our limited computational resource (see also my comment (a)). In any case, your results inspired us to try larger number of levels in the future.

Our experience with our own and other Z-coordinate models is that it requires a large number of levels to get reasonable stratification and bottom intrusion right (due to staircase). We switched to hybrid coordinates precisely because of this. I hope that authors will avoid conveying this kind of mis-information.

2. I expected, after having seen their wrong criticism against the work of Stanev et al. (2017), to see some examples. Unfortunately, this paper is only cited in the introduction, so their statement there is totally unjustified. A fair approach would be to clearly demonstrate what their progress is in comparison with earlier unstructured-grid experiments.

Joseph Zhang March 2018

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