Ayache et al NEMO iso review

Water isotope tracers are indeed a useful way to track the water cycle, and this study seeks to provide for high resolution insight into the Mediterranean ocean.

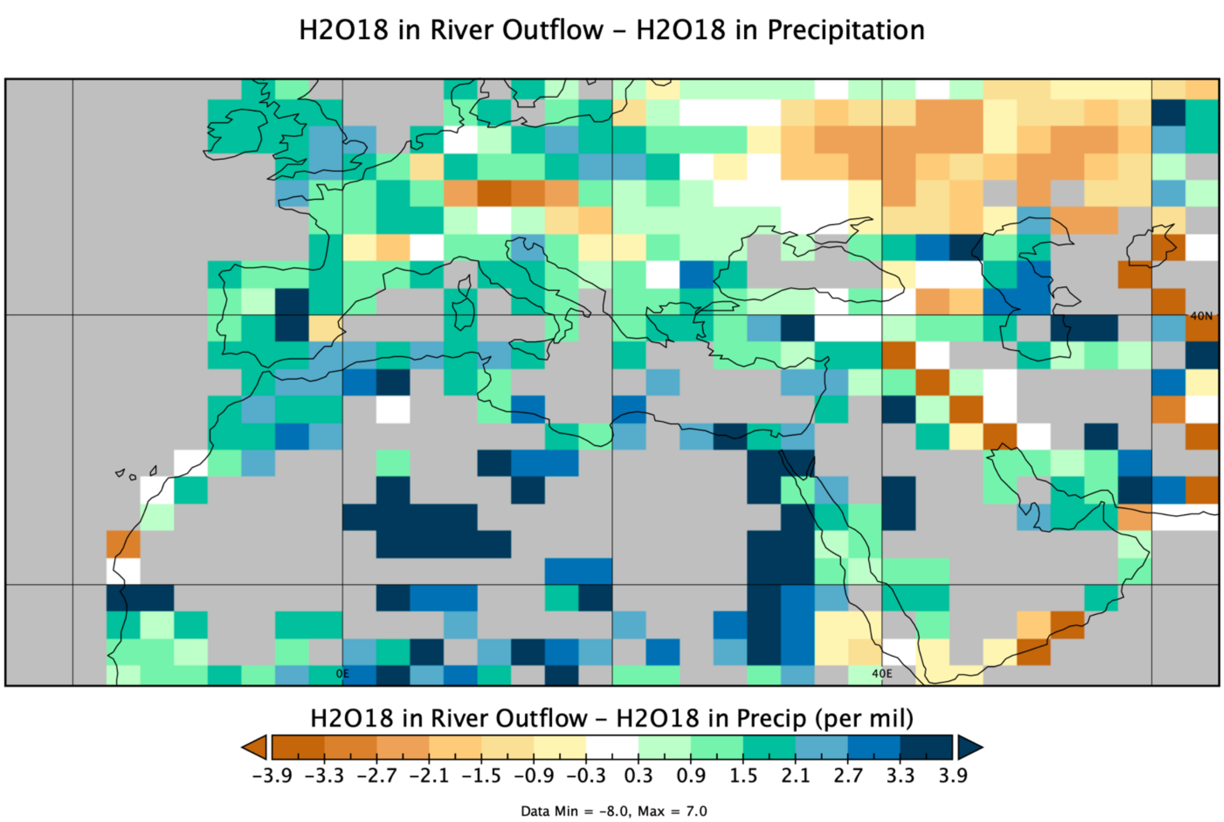
The authors of this study include expert isotope modelers, so the work is on the whole very solid.

I have Mostly few questions about the specifics of implementation and the write up.

1) for someone who is *not* a water isotope modeler, the casual inclusion of shorthand / jargon without explanation needs to be expressly defined. I.E., $\delta^{18}O_{sw}$ or δD (also—shouldn't you write δD_{sw} to be consistent?) or $CaCO_3$ or $\delta^{18}O_c$ all need to be defined – what does the delta mean. What do the subscripts mean. Some of the equation rendering has broken down maybe on the author's side, maybe on the Copernicus side.
2) In the write up of previous work in the med for isotopes, the authors may (not?) be aware that there is almost certainly a mistake in the δD values of Gat as they vary much much less than $\delta^{18}O_{sw}$ – probably the original source should be sought out for that validation.
3) When it is said that 'we use fluxes' from LMDZiso – that is surface water isotope fluxes? How are fluxes from rivers handled? Do you use observed isotope values or simulated ones? (Do the simulated river values closely approximate the measured ones?) If no measurements are available, what was done instead?
4) On page 5, they say "it is common to transport the isotopic ratio rather than the individual isotope…" then later "and pseudo-salinity fluxes". I don't know NEMO that well, but I am going to guess they are saying in a round about way that this ocean model has a rigid lid instead of a free surface. They should say either way. Because most isotope models do *not* in fact transport around concentrations of isotopes, they transport around mass. Sure – some models do not actually conserve mass – they are forever having to reimplement water isotopes in their code because they have virtual moisture or salt fluxes. Anyhow, those who *can* do indeed transport around mass not concentration. The per mil isotopic composition is determined on post-processing. Why? This is done so that the isotope / tracer code can have an exact replica of 'water' from the non-tracer code and this tracer can be 1:1 compared throughout the entire model to made sure mass isn't being gained/lost anywhere spuriously. Isotopic composition comes into play because SMOW is defined and fractionation at phase changes is defined. This is, in general, simpler for an ocean model where the mass of water is simply (MO – S), but if you have a rigid lid, then you have virtual mass fluxes of isotopes. Clarity for this point is required.
5) The 'interpolated to 20 min time step'—does this mean that actual rainfall and weather systems otherwise are regressed and then passed to the model at this finer time step, or is the daily value simply applied/scaled at the 20 minute interval. I would guess that if you are using some sort of nudged version of LMDZiso that there is useful information at a finer timescale (i.e., if its been nudged at 3 hour timesteps,

why not interpolate from 3hr->20min) – otherwise you'll miss the finer temporal resolution features. You wouldn't need to store *all* of LMDZiso values at that timestep—just those in your domain.

6) I'm still confused about the pseudo-salinity tracer. Please explain
7) Page 6:: the present day values seem awfully low. CO2 of 348ppm – I rarely encounter PhD students anymore born in a world with CO2 this low.
8) NEMO-MED12 grid is jargon that I don't understand
9) Still confused on L165-170 how the isotopic composition for the rivers was determined. It sounds like you are saying that the isotopic composition of river discharge = local grid box precipitation isotopic composition (which would be wrong of course). Can't you use observations *or* use d18Oriver from LMDZiso (or another isotope enabled model). Since you have already established that the Med is an evaporative basin, you might expect that d18Oriver to be a bit enriched compared to d18Oprec… (Places downriver or downhill in a P>E location you would expect d18Oriver to be a bit depleted compared to d18Oprec…) But the Med, and particular places like the Nile, you definitely should expect some evaporation to strip out the light isotopes of the river.



10) Can you write up the E-W surface d18Osw context from obs ? Maybe putting observed d18Oriver would make for a better gradient. (The baseline composition is set by your SMOW definition—I'd worry less about that.)
11) For deriving d18O-S relationships – can you put yours in context of the LMDZiso? Would you expect NEMOiso to differ that much given that you are prescribing your end member from the coupled model? Is this a useful section?

12) For section 3.3 – can you please check the Gat96 comparison. Does it make sense?
13) For the d18Ocalcite discussion, what is the correlation between d18Oc and temperature temporally and spatially. For interannual variability, does the inclusion of d18Osw confound the correlation. Also—you are presuming surface dwelling foraminifera. Maybe its interesting to look at species specific d18Oc.
14) There are *some* existing SWING comparisons of different isotopic compositions for different groups. Maybe for your next paper you could pull those in, but for this one, you should at least mention and speculate if it would be useful.