

Interactive comment on “Mg/Ca, Sr/Ca and stable isotope from planktonic foraminifera *T. sacculifer*: testing a multi-proxy approach for inferring paleo-temperature and paleo-salinity” by Delphine Dissard et al.

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nice idea to try and leverage some information from Sr to try and improve the paleo-SST/SSS estimation. i have several comments (mainly on the statistical aspects).

while this seems like a great new dataset, you mention it was a 'meridional' transect in the Atlantic (line 98) - this screams covariance of temperature and salinity to me. covariance of predictor variables is going to seriously impact you ability to determine the correct coefficients (especially with a relatively small dataset), however i see no men-

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tion/discussion of T/S covariance in the dataset. i really think this potential covariance between T and S needs to be looked at and discussed in relation to your regressions.

i do not think your regression approach is valid. there is no problem with the regressions of Mg and Sr against T (or T and S) individually (except the covariances mentioned above), but then you invert the regression, such that you are regressing SST against Mg and Sr. i do not think this is a valid approach with least squares regression, as the residuals are calculated along the y vector. you also mention that there is an improvement in fit compared to the single regressions above (line 234), however these regressions results are not comparable in this way as i) the equations are inverted (and the residuals are thus not calculated in the same way), and ii) you have changed the degrees of freedom

it would be better to regress the Mg and Sr data individually against T and S, then solve the resulting equations simultaneously - you could then test if there is an improvement in the observed versus predicted T/S using Mg only and (Mg+Sr).

finally in several places (i.e. line 290) and figure 3 you refer to the calibration of Anand et al 2003. although this is still a widely applied calibration, in our 2018 paper (Gray et al., 2018, EPSL) we show that the calibrations of Anand et al are inaccurate due to seasonal changes in the d18O of sea water at that site. the equations of Anand et al do not fit the data from Anand if climatological (or measured insitu) temperature is used instead (see attached figure). i mention this as something to be cautious of when discussing this work.

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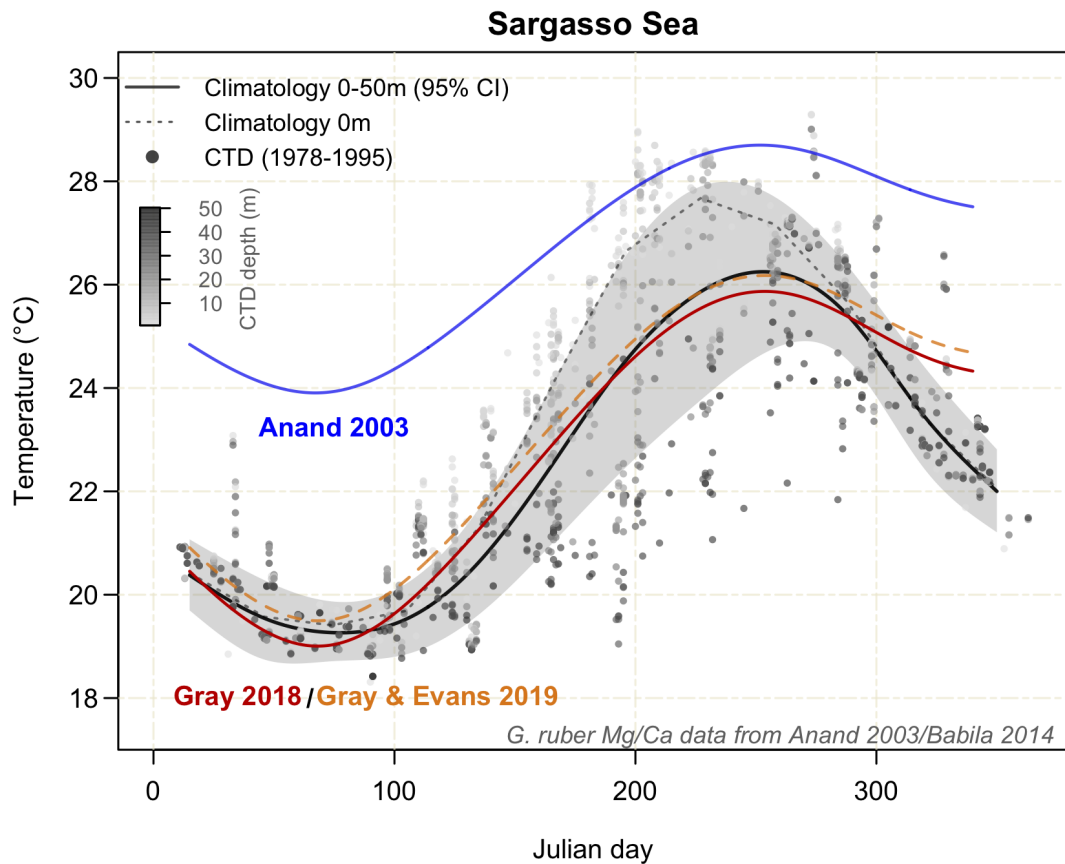


Fig. 1.

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