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# Comparing Bayesian stable isotope mixing models: Which tools are best for sediments?

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Bayesian stable isotope mixing models have received much attention as a means of coping with multiple sources and uncertainty in isotope ecology (e.g. Phillips et al., 2014), enabling the probabilistic determination of the contributions made by each food source to the total diet of the organism in question. We have applied these techniques to marine sediments for the first time. The sediments of the Chukchi Sea and Beaufort Sea offer an opportunity to utilize these models for organic geochemistry, as there are three likely sources of organic carbon; pelagic phytoplankton, sea ice algae and terrestrial material from rivers and coastal erosion, as well as considerable variation in the marine $\delta$13C values. Bayesian mixing models using bulk $\delta$13C and $\delta$15N data from Shelf Basin Interaction samples allow for the probabilistic determination of the contributions made by each of the sources to the organic carbon budget, and can be compared with existing source contribution estimates based upon biomarker models (e.g. Belicka & Harvey, 2009, Faux, Belicka, & Rodger Harvey, 2011). The $\delta$13C of this preserved material varied from -22.1 to -16.7‰ (mean -19.4$\pm$1.3‰, while $\delta$15N varied from 4.1 to 7.6‰ (mean 5.7$\pm$1.1‰. Using the SIAR model, we found that water column productivity was the source of between 50 and 70% of the organic carbon buried in this portion of the western Arctic with the remainder mainly supplied by sea ice algal productivity (25-35%) and terrestrial inputs (15%).
With many mixing models now available, this study will compare SIAR with MixSIAR and the new FRUITS model. Monte Carlo modeling of the mixing polygon will be used to validate the models, and hierarchical models will be utilised to glean more information from the data set.