

Response to Referee #3

We thank the reviewer for their effort put towards reviewing our manuscript. Our responses below are in black, Time's New Roman and referee's comments are in blue, Calibri font.

Interactive comment on "Global sinusoidal seasonality in precipitation isotopes" by Scott T. Allen et al.

Anonymous Referee #3

Received and published: 23 April 2019

The authors present an incredibly useful predictive statistical model of the global patterns of d18O and d2H in precipitation. The methods are adequate and sound and the results are clearly described and presented in tables and figures. In my opinion, the manuscript can be accepted in its present form. I leave the following three comments only to encourage the authors to expand the discussion if they agree it would improve the paper.

The authors' objective to produce the predictive model was clearly motivated by a need in the hydrological community for isotopic input data to calculate young water fractions and unravel storage selection behavior of watersheds using stable isotope data. The observed patterns in explanatory variables are only lightly discussed in terms of atmospheric circulation patterns or origins of atmospheric water vapor.

There are a number of studies that have used atmospheric air mass trajectory analyses to study the variability of isotopes in precipitation. I understand this is well outside the scope of this manuscript - and possibly out of reach computationally. It might be worth mentioning air mass trajectory analysis as a possible path for improving the predictions of stable isotopes in precipitation.

The reviewer is correct that our primary objective is motivated by needs of the hydrologic community. The reviewer is also correct that air-mass trajectory effects could result in some of the scatter in the initial regression models. We now add further discussion on air-mass trajectory effects.

On page 4, the authors describe the decision to use the "robust-fitted" seasonal parameters (as opposed to the "amount-weighted" parameters) for further analysis because they capture the variations during drier seasons better. I wonder if the "amountweighted" offset would provide a better estimate which is less biased by light (summer) precipitation events and if there is a significant difference between the two estimates.

Although we do focus on the robust fitted data in the manuscript, we also provide values for the amount-weighted fits as part of the data products provided. They can be directly compared using the supplemental data that we will now provide. We also have extended the methods section, where we describe the two fitting approaches, to emphasize that these two metrics have different limitations.