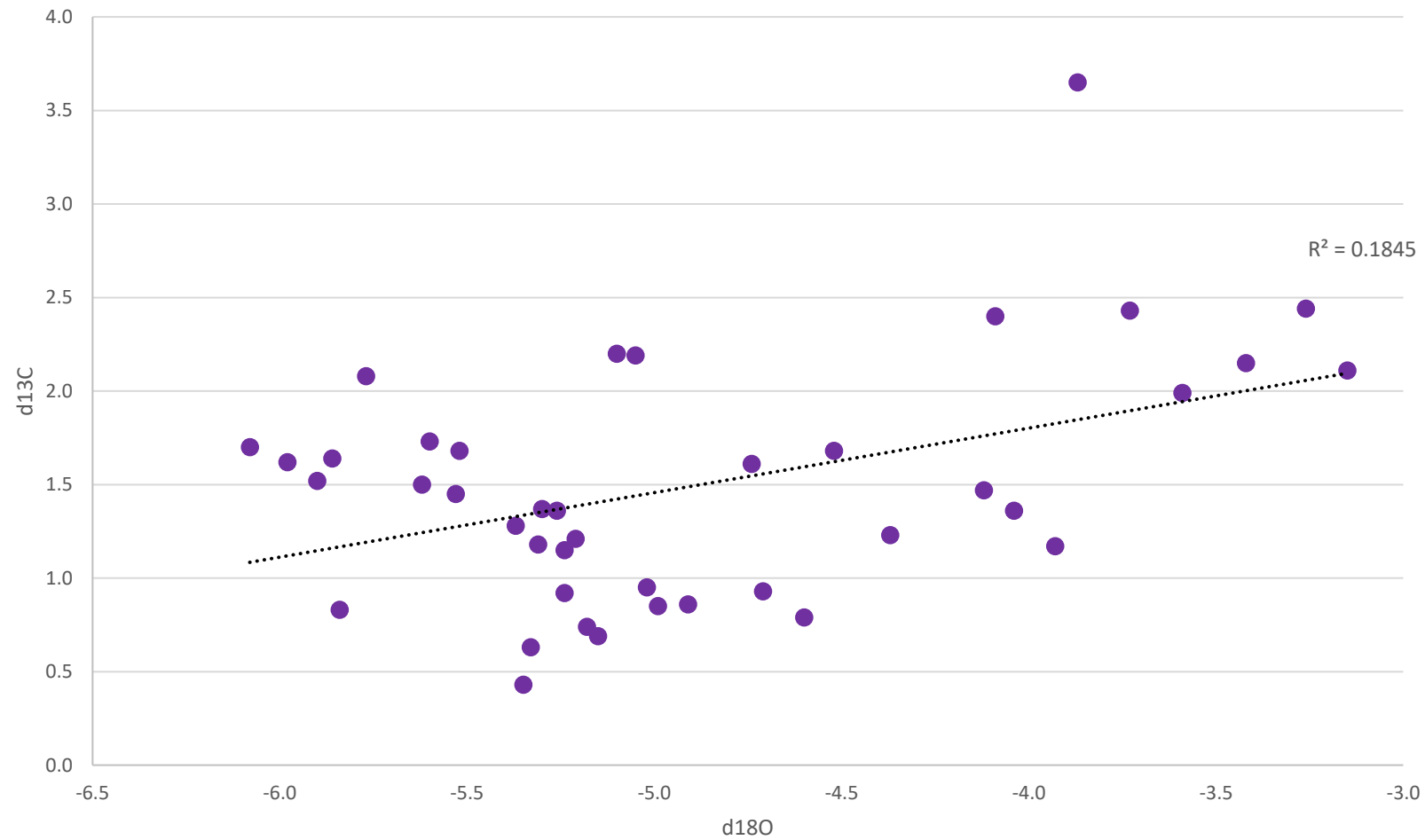
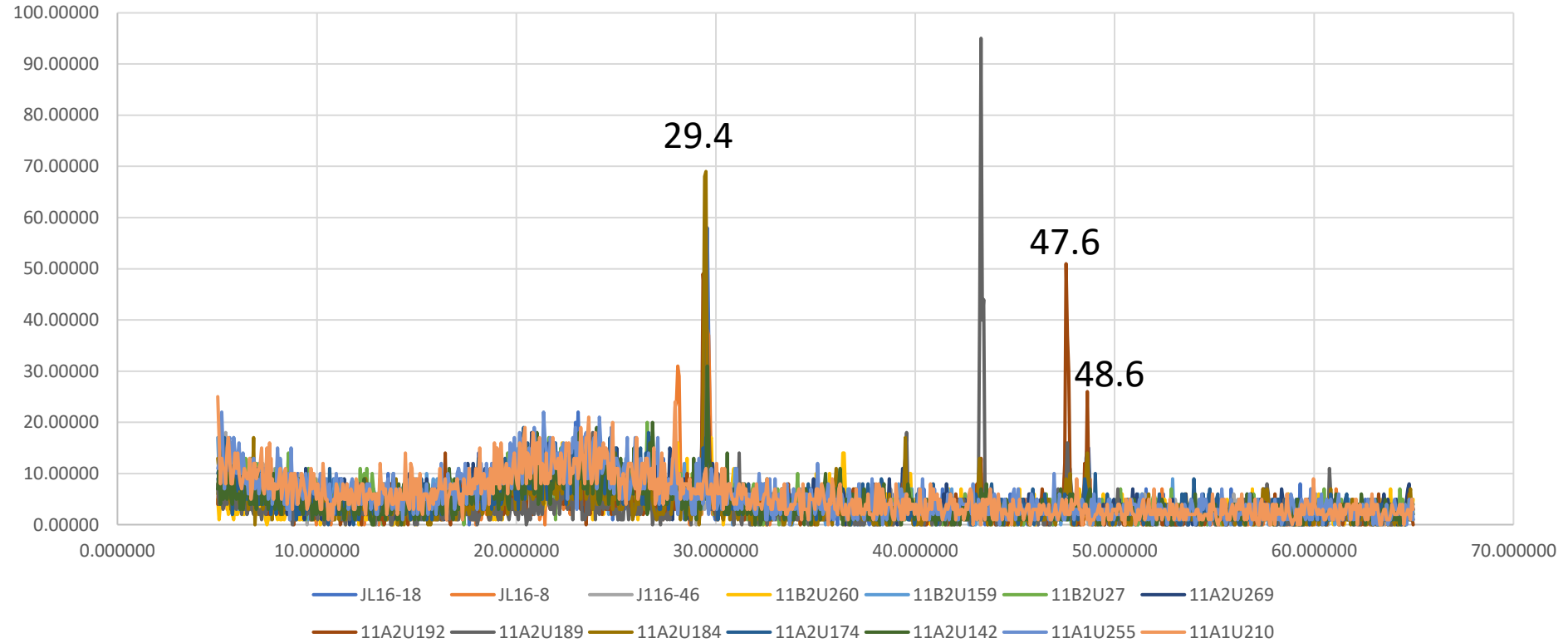


Supplementary Figure 1. Red circles mark locations where sediments collected with a ponar in 2016 were used for carbonate stable isotope analysis. More samples than are represented here were originally collected, but only those represented had sufficient carbonate content for analysis.

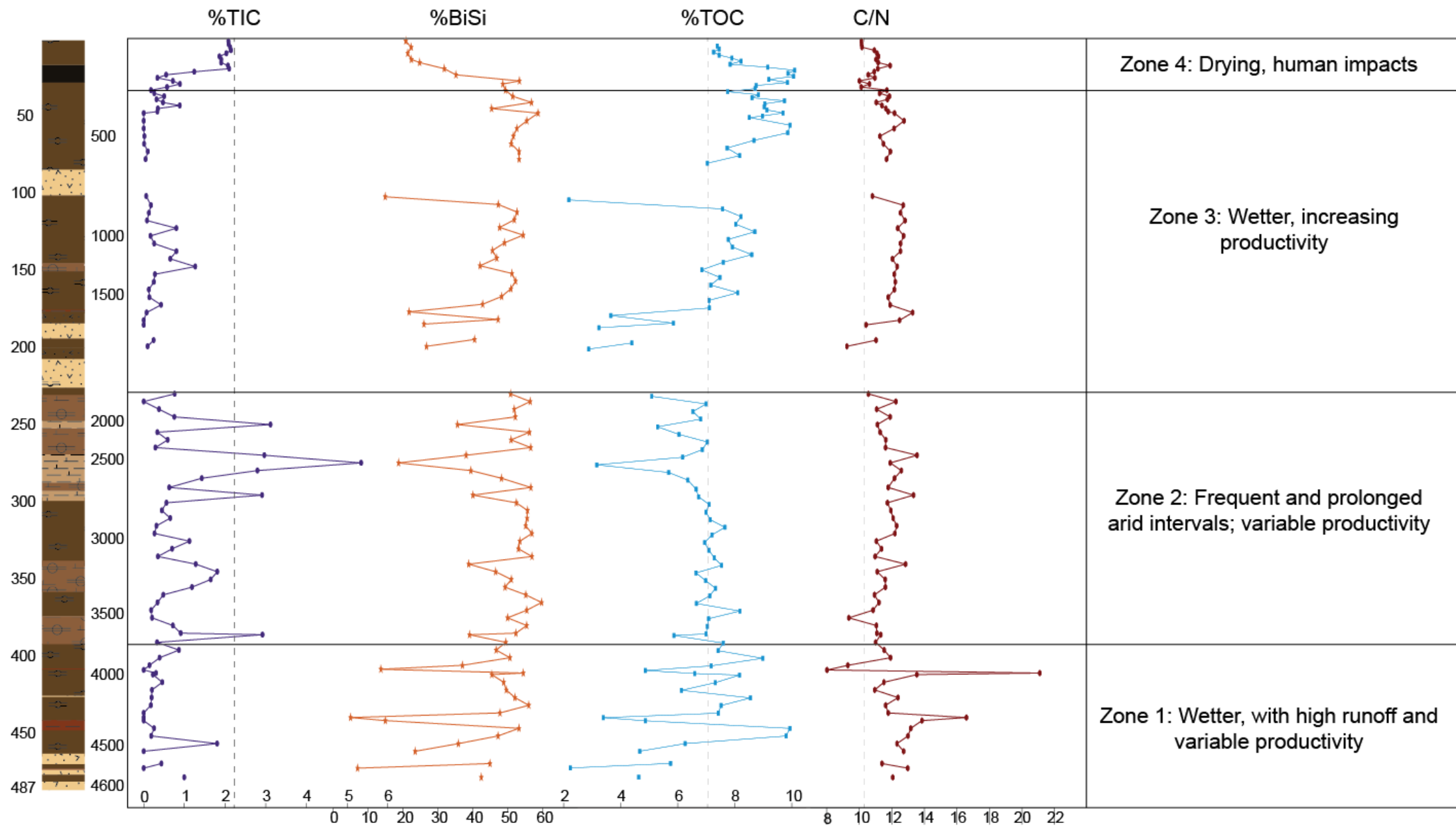


Supplementary Figure 2. Crossplot of carbonate isotope values for surface samples.

### XRD spectra for June Lake sediments



Supplementary Figure 3. Samples from throughout the June Lake core were analyzed, with particular attention to intervals of high TIC. The dominant peak for most samples was at approximately 29.4 degrees, consistent with calcite. Smaller peaks at 47.6 and 48.6 are also consistent with calcite. For aragonite and dolomite, we would anticipate dominant peaks at 26.3 and 31, respectively. The low, broad peak from ~22-26 degrees is likely opal. The prominent peak at 43.3 degrees only occurs in one sample and has not yet been identified.



Supplementary Figure 4. Geochemistry of core 11 from June Lake after Lyon et al. (2020). TIC is interpreted as an indicator of drought, whereas BiSi and TOC are paleoproduction indicators. C/N indicates organic matter source, with values <10-12 consistent with an algal OM source. Vertical dashed line indicates values of surface sediments as established in Lyon et al. (2019)