The Timing and Duration of Lacustrine Tufa Formation

Christine Y. Chen
Lawrence Livermore
National Laboratory, USA

Monday, 03 May 2021
In arid regions worldwide, extensive build-ups of porous carbonate rock called “tufas” are unmistakable evidence of past pluvial lakes. Knowing the timing of their formation would yield insights on when these lakes persisted, and by extension, how past changes in rainfall have impacted surface water availability over the last 1 million years. However, past attempts at dating tufas have been confounded by a poor understanding of their complex structure, morphology, and texture, leading to misguided conclusions on their age as well as the utility of certain geochronological tools on these materials.

In this presentation, I ask: Precisely when and at what rate did tufas form? Presenting data from late Pleistocene lake basins in the central Andes and Searles Lake in the western United States, I demonstrate that the complex structure of tufas can instead be exploited to strengthen, rather than complicate, geochronological interpretations. I showcase the descriptive power of combining (1) precise uranium-thorium (U-Th) dates on tufas with (2) geological observations of their depositional context at all scales, from the outcrop to the microscale. Using these two data types to inform one another, I propose more nuanced interpretations on the timing and variability of past lake levels associated with tufas.