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Nondestructive U–Th mapping with synchrotron XRF tomography for geochronology in zircon

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We show modeling and data demonstrating insights from nondestructive 3-D mapping of U and Th in zircon. Using a synchrotron x-ray source and tomographic reconstruction, we create 3-D animations and maps of the U and Th concentrations in zircon crystals. We developed this technique for micron-scale characterization of parent nuclide distribution and inclusions in apatite [1], and we now extend the same approach to zircon. Zircon frequently exhibits extreme zonation, magnifying the potential effects on the interpretation of geochronological and thermochronological data. We demonstrate the power of the technique and explore its implications by revisiting a sample from a dropstone from the Wilkes Basin, East Antarctica, that exhibited an unusual array of dates from different geochronometers [2].

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