

# Detecting magma-poor orogens in the detrital record: Advantages of the U-Pb apatite system over zircon

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We present U-Pb detrital apatite and rutile age data from the French Broad River, which rises in the Inner Piedmont of North Carolina and traverses progressively older-accreted Appalachian terranes to the NW. The U-Pb apatite and rutile systems both yield substantially younger ages than U-Pb zircon age data obtained from previous studies<sup>1</sup>; these two thermochronometers primarily record the Acadian (c. 410-370 Ma) and Alleghanian (c330-290 Ma) orogenies. This is in stark contrast with the U-Pb zircon dataset which is dominated by Grenvillian detritus and fails entirely to record the Pangaea-forming collision of Laurentia and Gondwana, the Alleghanian orogeny. The absence of Alleghanian zircon can be explained by the absence of significant Alleghanian magmatism and anatexis. There is likely Alleghanian and Acadian growth of apatite, with some age resetting from the older belts

There is a younging trend in the apatite and rutile data from NW to SE that may be due to the SE retreat of the metamorphic front with the addition of new terranes sequentially to the SE. However divergent behaviour is observed between the detrital rutile and apatite U-Pb age datasets, despite their similar closure temperatures. While both systems record both orogenic events, rutile is heavily biased towards the younger Alleghanian event in all samples compared to apatite. This could either be due to the greater mechanical and chemical stability of rutile in detrital systems compared to apatite, or due to rutile fertility differences between the different terranes.

[1] Hietpas, J., Samson, S., Moecher, D., & Schmitt, A. K. (2010). *Geology*, **38**(2), 167–170. doi:10.1130/G30265.1