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The detrital zircon record of Earth's evolving surface environment

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The detrital zircon record has become one of the most excessively exploited records in geologic research. Despite the exhaustive number of studies, there is still a surprising amount of valuable information to be bled from these resilient little grains. Here I will discuss aspects of the zircon record that help to better understand relationships between secular changes in tectonic processes and the evolution of Earth's surface environment. Large compilations of zircon isotopic and geochemical data are utilized to track spatiotemporal variation in continental silicic magmatism, which mostly occurs along continental arcs. This provides a means to assess 1) changes in the composition and weatherability of the continental crust, 2) potential cyclicity of crustal recycling, and 3) changes in continental arc magmatism and volcanic CO₂ outgassing through time. Ultimately, these records elucidate the important influence that changes in plate tectonic regimes have played in driving changes in Earth's atmospheric composition and long-term climate state (i.e., icehouse-greenhouse transitions) for more than ~2.4 billion years.

