Using zircon REE compositions to aid in U-Pb zircon volcanic ash age interpretation in the Permian-Triassic Karoo Supergroup of South Africa

MCKAY M. P.[1], WEISLOGEL A. L.[2] AND FILDANI A.[3]

[1]West Virginia University, Morgantown, WV 26506
matthewpaulmckay@gmail.com
[2]West Virginia University, Morgantown, WV 26506
amy.weislogel@mail.wvu.edu
[3]Statoil Research Center Austin, TX 78730
afildani@gmail.com

U-Pb zircon geochronology in volcanic ash is commonly used to provide absolute age controls on the stratigraphic record. This approach relies on the assumption that a statistically significant population of zircon were crystallized in the volcanic system just prior to eruption and were subsequently erupted and deposited in the ash >100's km away in a sedimentary basin. A volcanic ash, however, may contain large numbers of "recycled" zircons that may either be distinctly older or statistically indistinguishable from coeruptive zircon; in the latter case, weighted mean zircon ages may yield erroneously old results. To circumvent this limitation, we present an interpretive tool that relates zircon mineral chemistry to U-Pb ages as determined by SHRIMP analyses. Zircons from ashes within the Karoo Supergroup of South Africa show increases in LREE/HREE ratios in younger zircon; this is interpreted as a response to incompatible element enrichment in the evolving magmatic system, which may be a proxy for volatile enrichment prior to volcanic eruption. Zircon age determinations for Karoo Supergroup ashes based on weighted means without considering zircon geochemistry are chaotic and do not reflect the observed stratigraphic order. By interpreting high LREE/HREE in zircon as an indicator of autocrystic zircon, weighted mean ages for volcanic zircon populations, ash ages match the sampled stratigraphic order. Further testing on larger, more diverse datasets could determine the robustness and validity of this conceptual approach.