U-Pb zircon ages of Deccan Acid Igneous Complexes and their temporal relationship with the Cretaceous-Paleogene boundary

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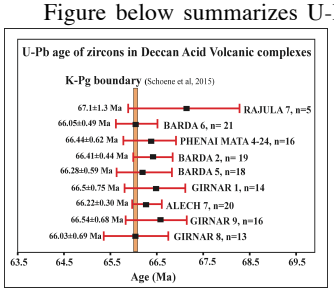
Intrusive acid igneous complexes in Deccan province

An earlier study demonstrated [1] that early and late phases of alkalic intrusives preceded and post-dated the main pulse of tholeitiic Deccan volcanism during Cretaceous-Paleogene (K-Pg) time, lasting ca. 4 Myr. Here we refine these temporal relationships using U-Pb geochronology of zircons from acid volcanic intrusives in Saurashtra peninsula, namely granophyre ring dykes in Barda-Alech Hills (B-A), Girnar Hills and Rajula complexes. These are aligned with the western Narmada rift, associated with the Phenai Mata complex, also included in this study.The B-A are ~560 km west of Western Ghats, site where temporal calibrations of Deccan stratigraphy were recently conducted [2, 3]. We also studied trace elements, REE, Nd, Sr and Hf isotopes in zircons for these complexes.

Discussion of Results

Figure below summarizes U-Pb zircon ages obtained by LA-ICP-MS, indicating that these spatially separated complexes were emplaced near the K-Pg age boundary [4]. Initial εHf of zircons range from +5.1 to -23.4, suggesting significant reworking of older crustal components. These results are also supported by whole-rock initial $^{87}Sr/^{86}Sr$ (0.7047 to 0.7472) and initial ε-Nd (+1.89 to -27.3) values, multiple trace elements and REEs. Preliminary high-precision U-Pb results by CA-ID-TIMS from two of these complexes suggest they were emplaced shortly (~250 kyr) after the K-Pg boundary.



We interpret these silicic intrusive complexes as resulting from Deccan plume-induced catastrophic melting of continental crust near the K-Pg boundary.

[1] Basu *et al*. (1993) *Science*, **261**, 902-906. [2] Schoene *et al*. (2015) *Science*, **347**, 182-184. [3] Renne *et al*. (2015), *Science*, **350**, 76-78. [4] Clyde et al. (2016), EPSL, **452**, 272-280.