Timing and Paleoenvironmental implications of Deccan volcanism relative to the KPg

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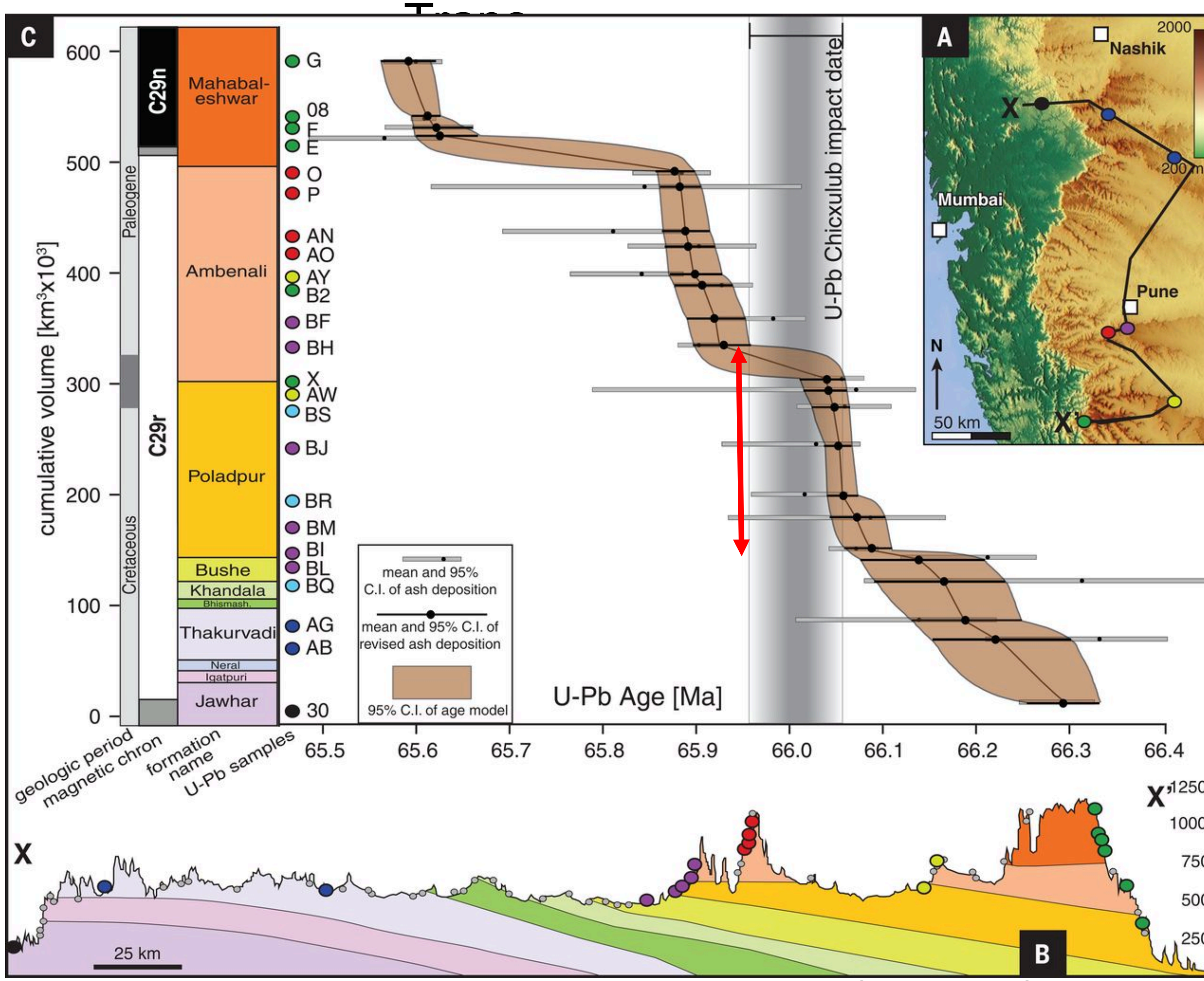
Stratigraphy, sampling transects, and U-Pb age model for the Deccan Traps

Deccan Volcanism



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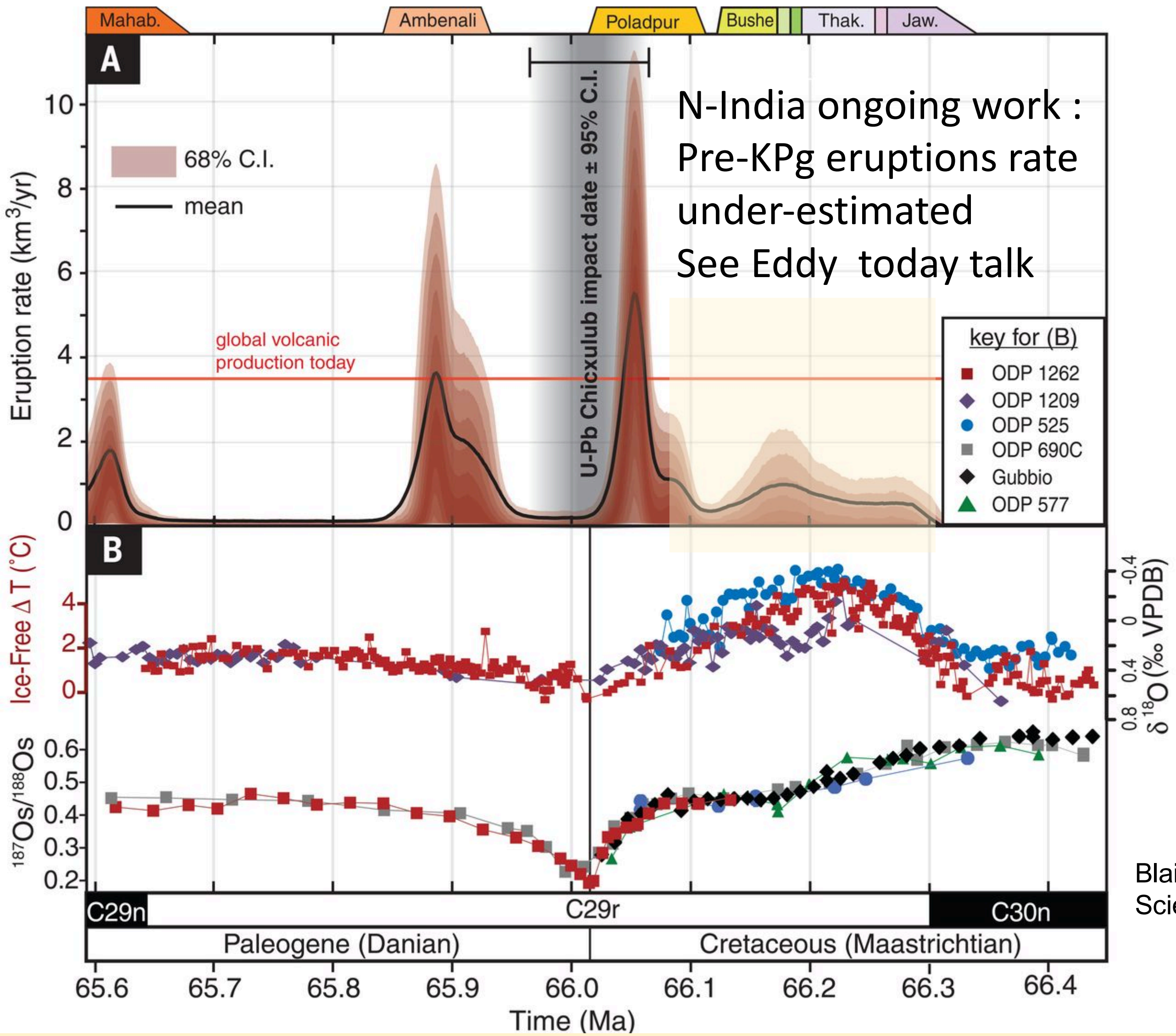
- Main eruptions started at~66.3Ma and continue to 65.5 Ma
- Acceleration of the eruptions rate ~70ky before the KPg boundary
- Chicxulub did NOT trigger an acceleration of Deccan volcanism

Eruption rate model for the Deccan Traps, based on U-Pb geochronology.



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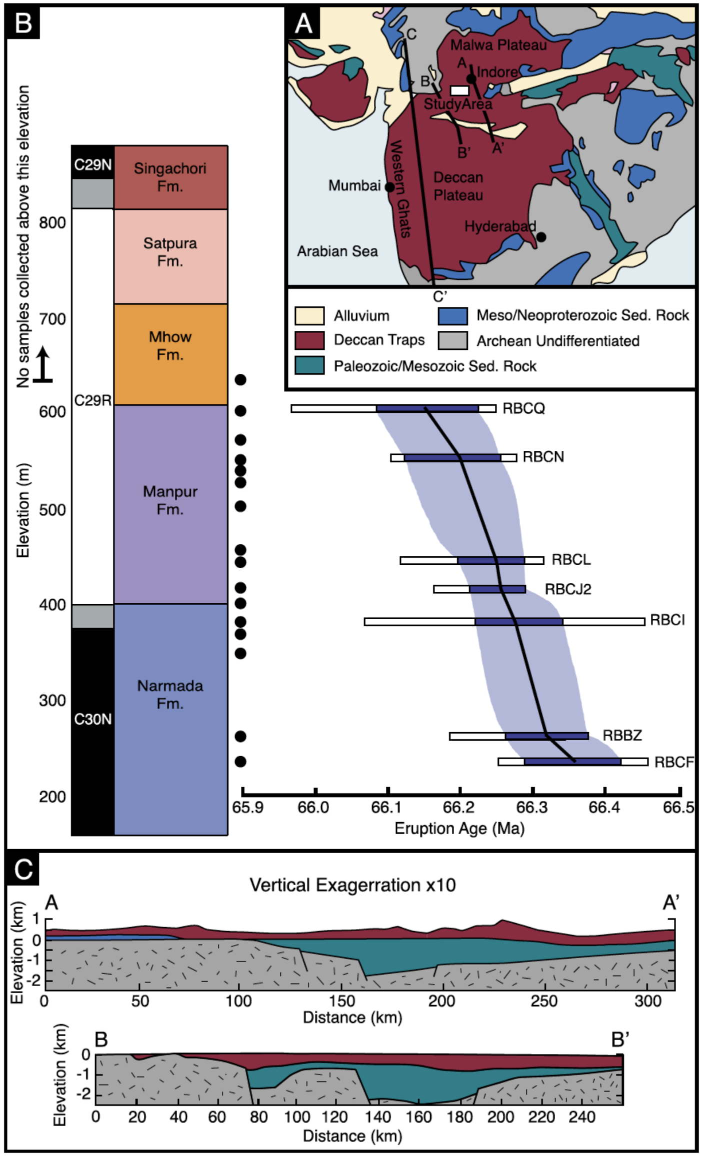
Maximum eruption rates occurred before and after the K-Pg extinction, with one such pulse initiating tens of thousands of years prior to both the bolide impact and extinction (Poladpur flows).

U-Pb zircon age constraints on the earliest eruptions of the Deccan Large Igneous Province, Malwa Plateau, India



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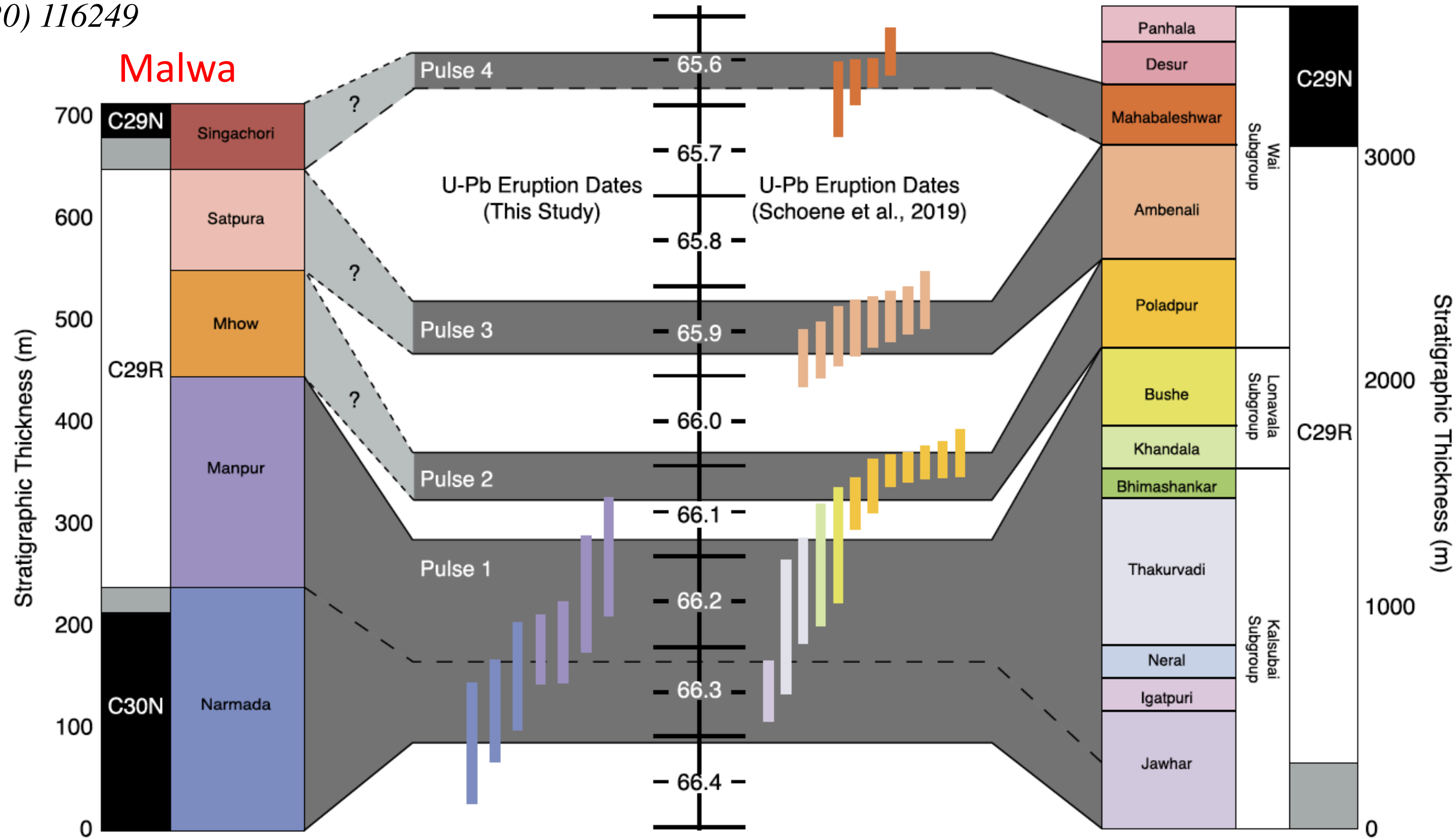
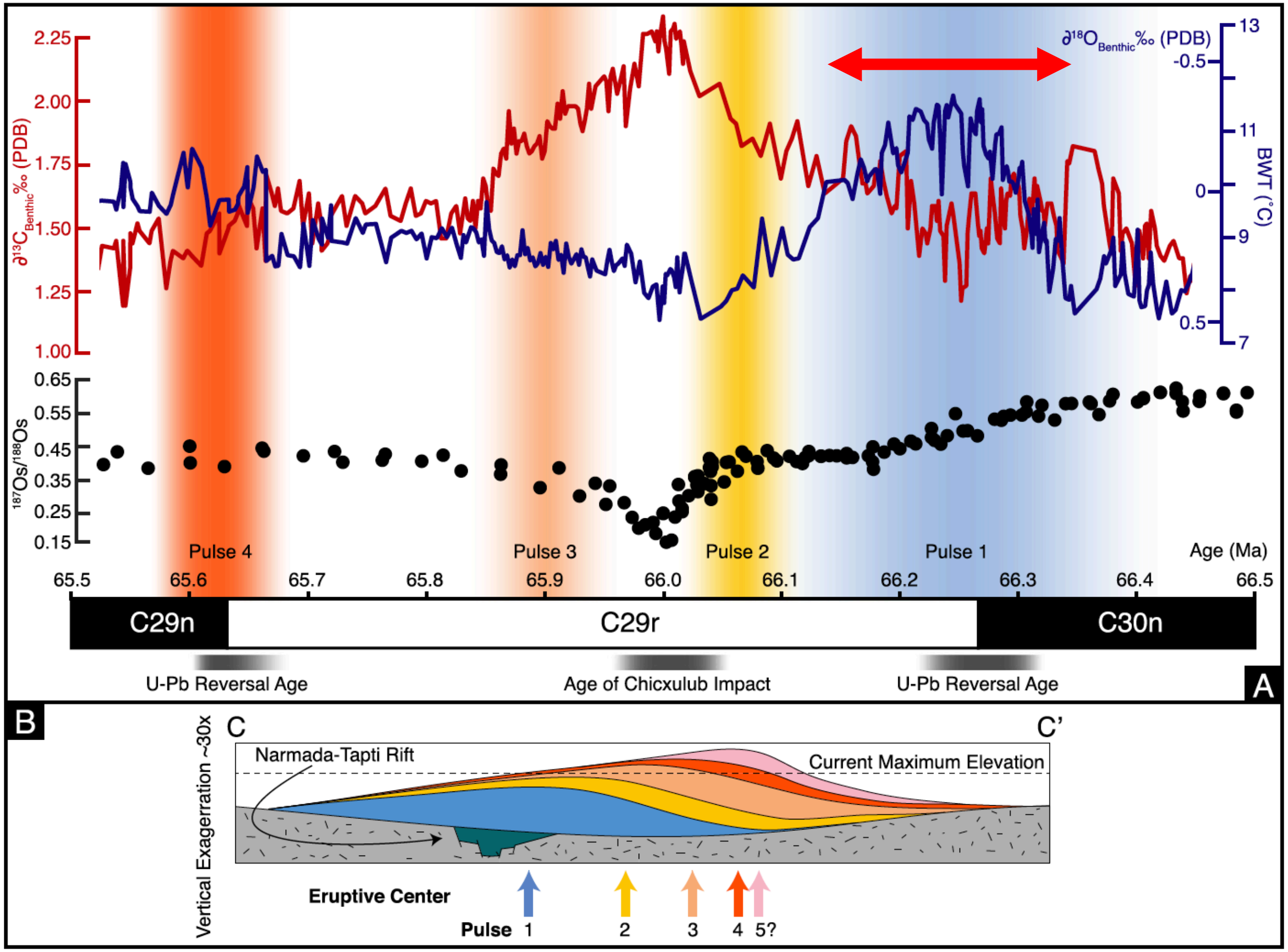
We present new chemical abrasion–isotope dilution–thermal ionization mass spectrometry (CA-ID-TIMS) U-Pb zircon geochronology from Malwa Plateau basalts on the northern margin of the Deccan LIP, India. These basalts have been previously interpreted as either an extension of the province's main volcanic stratigraphy or as an independent eruptive center active up to millions of years prior to the main eruptive phase.



Our data demonstrate that the lower Malwa Plateau basalts are temporally correlative with the first pulse of Deccan volcanism and provide new constraints on its initiation and duration. Paleomagnetic data further indicate that upper Malwa Plateau basalts may be age-equivalent to the second, third, and fourth pulses of Deccan volcanism. The relative thicknesses of age-equivalent packages of basalt are consistent with eruption of the Deccan LIP from a southward-migrating eruptive center.

Late Maastrichtian warming



The first eruptive pulse is coeval with a ~200kyr Late Maastrichtian warming event preserved globally in coeval stratigraphic sections. The first pulse of Deccan magmatism was more voluminous in the north, where it erupted through organic-rich sedimentary rocks of the Narmada-Tapti rift basin. Thermal metamorphism of these sediments could have been a source of sufficient CO_2 to drive the Late Maastrichtian warming event,

CONCLUSIONS

- Maximum eruption rates occurred before and after the K-Pg extinction, with one such pulse initiating tens of thousands of years prior to both the bolide impact and extinction.

- Initial eruption of Deccan basalts through the Narmada-Tapti Rift may have provided a critical source of greenhouse gases via metamorphism of organ rich sedimentary rock.

- These findings support extinction models that incorporate both catastrophic events as drivers of environmental deterioration associated with the K-Pg extinction and its aftermath