

Extraterrestrial origin of anomalous features in natural archives

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AD 775 anomaly

Basics:

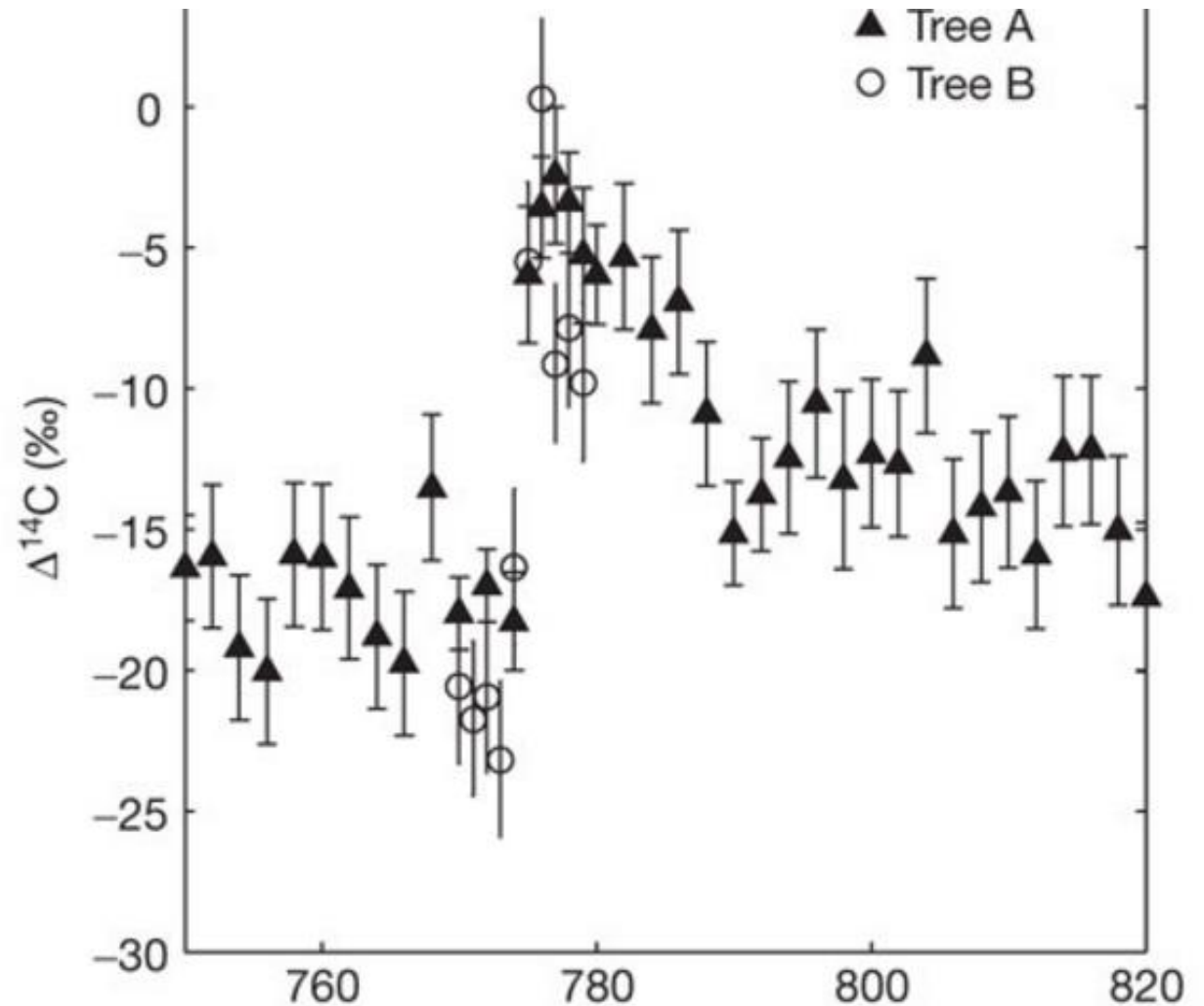
-Earth's radiocarbon is produced in the atmosphere, and the production is initiated by high-energy cosmic ray particles

- ^{14}C ends in the biosphere through carbon cycle

- ^{14}C is unstable and has a half-life of ~ 5730 years. Production - decay \rightarrow \sim equilibrium concentrations

-Miyake et al. (2012) Observed a drastic increase in ^{14}C at AD 774/775 (measured from tree-rings)

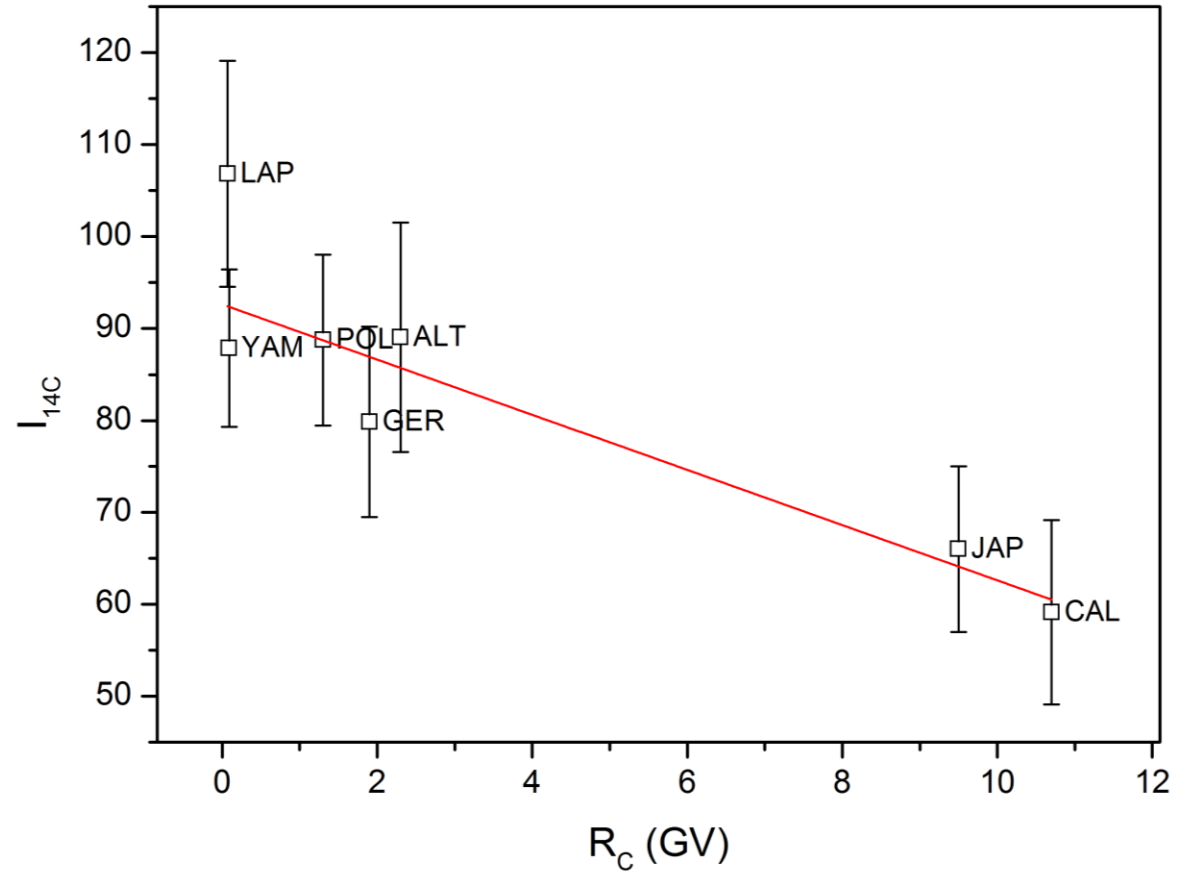
-Reason for excess: supernova, short GRB, comet, large solar flare?



Source: Miyake et al., *Nature*, 486(7402): 240–242, 2012

Polar enhancement of AD 775

- Various measurements from NH, 1 from New Zealand
- We measured the event from a Lapland tree
- ^{14}C intensity vs. vertical cutoff rigidity (R_c)
- Particles penetrate high geomagnetic latitudes easier
- Polar enhancement -> solar origin



What's next?

- Higher resolution measurements (timing)
- Measurement of AD 994 event (polar enhancement?)

