Earth's magnetic field flipping linked to extinctions 42,000 years ago

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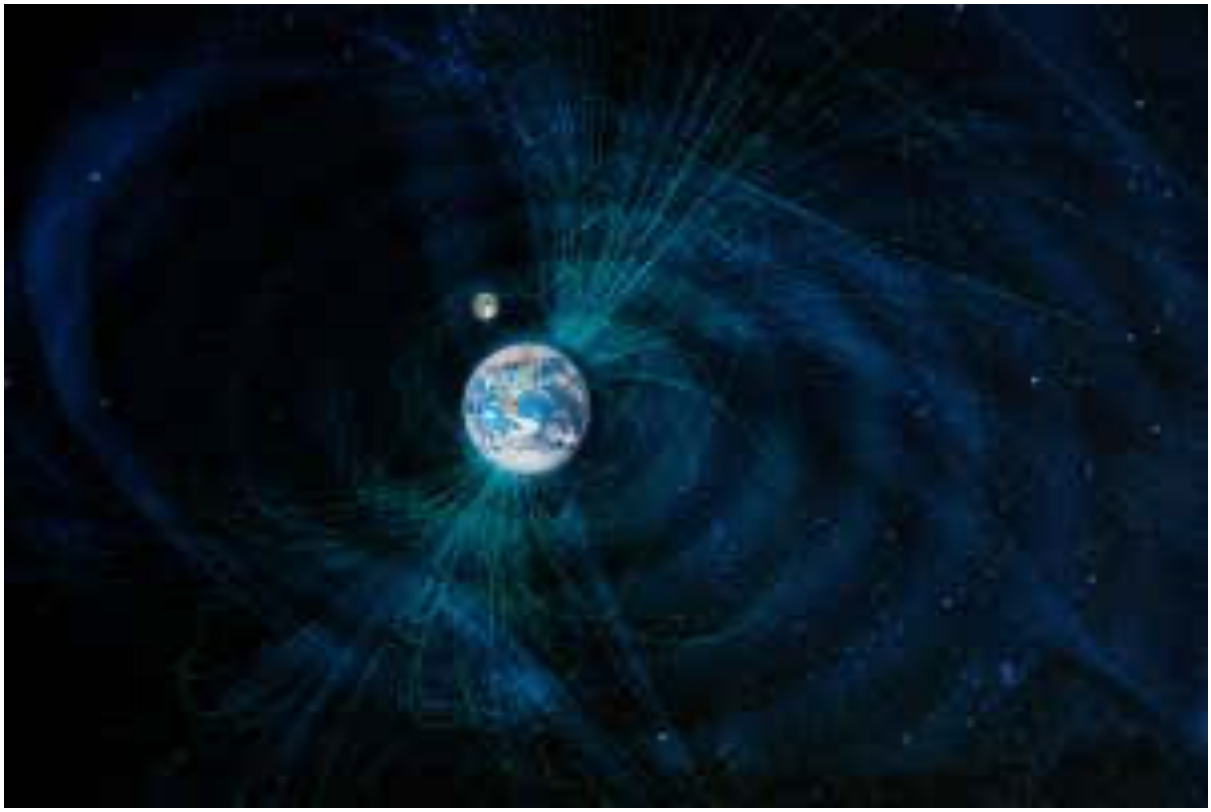

Earth’s magnetic field is most concentrated at the north and south poles

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The most recent reversal of Earth’s magnetic field may have been as recent as 42,000 years ago, according to a new analysis of fossilised tree rings. This flip of the magnetic poles would have been devastating, creating extreme weather and possibly leading to the extinction of large mammals and the Neanderthals.

Earth’s magnetic field extends into space and is most concentrated at the north and south poles. The magnetic poles wander and occasionally reverse around every 200,000 to 300,000 years, but we have little evidence on how this impacts our planet.

Alan Cooper at the South Australian Museum in Adelaide and his colleagues have now provided some answers. They came up with the most accurate date yet of Earth’s last magnetic field reversal called the Laschamp event, which they estimate occurred between 41,560 and 41,050 years ago and lasted less than 1000 years.

The team calculated this using radiocarbon analysis of tree rings from an ancient, fossilised kauri tree (*Agathis australis*) preserved in northern New Zealand wetlands.

"The tree lived right through the Laschamps and we used the shift in radiocarbon, carbon-14, in the atmosphere to detect exactly when the magnetic field collapsed," says Cooper.

The Earth's magnetosphere – the region around the planet dominated by Earth's magnetic field – weakens when the magnetic poles reverse. Cooper and his team estimate Earth's magnetic field was just 6 per cent of current levels during the Laschamp event.

Read more: The north pole is moving and if it flips, life on Earth is in trouble

When the magnetic field weakens, more cosmic rays enter the atmosphere and transform certain atoms into radioactive carbon-14, raising levels of this isotope. By measuring the levels of carbon-14 in each tree ring of the kauri tree, they were able to accurately date the Laschamp event.

They then used climate modelling to find that several major changes coincided with the Laschamp event. The weakened magnetic field allowed more ionising radiation from solar flares and cosmic rays from space to reach Earth.

"These damage the ozone layer and ultraviolet light comes in at very high levels," says Cooper. This would have caused extreme weather conditions, including lightning, high temperatures and lots of sunlight – which may have been difficult for organisms to adapt to.

"These extreme environmental changes may have caused, or at least contributed to, extinction events including those of large mammals in Australia and the Neanderthals in Europe," says Paula Reimer at Queen's University Belfast, UK, who wasn't involved in the research. Megafauna across Australia and Tasmania – prehistoric giant mammals that existed in the Late Pleistocene – and Neanderthals in Europe went extinct around the same time as the magnetic pole reversal, 42,000 years ago.

The north pole has been moving spasmodically over the past century, drifting around a kilometre per year, says Cooper. "It doesn't necessarily mean that it is going to happen again, but if it did it would be absolutely catastrophic," he says.