New study investigates the reconstruction of the intertropical convergence zone

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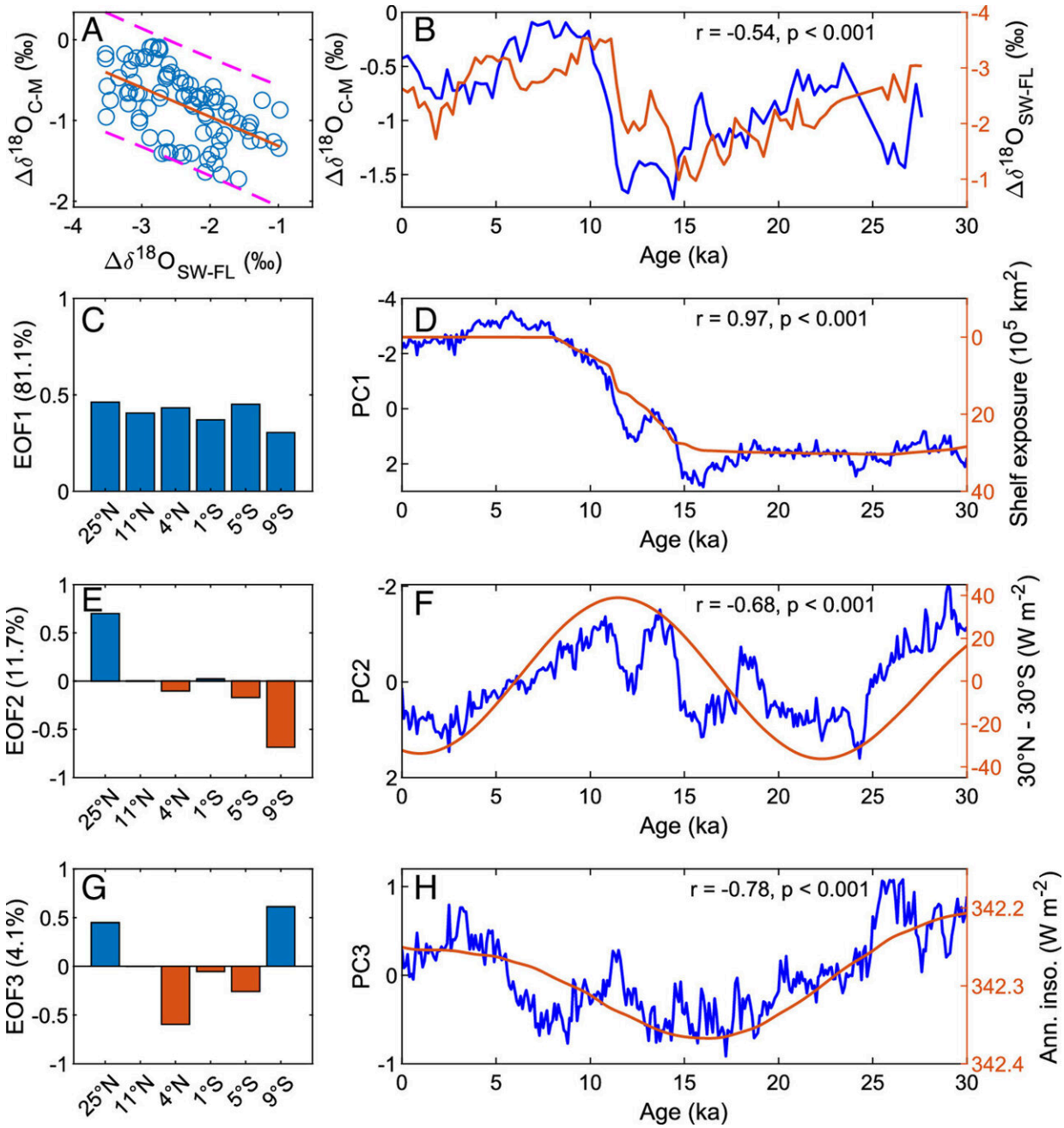

Reconstructions of the ITCZ strength, position, and contraction–expansion based on EOF analysis of extended $\delta^{18}O$ records. Credit: *Proceedings of the National Academy of Sciences* (2024). DOI: 10.1073/pnas.2408502121

The study focuses on the so-called Intertropical Convergence Zone (ITCZ), a low-pressure trough near the equator whose position and intensity changes seasonally with the position of the sun. Trade winds from the northern and southern hemispheres meet here. This results in heavy cloud formation and heavy rainfall. To analyze how the ITCZ has changed over the past 30,000 years, researchers use the stable oxygen isotope $\delta^{18}O$ in calcareous deposits in cave systems on land and deposits of calcareous organisms on the ocean floor.

By releasing enormous amounts of water vapor and latent heat into the atmosphere, the position and strength of the ITCZ over the Indo-Pacific Warm Pool (IPWP) is of particular importance for global climate regulation.

While recent studies of the ITCZ have already fundamentally improved our understanding of the mechanism over the past millennia, Mohtadi and his colleagues used empirical orthogonal functional (EOF) analysis to examine the data in relation to precipitation in this and other regions.

The team was able to identify the main components for the size, strength and position of the ITCZ. They came to the conclusion that the inclination of the Earth's axis and the eccentricity of the Earth's orbit around the sun have significantly influenced the size of the ITCZ in the past.

"It is important to understand whether the rain belt shifts, intensifies or relocates under different environmental conditions, also with regard to the current global warming," explains Mahyar Mohtadi. "Our study shows how this information can be filtered out of the data, at least in this region."

The paper is published in the journal *Proceedings of the National Academy of Sciences*.

More information: Fuzhi Lu et al, Reconstruct the intertropical convergence zone over the Indo-Pacific Warm Pool with extended records and empirical orthogonal function, *Proceedings of the National Academy of Sciences* (2024). DOI: 10.1073/pnas.2408502121

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