

Rapid climate changes, but with a 120 year time lag

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Regional climate changes can be very rapid. A German-British team of geoscientists now reports that such a rapid climate change occurred in different regions with a time difference of 120 years. Investigation in the west German Eifel region and in southern Norway demonstrated that at the end of the last glaciation about 12,240 years before present climate became warmer, first recognised in the Eifel region and 120 years later in southern Norway. Nonetheless, the warming was equally rapid in both regions.

The team around Christine Lane (Oxford University) and Achim Brauer from the GFZ German Research Centre for Geosciences reports in the latest volume of *Geology* that within the younger Dryas, the last about 1100-year long cold phase at the end of the last ice age, a rapid warming first was measured in the Eifel region. Sediment cores from the Meerfelder Maar lake depict a typical deposition pattern, which was also found in the sediments of Lake Krakenes in southern Norway, but with a time lag of 120 years.

But how did the researcher revealed such a accurate time marking? "12 140 years ago a major eruption of the Katla volcano occurred on Iceland" explains Achim Brauer. "The [volcanic ash](#) was distributed by strong winds over large parts of northern and central Europe and we can find them with new technologies as fine ash particles in the sediment deposits of lakes. Through counting of annual bands in these sediments we could precisely determine the age of this volcanic ash." Therefore, this ash material reflects a distinct time marker in the sediments of the

lakes in the Eifel and in Norway.

Furthermore, lake sediments are very accurate climate archives, especially when they contain seasonal bands similar like tree rings. "It is a diligent piece of work to count and analyse thousands of these thin layers under the microscope to reconstruct climate year-by-year far back in time", illustrates Brauer.

The ash of the Katla [volcanic eruption](#) thus was deposited at the same time in the Eifel and in Norway. The sediments of the Eifel maar lake depict the rapid warming 100 years before the volcanic ash, while it is seen in the southern Norwegian lake sediment 20 years after the volcanic eruption. The same warming, but with a 120 difference in timing between the about 1200 km distant locations? Achim Brauer:

"We can explain this difference with the shift of hemispheric wind systems. Climate changed in both regions very rapid, but the polar front, that is the atmospheric boundary layer between cold polar air and the warmer air of the mid-latitudes, required more than 100 years to retreat from its glacial position at about the location of the Eifel at 50° N to its southern Norwegian position at 62° N."

Hence, the study provides evidence for a rapid change that slowly moved northwards. The result of this study has some implications on the understanding of both past and future climate change. The assumption of an everywhere and always synchronously changing climate must be questioned and [climate](#) models have to better consider such regional aspects.

More information: C.S. Lane, A. Brauer, S.P.E. Blockley, P. Dulski: "Volcanic ash reveals a time-transgressive abrupt climate change during the Younger Dryas", *Geology* v. 41, no. 12, p. 1251 December 2013; [DOI: 10.1130/G34867.1](https://doi.org/10.1130/G34867.1)

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