**Abstract**

Millennial-scale dry events in the Northern Hemisphere monsoon regions during the [last Glacial](https://www.sciencedirect.com/topics/earth-and-planetary-sciences/last-glacial) period are commonly attributed to southward shifts of the [Intertropical Convergence Zone](https://www.sciencedirect.com/topics/earth-and-planetary-sciences/intertropical-convergent-zone" \o "Learn more about Intertropical Convergence Zone from ScienceDirect's AI-generated Topic Pages) (ITCZ) associated with an intensification of the northeasterly (NE) trade wind system during intervals of reduced Atlantic meridional overturning circulation (AMOC). Through the use of high-resolution [last deglaciation](https://www.sciencedirect.com/topics/earth-and-planetary-sciences/last-deglaciation) pollen records from the [continental slope](https://www.sciencedirect.com/topics/earth-and-planetary-sciences/continental-slope) off Senegal, our data show that one of the longest and most extreme droughts in the western Sahel history, which occurred during the North Atlantic Heinrich Stadial 1 (HS1), displayed a succession of three major phases. These phases progressed from an interval of maximum pollen representation of Saharan elements between ∼19 and 17.4 kyr BP indicating the onset of aridity and intensified NE trade winds, followed by a millennial interlude of reduced input of Saharan pollen and increased input of Sahelian pollen, to a final phase between ∼16.2 and 15 kyr BP that was characterized by a second maximum of Saharan pollen abundances. This change in the pollen assemblage indicates a mid-HS1 interlude of NE trade wind relaxation, occurring between two distinct trade wind maxima, along with an intensified mid-tropospheric African Easterly Jet (AEJ) indicating a substantial change in West African atmospheric processes. The pollen data thus suggest that although the NE trades have weakened, the Sahel drought remained severe during this time interval. Therefore, a simple strengthening of trade winds and a southward shift of the West African monsoon trough alone cannot fully explain millennial-scale Sahel droughts during periods of AMOC weakening. Instead, we suggest that an intensification of the AEJ is needed to explain the persistence of the drought during HS1. Simulations with the Community Climate System Model indicate that an intensified AEJ during periods of reduced AMOC affected the North African climate by enhancing moisture divergence over the West African realm, thereby extending the Sahel drought for about 4000 years.

**Conclusions**

The records presented in this study allow us to recognize three major phases within HS1 and to suggest potential forcing mechanisms for each. The general trend of extremely dry conditions associated with an intensification of the NE trade winds during HS1 is interrupted by an interval (between ∼17.4 and 16.2 kyr BP) of reduced input of Saharan pollen and increased input of Sahelian pollen, which is interpreted as a period of NE trade wind relaxation

The Main Topic :

Sahel megadrought during Heinrich Stadial 1: evidence for a three-phase evolution of the low- and mid-level West African wind system

Parameters :

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| **#** | **Name** | **Short Name** | **Unit** | **Principal Investigator** | **Method/Device** | **Comment** |
| [1](https://doi.pangaea.de/10.1594/PANGAEA.801825?format=html#mcol0_ds1451076) | [DEPTH, sediment/rock](https://www.pangaea.de/nojs.php) | Depth sed | m |  |  | [Geocode](https://wiki.pangaea.de/wiki/Geocode) |
| [2](https://doi.pangaea.de/10.1594/PANGAEA.801825?format=html#mcol1_ds11933279) | [Depth, top/min](https://www.pangaea.de/nojs.php) | Depth top | m | [Bouimetarhan, Ilham](https://orcid.org/0000-0003-3369-3811) |  |  |
| [3](https://doi.pangaea.de/10.1594/PANGAEA.801825?format=html#mcol2_ds11933280) | [Depth, bottom/max](https://www.pangaea.de/nojs.php) | Depth bot | m | [Bouimetarhan, Ilham](https://orcid.org/0000-0003-3369-3811) |  |  |
| [4](https://doi.pangaea.de/10.1594/PANGAEA.801825?format=html#mcol3_ds1451075) | [AGE](http://en.wikipedia.org/wiki/Kyr) | Age | ka BP |  |  | [Geocode](https://wiki.pangaea.de/wiki/Geocode) |
| [5](https://doi.pangaea.de/10.1594/PANGAEA.801825?format=html#mcol4_ds11933282) | [Pollen, total](https://www.pangaea.de/nojs.php) | Pollen tot | # | [Bouimetarhan, Ilham](https://orcid.org/0000-0003-3369-3811) | Counting, palynology | Pollen sum (trees, herbs, aquatics) |
| [6](https://doi.pangaea.de/10.1594/PANGAEA.801825?format=html#mcol5_ds11933283) | Pollen, total | Pollen tot | #/cm3 | [Bouimetarhan, Ilham](https://orcid.org/0000-0003-3369-3811) |  |  |
| [7](https://doi.pangaea.de/10.1594/PANGAEA.801825?format=html#mcol6_ds11933284) | [Pollen, flux](https://www.pangaea.de/nojs.php) | Flux pollen | #/cm2/a | [Bouimetarhan, Ilham](https://orcid.org/0000-0003-3369-3811) |  | Pollen accumulation rates |
| [8](https://doi.pangaea.de/10.1594/PANGAEA.801825?format=html#mcol7_ds11933285) | Algae, freshwater | Algae fw | #/cm3 | [Bouimetarhan, Ilham](https://orcid.org/0000-0003-3369-3811) |  | Concentrations |
| [9](https://doi.pangaea.de/10.1594/PANGAEA.801825?format=html#mcol8_ds11933286) | [Accumulation rate, algae, freshwater](https://www.pangaea.de/nojs.php) | Algae fw acc rate | #/cm2/ka | [Bouimetarhan, Ilham](https://orcid.org/0000-0003-3369-3811) |  |  |

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Data set Link :

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