

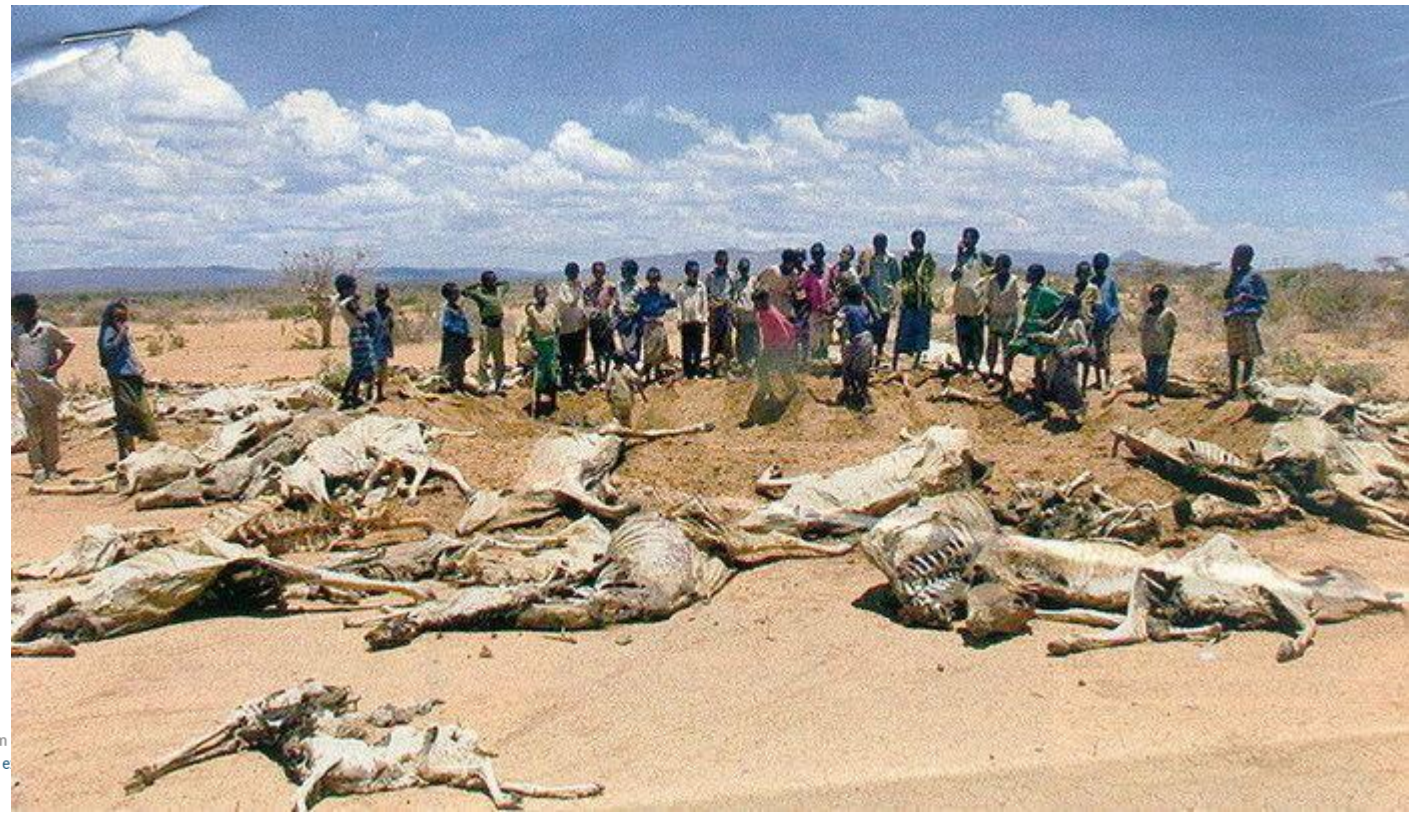
Master Project

Study the effect of recent aerosol changes on precipitation in the Sahel region

Supervisors: Terje Berntsen and Ada Gjermundsen

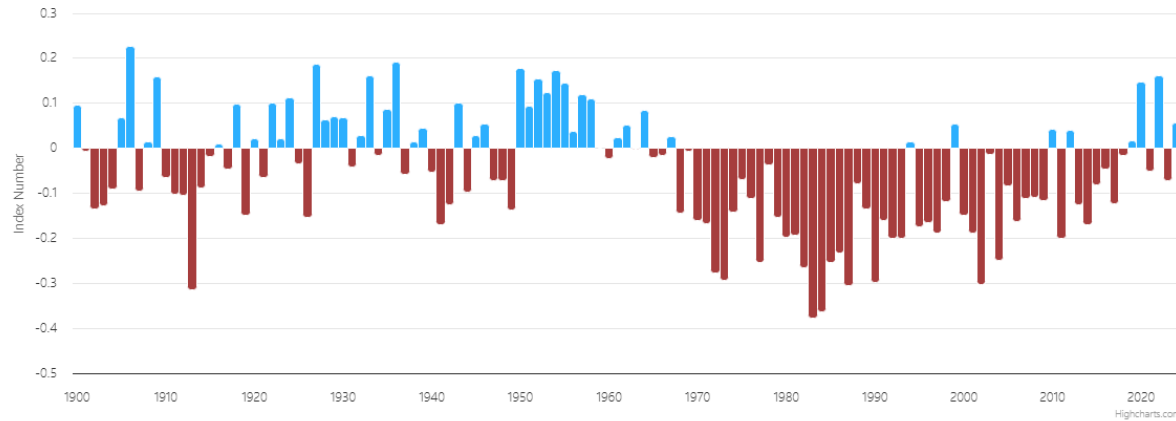
Drought in Sahel 1970-1980

100000 deaths by famine



Sahel Rainfall Index

The Sahel Rainfall Index presents annual rainfall from 1900 to the most recent rainy season in terms of deviation from the long-term mean in the Sahel, from son. See 'Applications and Downloads' below to download corresponding data as csv. Background information on [Weather & Climate](#) in West Africa and an e is given on this site.



Annual rainfall index for the Sahel region, shown as deviation from the long-term mean (calculated from 1900). For information on the annual number of meteorologic stations used and the standard error of the index, see [Methods and Data](#).

Causes ?

- Inter annual variability
- Regional land use change
- Anthropogenic forcing

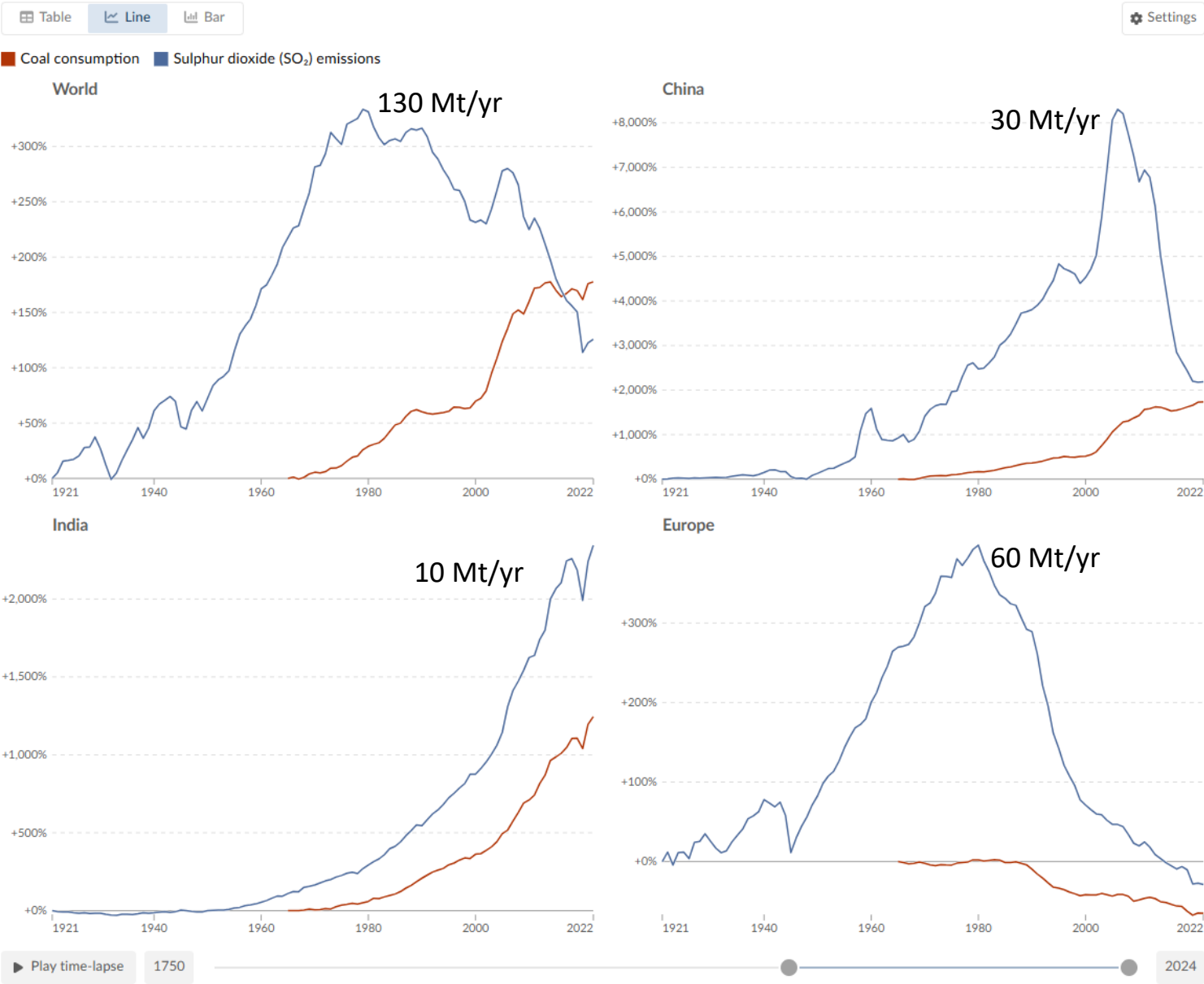
<https://sahelrainindex.info/>



Change in coal consumption and sulphur dioxide emissions, 1921 to 2022

Our World
in Data

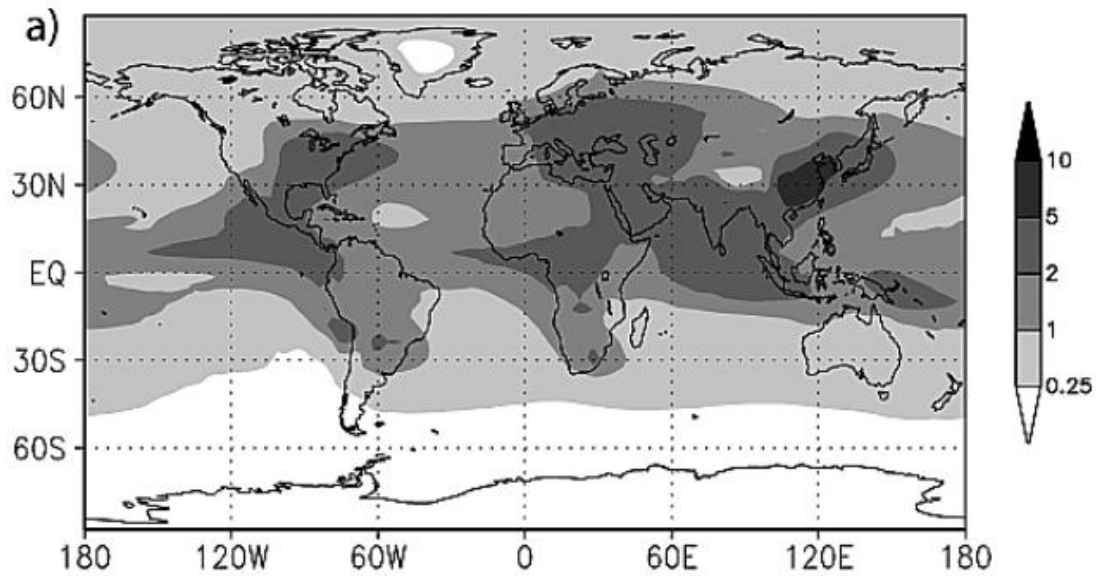
Sulphur dioxide (SO₂) is an air pollutant formed from the burning of fuels that contain sulphur, such as coal. Countries can reduce SO₂ emissions by burning less coal, or installing desulphurization technologies which remove sulphur from the smokestack.



Data source: Community Emissions Data System (CEDS) 2024; Energy Institute (2024) – [Learn more about this data](#)
OurWorldinData.org/air-pollution | CC BY

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Huge regional
differences in
development of
SO₂ emissions



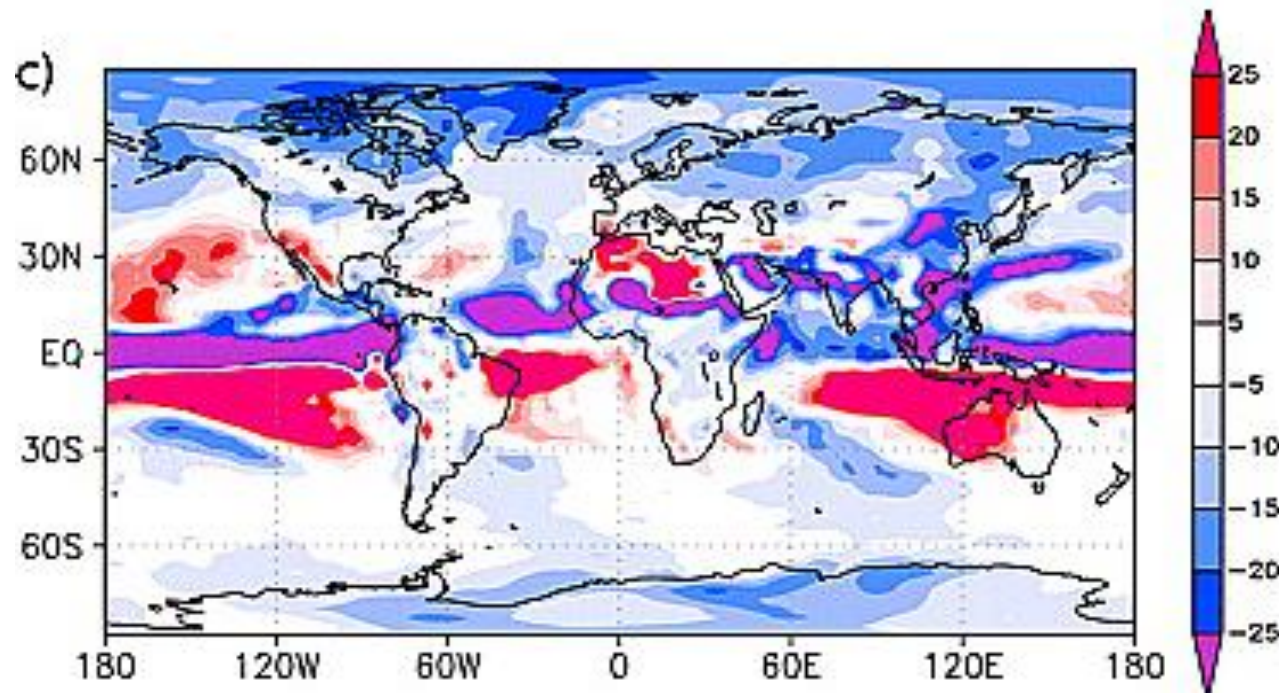
Simulated column integral of sulfate (mg S m^{-2})

Response of the climate system to aerosol direct and indirect forcing: Role of cloud feedbacks

J. E. Kristjánsson ✉ T. Iversen, A. Kirkevåg, Ø. Seland, J. Debernard

First published: 23 December 2005 | <https://doi.org/10.1029/2005JD006299> | Citations: 75

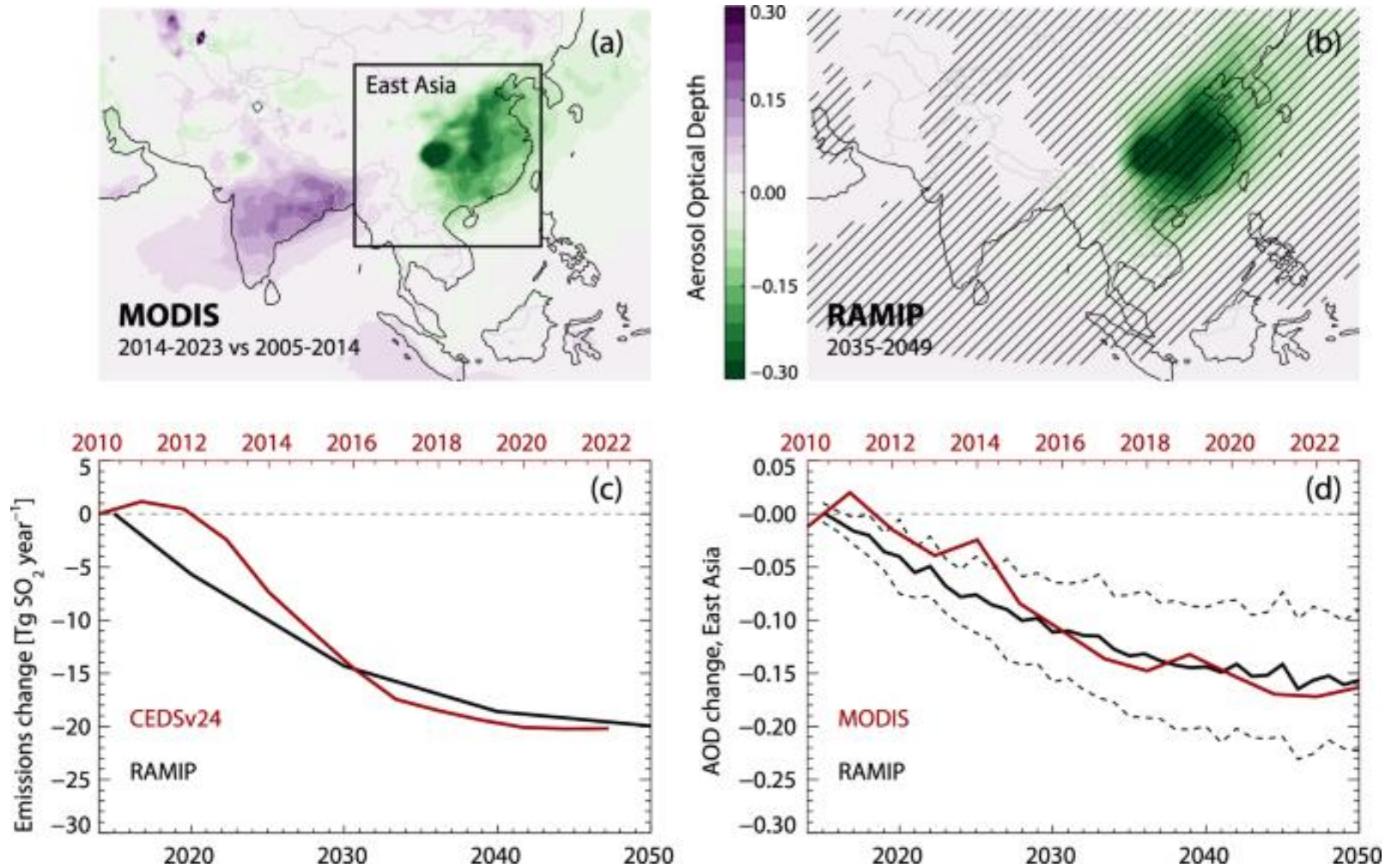
Simulations with year 2000 emission data



Simulated changes in precipitation (%), due to aerosol forcing

Conclusion: Contribution from anthropogenic aerosols to the Sahel drought

Recent changes in aerosols over Asia (2020 vs. 2010)



2024, 2025: Floods in Sudan



Heavy Rain → land slide 30th August 2025 in Darfur. 300-1000 deaths

<https://news.un.org/en/story/2024/07/1152676>



<https://www.darfur24.com/en/2025/09/02/un-hundreds-killed-in-darfur-landslide/>

Master Project

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Methods

- Model simulations with NorESM3 (hopefully 😊)
- Analyse recent changes (last decades)
- Perform sensitivity studies with idealised emission changes

Note: Conclusions might be that there is NOT a cause – effect here. But it is still a very valuable result and includes development of understanding of climate physics.