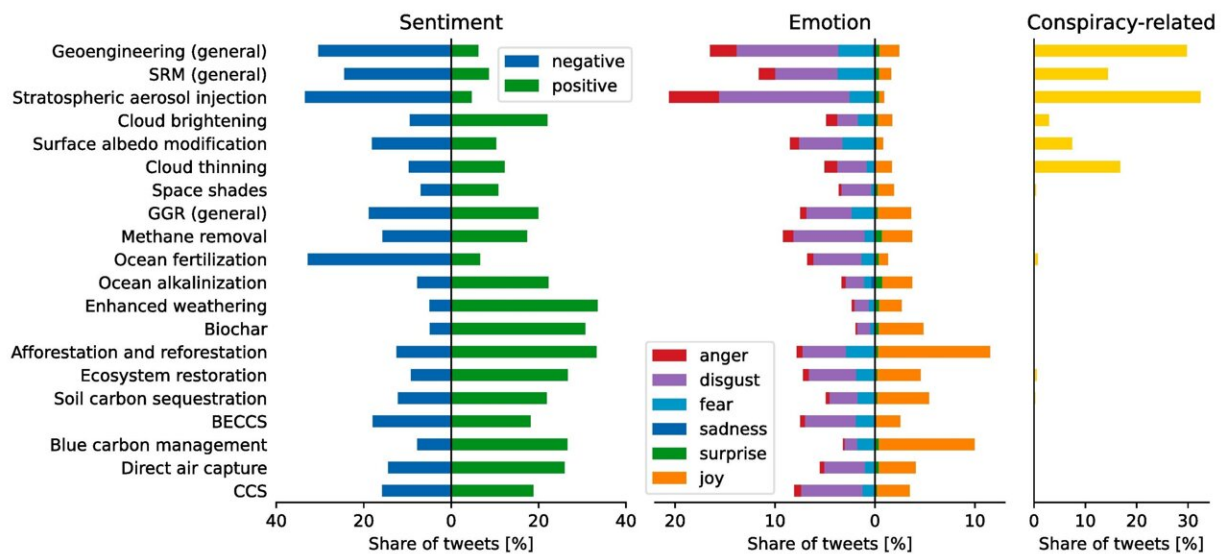


Study shows support for carbon removal but great concern over solar manipulation

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Share of sentiments and emotions as well as share of conspiracy-related tweets for each technology category. Credit: *Global Environmental Change* (2023). DOI: 10.1016/j.gloenvcha.2023.102765

According to forecasts, even the strategy to gradually reduce climate gas emissions to zero everywhere will no longer be enough to limit global heating to well below 2°C. Today, the discussion is also about "negative emissions," i.e., the removal of the most important greenhouse gas, CO₂, from the atmosphere. Under the heading of "solar radiation management," some are even talking about a potential reflection of

incoming sunlight.

A new study led by the Berlin-based climate research institute MCC (Mercator Research Institute on Global Commons and Climate Change) now sheds light on the acceptance of such options. The study is published in the journal *Global Environmental Change*.

"It is important to discuss this topic not only in the sphere of science and politics, but to involve the public," says Finn Müller-Hansen, researcher in the MCC working group Applied Sustainability Science, and lead author. "In our study, we want to understand attitudes and concerns about emerging technologies on greenhouse gas removals and solar radiation management. If these feed into the policy process, it can help avoid social conflict.

"It's not so easy to do this via surveys, because when you're not familiar with issues, you can be strongly influenced by the way the questions are asked. That's why we chose a different approach: we were interested in how people engage with these topics without being asked."

To this end, the study focuses on the short message service X (formerly Twitter), with an evaluation of a total of about 1.5 million tweets posted in English on this topic area since its launch in 2006, through to 2021, from across the world. The tweets addressed 11 technologies of greenhouse gas removal (from afforestation to accelerated weathering of soils to [carbon capture](#) in climate plantations and air filter systems), plus five variants of solar radiation management (from stratospheric aerosol injection to the installation of huge solar sails in space), as well as tweets about "geoengineering" as an umbrella term for all these procedures.

According to the researchers, the analysis results in important insights for politics and business, even if the X (Twitter) community does not necessarily react in the same way as the population as a whole. The

increasing relevance of the topic is evident over time: the proportion of overall messages in which it featured increased threefold from 2014 to 2021 compared to the earlier period.

While solar radiation management remains a niche topic in absolute terms, being mentioned in only 50,000 of the 1.5 million tweets, the discussion on greenhouse gas removal has become more refined, addressing individual technologies specifically. And the automated readout of the "sentiments" and "emotions" conveyed in the tweets reveals that the more differentiated the debate on [negative emissions](#) becomes, the more sympathetic the assessment.

Among the almost 800,000 tweets exclusively discussing the umbrella term "geoengineering," negative sentiments (present in 30% of all tweets) still clearly outweigh the positive sentiments (6%). By contrast, [tweets](#) on individual technologies of greenhouse gas removal are found to be more favorable. This trend increases the more the removal is perceived as "natural," and the greatest approval is found for afforestation. So-called ocean fertilization, in which algae growth is stimulated with nutrients in order to bind CO₂, is viewed very critically.

A distinctly negative sentiment and the prevalence of emotions such as "disgust" and "fear" are shown by the analysis of X (Twitter) traffic on the potential manipulation of sunlight. In particular, stratospheric aerosol injection is outright rejected. In this context, the researchers point to concerns about uncontrolled environmental consequences and a lack of international coordination. The study culminates in the recommendation that, in view of such fears, the vague umbrella term "geoengineering" should no longer be used, and the debate should focus on the options for greenhouse gas removal.

More information: Finn Müller-Hansen et al, Attention, sentiments and emotions towards emerging climate technologies on Twitter, *Global*

Environmental Change (2023). [DOI: 10.1016/j.gloenvcha.2023.102765](https://doi.org/10.1016/j.gloenvcha.2023.102765)

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