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A SIGNIFICANT STEP IN UNDERSTANDING CLIMATE CHANGE

We are currently living in what is considered as the Anthropocene, an age in which human activities have a significant impact on the planet. Perhaps the most serious damage inflicted by humans has been on its climate.

Climate change, driven by an increase in the average surface temperature of Earth, results from a surge in radiative forcing—the difference between the energy received by Earth and the energy radiated back to space. The radiative forcing agents of the industrial era include greenhouse gases such as carbon dioxide (CO_2) and methane, which trap the longwave radiation emitted by our planet.

To measure how effective a forcing agent is in causing Earth's climate to change, researchers use the concept of efficacy, defined as the ratio of global temperature change due to that particular forcing agent to the temperature change caused by CO_2 for the same radiative forcing value.

In a new study, GovindasamyBala—one of India's most well-known climate scientists—and his student, AngshumanModak, addressed the issue of the efficacy of the incident solar radiation relative to CO_2.* Using a modelling approach, they considered climate system responses during three different time periods: a week, four months and a century.

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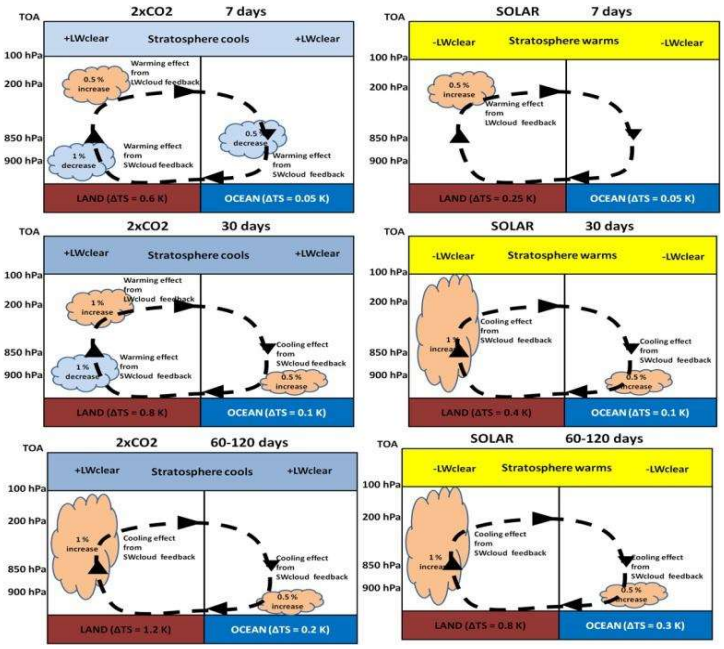

This schematic diagram illustrates the differences in climate system response for solar and CO_2 forcing on 7, 30 and 60--120 day timescales. The closed circulation indicates a global monsoonal circulation initiated during climate change. The cloud and stratospheric temperature responses are very different in the two cases

“What we found was that the Sun is less effective than CO_2 in causing climate change,” says Bala. In fact, the study shows that solar forcing is only 80% as effective as CO_2 forcing. “This means that for the same radiative forcing, if CO_2 causes 1 °C warming, the Sun causes only 0.8 °C warming,” he continues. This finding, Bala argues, is crucial not just for our understanding of the mechanisms of climate change but also for the formulation of more effective climate change policies.

* AngshumanModak, GovindasamyBala, Long Cao and Ken Caldeira. 2016. Why must a solar forcing be larger than a CO_2 forcing to cause the same global mean surface temperature change? *Environ. Res.* Lett. 11(4):1-12