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Have tropospheric aerosol emissions contributed to the recent climate hiatus?

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During the last 15 years global warming has slowed considerably, with the resulting plateau in global temperature records being dubbed the *climate hiatus*. Apart from variations in solar irradiance and ocean temperature, increased anthropogenic aerosol emissions in South and East Asia have been suggested as possible causes for this hiatus. While European and and North American aerosol emissions have constantly decreased since the 1980's, emissions in China and India have started increasing at the same time and, although total global aerosol emissions have decreased, aerosol effects on the global energy budget are expected to enhance towards the equator due to stronger irradiance there.

In this study we used the aerosol-climate model ECHAM5-HAM2 to assess the effect that this re-distribution of anthropogenic aerosol emissions towards the equator may have on climate. To this end, we computed radiative forcing and equilibrium temperature response due to the change in global aerosol emissions (black carbon (BC), organic carbon and sulphur dioxide) between 1996 and 2010, keeping all other anthropogenic influences fixed. Surprisingly we found that the cooling due the increased aerosol emissions in China and India is almost negligible compared to the warming caused by the decreasing aerosol emissions in Europe and North America. The radiative flux perturbation (RFP; includes aerosol indirect effects) was 0.42 $\mathrm{W/m^2}$ and the change in global equilibrium 2 m temperature increased by 0.25 °C.

The lack of cooling in China and India stems from a cancellation of sulfate cooling and BC warming, especially over China. There, the strong cloud cover leads to both attenuation of sulphate aerosol light scattering and saturation tendency of indirect aerosol effects on clouds. BC levels on the other hand increase also above the clouds (relative increase of BC levels is almost uniform with height), leading to warming through light absorption.