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Chinese lockdown as aerosol reduction experiment

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The lockdown of large parts of chinese economy beginning in late January 2020 lead to significant regional changes of aerosol loads, which suggests a reduction of backscatter and consequently a regional warming in the following months. Using local data and a numerical experiment with a limited area model, we have examined how strong this response may have been. The observed (local and re-analysis) observations point to a warming of less than 1.0^{o}, the simulations to a warming of about 0.5^{o}. These numbers are uncertain, because of large-scale natural variability and an ad-hoc choice of aerosol optical depth anomaly in the simulation. Thus, the result was, in short, that there was actually a weak warming of a few tenth of degrees, while noteworthy changes in circulation or in precipitation were not detected.

More specifically, we found

- at selected central China stations temperature were found to be higher than in previous 2 years. This warming goes with a marked **diurnal** signal, with a stronger warming, when cloudiness is low, and weaker warming, when cloudiness is high. Maximum warming in the early afternoon (06 UTC), weakest at night (18 UTC)
- This may be related to a **general warming** of large swaths of Asia (including Siberia, which is not related to local aerosol forcing. Indeed, also the stations outside the immediate strong lockdown are showing a albeit weaker warming. Thus, the difference 2020 minus 2919/2018 may overestimate the effect.
- The ad-hoc numerical experiment indicates that the change caused by the overall reduction of the atmospheric optical depth does not lead to phases of larger deviations of local time series in the simulations. Instead, the simulations with reduced aerosol load show more a mere locally increased temperature. This may indicate that the aerosol effect is mostly local thermodynamic.