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12. Deutsche Klimatagung

Climatic environment of the COVID-19 outbreak – a lesson from the German shutdown

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For directly transmissible infectious diseases, potential seasonal effects in the course of an epidemic may be borne in four groups of variable, partially sensitive, pathways: changes in the susceptibility of the hosts, in their individual and collective behavior, in the transmissibility of the pathogen, and in the survival of the latter, under changing environmental conditions. Mechanisms are diverse and concepts not finally settled, not even for the common cold or influenza. Nevertheless, seasonality of an epidemic is an aggregate phenomenon, and this holds for interacting effects as well even in the climatic conditions themselves. Societal shutdown aimed at containing an epidemic, like the German shutdown in spring 2020, creates a kind of 'laboratory' situation and bears rare data that may be suited to disentangle extrinsic from intrinsic factors of the evolution. In a pilot study, a five-parameter climatic data set of station Lindenberg (Mark), taken as representative for the German capital, has been blended in daily resolution with the COVID-19 incidences provided by the Robert Koch Institute. The climate data include surface air temperature, pressure, relative humidity and wind speed, as well as sunshine duration – all under suspicion in the related literature. Early in March, a specific dynamic combination of these five variables, toward the spring seasonal transition, may eventually have triggered the epidemic outbreak in Berlin. Under relatively cool conditions and a calm wind field, a pronounced surface pressure wave passed the region, followed by a marked change in cloudiness that substantially increased the daily sunshine duration and became accompanied by a mirror-like drop this way in the relative humidity from above 85% to less that 50%. This favorable change of extrinsic conditions may have contributed to transform a latent spread of the SARS-CoV-2 virus into the epidemic outbreak (the rising flank of the epidemic curve closely follows that of the pressure wave by a couple of days, whereas a similar pressure wave two months before did not have any similar effect). In the weeks to follow the outbreak, a sort of cooperative slow dynamics is maintained in the regional climate system, and this is exploited for the period until the rise of shutdown restrictions to quantify regressions aimed to drive an equation-based epidemic model by observed climate dynamics. The study is being extended – across the season 2020, to further climate stations, to other regional outbreaks, beyond observation, etc.