COVID-19 Pandemic: Lessons from Physics

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Abstract. COVID-19 pandemic control must draw on the expertise of virologists, epidmiologists, psychologists, but also matematicians and other disciplines. Among them, physics offers its own tools and theories that can explain the mechanisms of spreading the disease, its localization and suppression. This work is based on the premise that social systems with thier interactions are too complex to be modelled in a simple way by straight-cut analytical models. The same applies to the biological processes in livig organisms. Therefore, empirical physical models are often used as useful approximations that can lead to tangible results. In this work we use the phenomenological theory of diffusion, the kinetic theory of gases, the gravitational model, the percolation theory and a certain analogy with the recombination of charge carriers in semiconductors to examine the spread of COVID-19 pandemic in Slovakia and its neighbouring states. The results show that the diffusion of the disease is approximately as fast as the diffusion of migrants to Europe in the last years. Population density is an important factor in the transmission of the disease. However, the economic factors, people's habits, their fears of a health care collapse, household indebtedness, etc., must be also taken into account. The results of physical solutions are highly dependent on accurate input statistics and are influenced by frequently changing measures.