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Simulation of the Aerosol-Atmosphere Interaction in the Dead Sea Area with COSMO-ART

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The Dead Sea is a unique environment located in the Dead Sea Rift Valley. The fault system of the Dead Sea Rift Valley marks the political borders between Israel, Jordan, and Palestine. The Dead Sea region and the ambient Eastern Mediterranean coastal zone provide a natural laboratory for studying atmospheric processes ranging from the smallest scale of cloud processes to regional weather and climate. The virtual institute DESERVE is designed as a cross-disciplinary and cooperative international project of the Helmholtz Centers KIT, GFZ, and UFZ with well-established partners in Israel, Jordan and Palestine. One main focus of one of the work packages is the role of aerosols in modifying clouds and precipitation and in developing the Dead Sea haze layer as one of the most intriguing questions. The haze influences visibility, solar radiation, and evaporation and may even affect economy and health.

We applied the online coupled model system COSMO-ART, which is able to treat the feedback processes between aerosol, radiation, and cloud formation, for a case study above the Dead Sea and adjacent regions. Natural aerosol like mineral dust and sea salt as well as anthropogenic primary and secondary aerosol is taken into account.

Some of the observed features like the vertical double structure of the haze layer are already covered by the simulation. We found that absorbing aerosol like mineral dust causes a temperature increase in parts of the model domain. In other areas a decrease in temperature due to cirrus clouds modified by elevated dust layers is simulated.