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Wind systems the driving force of evaporation at the Dead Sea

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The Dead Sea is a unique place on earth. It is located in the Eastern Mediterranean at the lowest point of the Jordan Rift valley and its water level is currently at 429 m below mean sea level. The region is located in a transition zone of semi-arid to arid climate conditions and endangered by severe environmental problems, especially the rapid lake level decline (>1m/year), causing the shifting of fresh/saline groundwater interfaces and the drying up of the lake. Two key features are relevant for these environmental changes: the evaporation from the water surface and its driving mechanisms. The main driver of evaporation at the Dead Sea is the wind velocity and hence the governing wind systems with different scales in space and time.

In the framework of the Virtual Institute DEad SEa Research Venue (DESERVE) an extensive field campaign was conducted to study the governing wind systems in the valley and the energy balance of the water and land surface simultaneously.
The combination of several in-situ and remote sensing instruments allowed temporally and spatially high-resolution measurements to investigate the frequency of occurrence of the wind systems, their three-dimensional structure, associated wind velocities and their impact on evaporation.
The characteristics of the three local wind systems governing the valley's wind field, as well as their impact on evaporation, will be presented. Mostly decoupled from the large scale flow a local lake breeze determines the conditions during the day. Strong downslope winds drive the evaporation in the afternoon, and down valley flows with wind velocities of over 10 $\mathrm{m\,s^{-1}}$ dominate during the night causing unusually high evaporation rates after sunset.