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The deeper structure of the southern Dead Sea basin derived from neural network analysis of velocity and attenuation tomography

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The Dead Sea basin is a pull-apart basin at the Dead Sea transform fault, the boundary between the African and the Arabian plates. Though the DSB has been studied for a long time, the available knowledge - based mainly on surface geology, drilling and seismic reflection surveys - gives only a partial picture of its shallow structure. Therefore, within the framework of the international DESIRE (DEad Sea Integrated REsearch) project, a dense temporary local seismological network was operated in the southern Dead Sea area. Within 18 month of recording 650 events were detected. In addition to an already published tomography study revealing the distribution of P velocities and the Vp/Vs ratios a 2D P-wave attenuation tomography (parameter Qp) was performed. The neural network technique of Self-organizing maps (SOM) is used for the joint interpretation of these three parameters (Vp, Vp/Vs, Qp). The resulting clusters in the petrophysical parameter space are assigned to the main lithological units below the southern part of the Dead Sea basin: (1) The basin sediments characterized by strong attenuation, high vp/vs ratios and low P velocities. (2) The pre-basin sediments characterized by medium to strong attenuation, low Vp/Vs ratios and medium P velocities. (3) The basement characterized by low to moderate attenuation, medium vp/vs ratios and high P velocities. Thus, the asymmetric southern Dead Sea basin is filled with basin sediments down to depth of 7 to 12 km. Below the basin sediments, the pre-basin sediments are extending to a depth between 13 and 18 km.