



Magma Intrusion in the upper crust of Abu Dabbab area, south east of Egypt

from Vp and Vp/Vs tomography

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1 Abstract

3-D images of P-wave velocity and Vp/Vs ratio have been produced for the upper crust of the Abu Dabbab area, North Mars Alam city. The inversion of local travel times of high quality data recorded at eleven mobile seismic stations around the study area is carried out. The best, in the least-squares sense, 1-D Vp model and the average value of Vp/Vs (1.72) were computed as prerequisites of the 3-D inversion that reaches a depth of 14 km. From the 3-D model it is evident that the distributions of Vp and Vp/Vs are characterized by marked lateral and vertical variations delineating structural heterogeneities. Due to the presence of a thin layer of sedimentary rocks saturated with surface water, low P-wave velocity and high Vp/Vs values are noticed near the surface. At greater depths, high Vp and low Vp/Vs zones may indicate crustal rocks with relatively higher rigidity and brittle behavior, while high Vp/Vs and low Vp may identify zones of relatively softer rocks, with ductile behavior. Low P-wave velocity values are observed at the intersections among the faults. Some magma intrusions could be associated to the Vp/Vs values which form an elongated anomaly, in the

western part of the study area, which extends from a depth of 12 km to about 1- 2 km of depth.

2 If the obtained 3-D model is used in the relocation of selected events, they turn out to be strongly clustered in correspondence with the high velocity anomalies detected in the central part of the study area. Most of the seismicity tends to occur at the boundaries between the high and low velocity anomalies and at pre-existing weakness zones, i.e. the areas of intersection among different faults. The occurrence of the seismic activity in the vicinity of low velocity anomalies and at the boundary between velocity contrast could also be explained by the occurrence of serpentinization processes in the crust of the study area.