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Seismic velocity-depth relation in foreland basins: the case study of the Central Adriatic Sea

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In the frame of the geological characterization of the subsurface, the multidisciplinary approach is key to fully understand the geological and geophysical processes. Seismic data analysis and interpretation would result in a mere exercise without constraints provided by geological, geophysical and petrophysical data. These constraints may be provided by borehole data, surface geology or laboratory measurements on samples. In this work, to support geological understanding of foreland basins we integrate reprocessed seismic profiles and borehole data in the Central Adriatic Sea to investigate the velocity-depth trend of the Pliocene-Quaternary turbiditic siliciclastic deposits. These deposits play a key role in the reconstruction of the geodynamic and stratigraphic evolution of the foreland basin, as well as on the hydrocarbon exploration and gas storage in central Adriatic. Relying on independent approaches to map two way time (TWT) thickness of the PH deposits, we converge on testing linear and exponential functions to predict V_P depth trend. Results suggest that for large (> 1500 m) thicknesses of the PH deposits best fit is achieved by the exponential function $V_P(z) = c\ z^{(1-n)}$ while for thinner deposits, a linear function like $V_P(z) = V_0 + k\ z$ provides best fitting estimates. We also investigate anomalies in velocity trend with depth and suggest that velocity drops observed in deep (2500-3500 m) PH sequences may reflect overpressure of these deposits. An hypothesis supported by the high sedimentation rates in central Adriatic during Pliocene. Finally, we stress the importance of considering vertical-component phenomena and their time evolution when modelling foreland basins.