

## 2.1 GEOPHYSICAL INSIGHTS INTO THE TECTONIC REGIME OF THE CHANIA BASIN IN THE AEGEAN REGION

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### ABSTRACT

This study focuses on one of the most seismically active regions within the Aegean area, where microzonation studies play a crucial role in earthquake engineering design. The study's purpose is to enhance understanding of the seismic behavior of the Chania basin, contributing valuable insights into its tectonic regime. Given the region's high seismic activity, the accurate determination of seismic parameters is essential for designing resilient structures. The research centers on the critical parameter of average S-wave velocity ( $V_{s30}$ ) within the top 30 meters of subsoil, as mandated by EUROCODE 8, the European seismic-resistant design standard. A comprehensive geophysical field campaign was undertaken in the Chania basin to achieve these objectives. This campaign included various geophysical methods, encompassing seismic, electric, and electromagnetic surveys. The data collection involved diverse techniques, such as TEM soundings, circular seismic arrays, passive and active linear surface waves, seismic profiles, geoelectrical resistivity imaging, and HVSR measurements. These combined methods aimed to provide a holistic view of the basin's subsurface properties. The study's primary contribution lies in its application of modern geophysical techniques to unravel the tectonic dynamics of the Chania/Souda basin. Through the integration of various geophysical datasets, the study presents a preliminary understanding of the region's tectonic framework. The importance of employing surface geophysics as a powerful tool for large-scale tectonic investigations is highlighted, particularly for complex systems. The results obtained from TEM measurements were meticulously assessed and validated using borehole data, enhancing the reliability of the findings. Through the construction of 2D pseudo sections, the study successfully identified geological formations and new fault structures. This comprehensive knowledge of the basin's geological and tectonic characteristics is a foundational resource for future regional seismotectonic studies and earthquake vulnerability assessments. In conclusion, this research sheds light on the Chania basin's seismic behavior and tectonic regime through the innovative application of a wide array of geophysical methods. By providing valuable insights into the subsurface properties and fault structures, the study advances the understanding of this seismically active region and offers a basis for informed decision-making in earthquake hazard mitigation and infrastructure design.

**KEY WORDS:** seismic dynamis, transient electromagnetics, Chania basin, geophysical insights, tectonic regime