



**AIN SHAMS UNIVERSITY**  
**FACULTY OF SCIENCE**

# **Seismic Velocity Modeling and Ground Motion Amplification at the 6<sup>th</sup> of October City Egypt using Refraction Seismic and Microtremor Measurements**

**A THESIS**

**SUBMITTED FOR THE DEGREE OF DOCTOR OF PHILOSOPHY  
IN APPLIED MATHEMATICS**

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**Cairo, 2013**

## ***ACKNOWLEDGEMENTS***

*My all gratitude is due to Allah the Almighty who guided and helped me to bring-forth the present study.*

*I would like to express my deepest appreciation to the memory of **Prof. Ahmed El-Azab Radwan** and Professor **Prof. Mahdy Mohamed Ahmed** for their kind supervision, guidance and encouragement.*

*I am greatly indebted to **Prof. Fawziya Abdel Aziem**, Professor of mathematics and **Prof. Ahmed S.A. Abu El-Ata** Professor of geophysics, for their generous expedient support, encouragement.*

*I wish to express my heartstring gratitude to **Prof. Salah Mohamed Mahmoud** Professor of geodynamics, the National Research Institute of Astronomy and Geophysics, for his vital assistance and guidance in the preparation and progress of this study.*

*My sincere thanks to **Dr. Adel M. E. Mohamed**, Associate Professor of Seismology, the National Research Institute of Astronomy and Geophysics, for his kind supervision, active discussion and effective assistance in the preparation of this study.*

*It's my pleasure to thank the scientific authorities for their kind and providing continuous facilities which made the completion of this work possible especially the **Mathematics and Geophysics departments** at the **Ain Shams University** and the **National Research Institute of Astronomy and Geophysics (NRIAG)**.*

*Finally, My deep appreciation to my **Mother**, my **wife**, my **sons**, and to all individuals who assisted in the careful, often tedious work of preparing this thesis.*

*Mohamed Abd-Rabo Taha*

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**ABSTRACT**

## **Seismic Velocity Modeling and Ground Motion Amplification at the 6<sup>th</sup> of October City using Refraction Seismic and Microtremor Measurements**

*By: Mohamed Abd-Rabo Mohamed Taha*

In order to quantify the near-surface seismic properties (P- and S-wave velocities and the dynamic elastic properties) with respect to depth at a specific area (the 6<sup>th</sup> of October club), we conducted non-invasive active seismic survey.

The primary wave velocity is determined by conducting the P-wave shallow seismic refraction. The dispersive characteristics of the Rayleigh type surface waves were utilized for imaging the shallow subsurface layers by estimating the 1D (depth) and 2D (depth and surface location) shear wave velocities. The reliability of the Multi-channel Analysis of Surface Waves (MASW) depends on the accurate determination of the phase velocities for horizontally travelling fundamental mode Rayleigh waves. Consequently, the elastic properties are evaluated empirically.

The  $V_s^{30}$  (average shear wave velocity down to 30 m depth), which is obtained from the MASW technique, plays a critical role for estimating the site response of the upper 30 m depth. The distribution of the obtained  $V_s^{30}$  at the studied area demonstrates site classes of C and D, according to the NEHRP (National Earthquake Hazard Reduction Program) and IBC (International Building Code) standards.

The damage caused by earthquake occurrences in different localities necessitates the evaluation of the underground and/or sub-soil structure. A priori estimation of the site effects became a major challenge for an efficient mitigation of seismic risk. In the case of moderate to large earthquakes, at some distance from large events, severe damage is often limited to zones of unfavorable geotechnical conditions, which give rise to significant site effects. The damage distribution in the near-source area is also significantly affected by the fault geometry and rupture history. The microtremor (background noises) and the shallow seismic surveys