جامعة عبد المالك السعدي
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Université Abdelmalek Essaadi

Pole for Doctoral Studies
Center for Doctoral Studies Sciences, Technologies, and Medical Sciences

ANNOUNCEMENT OF DOCTORAL THESIS DEFENSE

M. OUTISKT Mohamed

Will present here research work with the aim of earning a Doctorate

Doctoral program: Engineering Sciences and Techniques
Discipline: Geosciences
Specialty: Applied Geology and Natural Risk Management

On 08/10/2025 at 11H00 at the Conference Hall, F Building, Faculty of Sciences and Techniques of Tangier, UAE
Under the Theme

TSUNAMI RISK ASSESSMENT ON THE MOROCCAN COASTS

Front of the jury composed of :

First Name & Last Name	Establishment	Designation
Pr. MAÂTOUK Mustapha	FST of Tangier, UAE	President
Pr. LOUDYI Dalila	FSTM of Casablanca, UH2	Reviewer
Pr. EL M'RINI Abdelmounim	FS of Tetouan, UAE	Reviewer
Pr. WAHBI Miriam	FST of Tangier, UAE	Reviewer
Pr. HAKKOU Mounir	IS of Rabat, UM5	Examiner
Pr. BOULAASSAL Hakim	FST of Tangier, UAE	Examiner
Mr. PINTO RAMOS João Francisco	DryUp Swiss Technology	Guest
Pr. VIANA BAPTISTA DE CARVALHO Maria Ana	ISEL, IDL-FCUL	Co-Supervisor
Pr. ABOUMARIA Khadija	FST of Tangier, UAE	Supervisor

Research Laboratory: Laboratory of Research and Development in Applied Geosciences "LR&DGéoAP"

Abstract

Coastal communities in Morocco, are exposed to the risk of tsunamis from seismic and volcanic sources in both the Atlantic Ocean and the Alboran Sea. This thesis is devoted to assessing tsunami risk on Moroccan coasts, particularly the city of Agadir on the southern Atlantic coast and the city of Martil on the Mediterranean coast. This study is based on an integrated approach combining hydrodynamic modeling, hazard mapping, urban vulnerability analysis and quantitative tsunami risk assessment to estimate potential human and material losses.

In fact, this work is based on the numerical simulation of tsunamigenic events using the NSWING and COMCOT codes, as well as a Quantitative Risk Assessment (QRA) approach to assess the potential loss of life and property. Three scenarios were simulated: i) the historical event of Lisbon 1755 and its impact on the city of Agadir, ii) the potential tsunami of La Palma and its impact on the same city, and iii) the potential tsunami of the Averroes fault and its impact on the city of Martil. The simulation results of the first scenario, based on the four sources of the Lisbon 1755 tsunami, were simulated to assess their impact on the Agadir city on the south-west Atlantic coast of Morocco.

The findings indicate that an event similar to the Lisbon 1755 tsunami, corresponding to the worst-case scenario associated with the Horseshoe fault (Mw 8.5), has the potential to generate tsunami waves reaching up to 6 m along the Agadir coast, with inundation exceeding 300 m inland. These findings suggest that the coastal region of Agadir is prone to a level I tsunami hazard, indicating a high-risk level, according to the classification of the Tsunami Early Warning and Mitigation System in the North-Eastern Atlantic, the Mediterranean and Connected Seas (NEAMTWS).

While, the simulation results of the second scenario corresponding to a tsunami generated by a potential 30 km³ collapse of the western flank of the Cumbre Vieja volcano (La Palma) shows that tsunami waves could reach 8 m at Agadir, with significant inland wave penetration exceeding 2 km and a flow depth of 35 m. The risk assessment estimates economic losses at $2 million and human losses at 52 lives/year. In contrast, on the Mediterranean coast, the results of the third scenario for assessing the potential tsunami impact of the Averroes fault in Martil show that flow depth varies between 0.5 and 7 m, with an inundated surface area of 70 km2. In addition, the arrival time of the first tsunami waves exceeded 40 min. Material losses could reach $3.72 million and human losses 1 live/year. In general terms, the Atlantic and Mediterranean coasts of Morocco, although different in geography, are exposed to tsunami risk and share a high vulnerability. In the end, these findings provide an important scientific basis for effective risk management and prevention strategies, early warning systems and evacuation plans adapted to local conditions.

Keywords: Tsunami, Inundation, Moroccan coasts, Numerical simulation, NSWING, COMCOT, QRA, Risk assessment, vulnerability, human and economic losses