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Seismic Hazard Microzonation Map for the Central Plain of Thailand

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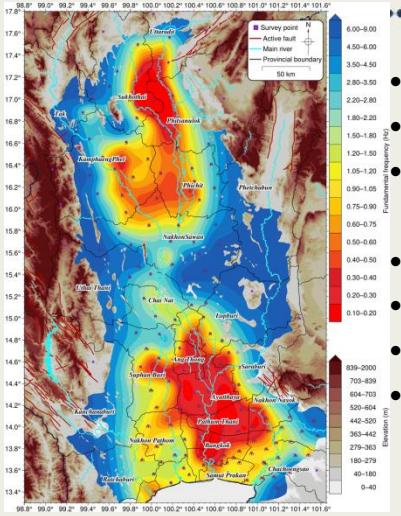
INTRODUCTION AND MAIN RESULTS



- Fundamental frequency map of central plain derived from HVSR analysis at 149 sites.
- Two zones identified: low frequency (thick sediment) and high frequency (shallow bedrock).
- Upper central plain (Nakhon Sawan northward) at 0.3-0.9 Hz, Nakhon Sawan and Chainat over 1.2 Hz.
- Chao Phraya River Basin averaged below 0.5 Hz, western part higher.
- Bangkok and Pathum Thani at 0.2-0.5 Hz, sediment layer 300-2000 m.
- Lowest Vs30 in Ayutthaya, Prathum Thani, Bangkok, indicating soft soil.
- Soil types: Upper central plain (Class E), southern areas (Class F), Vs30 < 180 m/s (Class E), Vs30 180-360 m/s (Class D).

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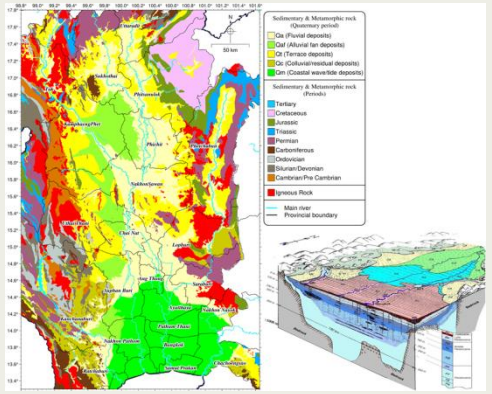
INTRODUCTION

Central Thailand's plain comprises upper and lower basins filled with thick quaternary sediments.

- Basin's sediment layer increases earthquake ground motion amplification.
- Site effects depend on soil/rock hardness, bedrock depth, sediment thickness, ground failure potential, and topography.
- HVSR technique commonly estimates Vs30 for site effect assessment.
- Research aims: seismic microzonation and probabilistic seismic hazard map for central plain of Thailand.
- Results inform earthquake hazard assessments and mitigation strategies.



(a) Geologic map of central Thailand and surrounding regions. (b)Cross-section illustrating sedimentary layers and bedrock depth in the lower central

MATERIALS AND EXPERIMENT

HVSR measurements and analysis

Equipment Setup and Data Collection

- Used SARA SL-06 24bit A/D datalogger with SS-05 tri-axial velocity seismic sensor. (0.5 Hz, sensitivity: 400 V/m/s)
- Conducted measurements at 149 sites across 23 provinces in the central plain of Thailand.
- Recorded data for 1-3 hours at each survey point

HVSR Analysis

- Utilized Geopsy software for HVSR analysis.
- Employed SESAME guidelines for evaluating clear HVSR peaks.

Results

Analyzed and interpreted HVSR data to extract subsurface information from ambient noise.

HVSR inversion

Inversion Technique

- Employ HV-inv computer code with diffuse field assumption for HVSR curve inversion.
- Utilize Monte Carlo sampling global optimization technique for parameter optimization.

Initial Model Parameters

Define initial model parameter ranges for layer thicknesses, Vp velocities, Vs velocities, and densities

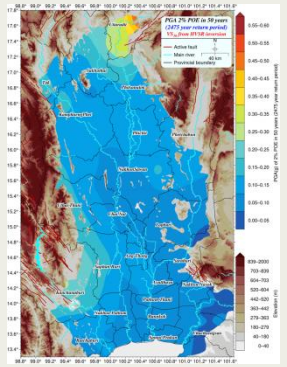
Vs30 Calculation

Determine Vs30 value from shear wave velocity profile derived from inversion process.

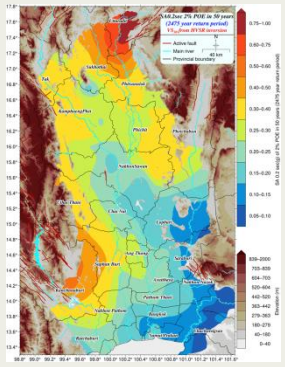
Results

Determine Vs30 value from shear wave velocity profile derived from inversion process

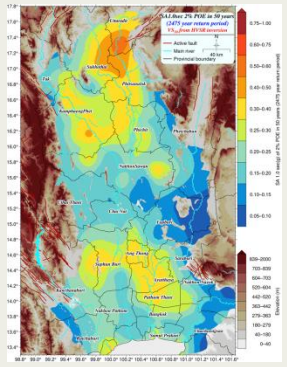
CONCLUSIONS



PSHA map for PGA at 2475-year return period on Vs30 site condition.



PSHA map for 0.2-sec spectrum acceleration at 2475-year return period on Vs30 site conditions.



PSHA map for 1.0-sec spectrum acceleration at 2475-year return period on Vs30 site conditions.

- Study focused on seismic microzonation of Thailand's central plain.
- Findings include fundamental frequency, Vs30, and soil classification maps derived from HVSR analysis at 149 sites.
- Upper central plain has low fundamental frequency (0.3-0.5 Hz) and Vs30 (Class E soil).
- Southern areas (Ayutthaya, Pathum Thani, central Bangkok) have extremely low Vs30 (<100 m/s, Class F soil).
- Seismic hazard maps for PGA, SA0.2s, and SA1.0s indicate high hazard in northern upper plain and western central basin.
- Site effect amplifies ground motion at 1.0 second period, exceeding Thai building standards.
- Results inform earthquake hazard assessments and mitigation strategies.