

NHR3 GeoHazard Research Program
Request for Proposals: RFP3A-2
Submission Deadline: **June 15, 2020 (5PM Pacific Time)**

RFP Subject: Liquefaction Triggering Model Using Arias Intensity (AI) or Cumulative Absolute Velocity (CAV) as Intensity Measures

Introduction: NHR3 GeoHazard Program

Natural Hazards Risk and Resiliency Research Center (NHR3) is a multidisciplinary and multi-campus research center with headquarters at UCLA (<https://www.risksciences.ucla.edu/nhr3>). The GeoHazard Research Program has recently been established at NHR3, with the focus on advancing seismic hazard characterization, use of earthquake ground motions in performance-based seismic design of infrastructure, and improving the assessment of liquefaction hazard. The GeoHazard Program is funded by infrastructure agencies, especially California Department of Transportation (Caltrans).

This request for proposals (RFP) is one of the RFPs related to technical topics in the GeoHazard Research Program.

Technical Objective of this RFP

Using the NGL dataset, develop a SPT or CPT based model for the prediction of liquefaction triggering that uses Arias Intensity or Cumulative Absolute Velocity as the intensity measure.

Technical Background

The evaluation of liquefaction triggering potential in practice generally relies on use of a *Simplified Procedure*, originally developed by Seed and Idriss (1971), but since updated to account for more recent case-histories and extensions from standard penetration test blow counts to CPT and shear-wave velocity. Almost all these methods rely on peak ground acceleration as the intensity measure. The shortcomings of PGA have been recognized for some time, e.g. Kayen and Mitchell (1997) and Kramer and Mitchell (2006), and is reflected in the need for a magnitude scaling factor as a proxy for number of loading cycles. Despite this recognition, PGA based methods have continued to dominate practice since other intensity measures lack the widespread availability of hazard information that exists for PGA. To address this availability issue, a separate project under the NHR3 Center will develop a simple web-tool that will provide Arias Intensity and CAV hazard information based on latitude, longitude, and Vs30 inputs. If needed, the databases of CAV and AI on for the NGA-West2 will be made available to the project participants.

Technical Requirements

The proposed model must be simple enough to be implemented in a spreadsheet. The study must include statistical comparisons to existing PGA based models.

References

Kayen, Robert, and Mitchell, James. (1997). Assessment of Liquefaction Potential during Earthquakes by Arias Intensity. *Journal of Geotechnical and Geoenvironmental Engineering*. 123. 1162-1174.

10.1061/(ASCE)1090-0241(1997)123:12(1162).

Kramer, S. L., and Mitchell, R. A. (2006). Ground Motion Intensity Measures for Liquefaction Hazard Evaluation. *Earthquake Spectra*, 22(2), 413–438. <https://doi.org/10.1193/1.2194970>

Seed, H. B. and Idriss, I. M., (1971). Simplified procedure for evaluating soil liquefaction potential, *J. Soil Mechanics and Foundations Div.*, ASCE **97**(SM9), 1249-273.

Project Duration: 24 months

Maximum Budget: \$162,500

Other Considerations in Proposal Selection

Preference will be given to proposals that incorporate multi-institutional participation/cooperation.

Proposal Submission Process

1. The master research contract between Caltrans and UCLA restricts only public universities to submit proposals. Thus, the Principal Investigator (PI) of the proposal must be from a public university in the US. The Co-PIs or collaborators may be from any public or private institutions.

2. The proposal blank template and proposal submission form are at the following web site:

<https://www.risksciences.ucla.edu/nhr3/seismic-geohazard/rfp>

3. As indicated in the proposal template, each proposal should include:

- a. Five-page project description,
- b. One-page roles of the key project participants,
- c. Two-page biographical sketch for each key project participants,
- d. One-page budget sheet. The indirect cost rate should be limited to a maximum 30%.
- e. One-page budget justification.

4. Each proposal should be submitted as a single PDF file via the URL listed above. The PDF file name should be: RFPXYZ_PI_name.pdf, for example, RFP3A-2_JohnJaneDoe.pdf

5. At this phase of the proposal submission, the proposal need not be submitted via institution's official Contracts and Grants Administration (OCGA) or Sponsored Projects Office (SPO). If the proposal is selected for funding, the official proposal will have to be submitted through the institution's OCGA/SPO.

Other Requirements

The projects participants must commit to the following:

1. Attending at least two technical meetings per each year of funding to review the progress of the project and plan to avoid any surprises at the end of the project. The dates of the meetings to be determined based on the mutual availability.
2. At the completion of the project, but not later than 90 days after the contract end-date:
 - a. Submitting an NHR3 report. Template of the NHR3 report will be available at NHR3 web site.
 - b. Submitting one-page "Executive Summary" (including one figure) to be posted at NHR3 web site. The template of the Executive Summary" will be available at NHR3 web site.

3. All data, models, methodologies, findings and recommendations of the project will be made available to the public through NHR3 web site.

Questions (if any) regarding this RFP should be sent to the following email address:

NHR3-RFP@risksciences.ucla.edu