# HIGH PERFORMANCE COMPUTING METHODS FOR EARTHQUAKE CYCLE SIMULATIONS

by

ALEXANDRE CHEN

A DISSERTATION

Presented to the Department of Computer Science
and the Division of Graduate Studies of the University of Oregon
in partial fulfillment of the requirements
for the degree of
Doctor of Philosophy

June 2024

DISSERTATION APPROVAL PAGE

Student: Alexandre Chen

Title: High Performance Computing Methods for Earthquake Cycle Simulations

This dissertation has been accepted and approved in partial fulfillment of the requirements for the Doctor of Philosophy degree in the Department of Computer Science by:

| | |
|---|---|
| Brittany A. Erickson | Chair |
| Boyana Norris | Core Member |
| Jee Choi | Core Member |
| Richard Tran Mills | Core Member |
| Leif Karlstrom | Institutional Representative |

and

| | |
|---|---|
| Krista M. Chronister | Interim Vice Provost for Graduate Studies |

Original approval signatures are on file with the University of Oregon Division of Graduate Studies.

Degree awarded June 2024

DISSERTATION ABSTRACT

Alexandre Chen

Doctor of Philosophy

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Title: High Performance Computing Methods for Earthquake Cycle Simulations

Earthquakes often occur on complex faults of multiscale physical features, with different time scales between seismic slips and interseismic periods for multiple events. Single event, dynamic rupture simulations have been extensively studied to explore earthquake behaviors on complex faults, however, these simulations are limited by artificial prestress conditions and earthquake nucleations. Over the past decade, significant progress has been made in studying and modeling multiple cycles of earthquakes through collaborations in code comparison and verification. Numerical simulations for such earthquakes lead to large-scale linear systems that are difficult to solve using traditional methods in this field of study. These challenges include increased computation and memory demands. In addition, numerical stability for simulations over multiple earthquake cycles requires new numerical methods. Developments in High performance computing (HPC) provide tools to tackle some of these challenges. HPC is nothing new in geophysics since it has been applied in earthquake-related research including seismic imaging and dynamic rupture simulations for decades in both research and industry. However, there's little work in applying HPC to earthquake cycle modeling. This dissertation presents a novel approach to applying the latest advancements in HPC

and numerical methods to solving computational challenges in earthquake cycle simulations.

NAME OF AUTHOR:   Alexandre Chen

GRADUATE AND UNDERGRADUATE SCHOOLS ATTENDED:

      University of Oregon, Eugene, OR, USA
      Fudan University, Shanghai, China

DEGREES AWARDED:

      Bachelor of Science, Physics, 2018, Fudan University

AREAS OF SPECIAL INTEREST:

      Itereative Algorithms
      Preconditioner
      Numerical PDEs
      SBP-SAT finite difference methods
      High performance computing

PROFESSIONAL EXPERIENCE:

      Teaching Assistant, Department of Computer Science, 2019S, 2019F, 2020S,
         2020F, 2021W, 2022W, 2023W, 2023F

GRANTS, AWARDS AND HONORS:

      Graduate Teaching/Research Fellowship, University of Oregon

PUBLICATIONS:

Thomas, D. R. K., & Smith, A. B. (2009). System models for the study of procrastination in high school students. *American Journal of Everything, 100*, 7–20.

## ACKNOWLEDGEMENTS

Here is an acknowledgment

To so-and-so. . .

TABLE OF CONTENTS

# LIST OF FIGURES

# LIST OF TABLES

# CHAPTER I

## INTRODUCTION

## 1.1 Chapter One Section One

### 1.1.1 Chapter one section one sub-section one.

#### 1.1.1.1 Chapter one section one sub-section one sub-sub-section one.

# CHAPTER II

# METHODOLOGY

## 2.1 Chapter Two Section One

# CHAPTER III

## RESULTS

## 3.1 Chapter Three Section One

### 3.1.1 Chapter three section one sub-section one.

#### 3.1.1.1 Chapter three section one sub-section one sub-sub-section one.

# CHAPTER IV

## CONCLUSION

## 4.1 Chapter Four Section One

### 4.1.1 Chapter four section one sub-section one.

#### 4.1.1.1 Chapter four section one sub-section one sub-sub-section one.

APPENDIX A

THE FIRST APPENDIX

## A.1 Appendix One Section One

### A.1.1 Chapter four section one sub-section one.

APPENDIX B

THE SECOND APPENDIX

## B.1  Appendix Two Section One

**B.1.1  Chapter two section one sub-section one.**  This is a sample citation: Schwartz (2012).

REFERENCES CITED

Schwartz, S. H. (2012). An overview of the Schwartz theory of basic values. *Online Readings in Psychology and Culture*, *2*(1), 1–20.