

Harsha Lokavarapu

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Education

University of California, Davis	MS	Computational Geodynamics	2017–
		Thesis Adviser: Professor Louise H. Kellogg	
University of California, Davis	BS	Computer Science	2015
	Minor	Applied Mathematics	2015

Appointments

2014-2017	Computational Infrastructure for Geodynamics (CIG)	Junior Assistant Programmer
2012	Certify Data Systems (Humana)	Internship as Code Developer

Programming Languages, Computing Skills, and Work Experience

Open Source Code Development

- Advanced Solver for Problems in Earth's ConvecTion ([ASPECT](#)) written in C++. I am one of the active contributors of this project.
- State of-the-art model of the Earth's Geodynamo, [Calypso](#) written in FORTRAN 90. I am the 3/4 most active contributor.
- Generalized reservoir modeling library (MS Thesis Project: [Resecore](#)) written in Python

Parallel Processing and High Performance Computing

Tools

- CMake, CTest - Build tool and Unit testing - (Git PR: [1](#), [2](#))
- CUDA - (Git: [PR](#))(SHT = Spherical Harmonic Transform)
- Distributed memory parallelism - MPI for C++ and FORTRAN
- Shared memory parallelism - openMP
- SLURM HPC scheduler
- Profilers: gdb and cuda-gdb

Machines

- National Science Foundation (NSF) Texas Advanced Computing Center
 - [Stampede](#) and [Stampede 2](#)
 - [Maverick](#)
- UCD Math and Physical Sciences (MPS) HPC Cluster

- [Ymir](#) - 38 Dual socket, quad core (Intel E5620 2.4 GHz CPUs) with 24 GB RAM.
- [Peloton](#) - 55 nodes with 64GB ram, 16 cores/32 threads (Intel Xeon E5-2630v3 Processors).

Computations

- [ASPECT](#)
 - Design and implementation of parallel particle generation algorithms. (Git: [PR](#))
 - Design and implementation of parallel particle interpolation algorithms including harmonic averaging and bilinear least squares. (Git PR: [Harmonic Average](#), [Bilinear least squares](#))
 - Design 2-D analytical solution to Stokes equations in order to benchmark the accuracy of particle algorithms in ASPECT. (Git PR: [1](#), [2](#))
 - Refactor existing benchmarks using C++ inheritance principles to reduce repetitive code with the help of Harry R. Levinson and others who added some commits on Jan 3, 2017 (Harry Levinson was a sophomore summer student that I worked with) (Git PR: [SolCx](#), [SolKz](#), [Compositional Fields](#))
 - Implementation of Schmeling subducting slab benchmark from Schmeling et al., Physics of the Earth and Planetary Interiors 171 (2008) 198–223
 - Execute strong and weak scaling tests for original draft of publication [3] (see below), which was not included in the final publication
 - ASPECT contributions Git [timeline](#)
- [Calypso](#)
 - Optimization of Legendre Polynomial transform in a spherical geometry using CUDA for Nvidia GPUs
 - Design different implementations using CUDA Fast Fourier Transform (cuFFT) library, CUDA Basic Linear Algebra Subprograms (cuBLAS), and (CUB) library. (Git code: [PR](#), [Dev branch](#))
 - Profile and test optimizations using strong and weak scaling tests
 - Published results as poster [4], [6] (see below) at the 2014, 2015 Annual Fall AGU Meetings
 - Calypso contributions Git [timeline](#)

Data Analysis and Visualization

- Jupyter Notebooks and Python - (Git: [Deep Carbon](#), [Convergence Analysis](#), and [more](#))
- R - (Git: [Code](#))
- Gnuplot - (Git: [Code](#))
- Bash scripting - running numerous jobs, job monitoring, and data collection (Git: [Code](#))
- Paraview (Git: [Code](#))
- Visit

Machine Learning

- Tensorflow Iris Classification Tutorial
- ASL MNIST image recognition
- Tensorboard - Analyzing training process

Outside Interests

- Virtual Reality - (Git: [VR-Experiments](#) using A-Frame library) - JavaScript
- 3-D Design/Printing - Tinkercad

Publications

Refereed Journal Publications

Submitted

- [1] L. H. Kellogg, D. L. Turcotte, M. Weisfeiler, H. Lokavarapu*, S. Mukhopadhyay, (2018) “Implications of a Reservoir Model for the Evolution of Deep Carbon”, *Earth and Planetary Science Letters*, Ms. Ref. No.: EPSL-D-17-01055

Accepted

- [2] R. Gassmoeller, H. Lokavarapu*, E. Heien, E. G. Puckett, and W. Bangerth, (2018) “Flexible and scalable particle-in-cell methods with adaptive mesh refinement for geodynamic computations”, *Geochemistry, Geophysics, Geosystems* manuscript 2018GC007508R [View Accepted Manuscript](#)

Appeared

- [3] E. G. Puckett, D. L. Turcotte, L. H. Kellogg, Y. He[†], J. M. Robey*, and H. Lokavarapu[@] (2018) “New numerical approaches for modeling thermochemical convection in a compositionally stratified fluid”, Special issue of . *Physics of the Earth and Planetary Interiors* associated with the 15th Studies of the Earth’s Deep Interior (SEDI) Symposium (*Phys. Earth. Planet. In.*) **276**:10–35, 10.1016/j.pepi.2017.10.004 [View Article](#)

Poster Presentations

- [1] L. H. Kellogg, H. Lokavarapu*, D. L. Turcotte, and S. Mukhopadhyay (2017) “A reservoir model study of the flux of carbon from the atmosphere, to the continental crust, to the mantle”, *Annual Geophysical Union Fall Meeting 2017* [View Abstract](#)
- [2] J. Jiang, A. P. Kaloti, H. R. Levinson, N. Nguyen, E. G. Puckett, and H. Lokavarapu[@] (2016) “Benchmark Results Of Active Tracer Particles In The Open Souce Code ASPECT For Modelling Convection In The Earth’s Mantle”, *Annual Geophysical Union Fall Meeting 2016* [View Abstract](#)
- [3] E. G. Puckett, D. L. Turcotte, L. H. Kellogg, H. Lokavarapu[@], Y. He[†], and J. M. Robey* (2016) “New Numerical Approaches To thermal Convection In A Compositionally Stratified Fluid”, *Annual Geophysical Union Fall Meeting 2016* [View Abstract](#)
- [4] H. Lokavarapu[@], and H. Matsui (2015) “Optimization of Parallel Legendre Transform using Graphics Processing Unit (GPU) for a Geodynamo Code”, *Annual Geophysical Union Fall Meeting 2015* [View Abstract](#)
- [5] J. A. Russo, E. H. Studley, H. Lokavarapu[@], I. Cherkashin, and E. G. Puckett (2014) “A New Monotonicity-Preserving Numerical Method for Approximating Solutions to the Rayleigh-Benard Equations”, *Annual Geophysical Union Fall Meeting 2014* [View Abstract](#)
- [6] H. Lokavarapu[@], H. Matsui, and E. M. Heien (2014) “Parallelization of the Legendre Transform for a Geodynamics Code”, *Annual Geophysical Union Fall Meeting 2014* [View Abstract](#)

[@]Undergraduate Student

*Graduate Student

[†]Postdoctoral Scholar