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Alper Altuntas

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EDUCATION

North Carolina State University **Raleigh, NC**
Ph.D. in Civil Engineering – Formal Program: Computing & Systems *Dec. 2016*

North Carolina State University **Raleigh, NC**
M.S. in Civil Engineering *Dec. 2012*

Istanbul Technical University **Istanbul, Turkey**
B.S. in Civil Engineering *June 2010*

EXPERIENCE

National Center for Atmospheric Research **Boulder, CO**
Software Engineer II *May. 2017-Present*

- Participates in the development, maintenance, and evaluation of ocean components of the Community Earth System Model (CESM), a leading climate model.
- Leads the software engineering efforts to incorporate a new ocean model (MOM6) in CESM.
- Serves as the CESM Ocean Modeling Working Group software liaison.
- Develops and publishes novel approaches for formal verification of numerical software.

North Carolina State University **Raleigh, NC**
Research Assistant *May 2011-Dec. 2016*

- Developed and incorporated reanalysis techniques in ADCIRC, a numerical ocean model.
- Designed a parallel, object-oriented software framework for hydrodynamic models.
- Performed ocean and wave model simulations for hindcasting and analysis purposes.
- Conducted profiling and optimization studies for high performance computing applications.

COMPUTATIONAL SKILLS

- **Programming Languages:** Fortran, C++, Python, Julia, Bash, NCL
- **Parallel Computing:** MPI, OpenMP, C++14 multithreading, Dask
- **Numerical Models:** CESM, POP2, MOM6, ADCIRC, SWAN
- **Formal Methods:** SPIN, Alloy, LTSA, KeYmaera X
- **Development Tools:** Intel VTune, Arm Forge
- **Platforms:** Linux (HPC), Mac, Windows

PUBLICATIONS

Journals

- Baugh, John, and **Alper Altuntas**. "Finite Element Simulation of Hurricane Storm Surge: A Case Study in State-Based Modeling." *Science of Computer Programming* 158 (2018): 100-121.
- **Altuntas, Alper**, and John Baugh. "Adaptive subdomain modeling: A multi-analysis technique for ocean circulation models." *Ocean Modelling* 115 (2017): 86-104.
- Baugh, John, **Alper Altuntas**, Tristan Dyer, and Jason Simon. "An exact reanalysis technique for storm surge and tides in a geographic region of interest." *Coastal Engineering* 97 (2015): 60-77.

Conference Proceedings

- Dyer, Tristan, **Alper Altuntas**, and John Baugh. "Bounded Verification of Sparse Matrix Computations." In Proceedings of 2019 Third International Workshop on Software Correctness for HPC Applications (Correctness), 2019. (accepted)
- **Altuntas, Alper**, and John Baugh. "Hybrid Theorem Proving as a Lightweight Method for Verifying Numerical Software." In Proceedings of 2018 IEEE/ACM 2nd International Workshop on Software Correctness for HPC Applications (Correctness), pp. 1-8. IEEE, 2018.
- **Altuntas, Alper**, and John Baugh. "Verifying Concurrency in an Adaptive Ocean Circulation Model." In Proceedings of the First International Workshop on Software Correctness for HPC Applications, pp. 1-7. ACM, 2017
- Baugh, John, and **Alper Altuntas**. "Modeling a Discrete Wet-Dry Algorithm for Hurricane Storm Surge in Alloy."In International Conference on Abstract State Machines, Alloy, B, TLA, VDM, and Z, pp. 256-261. Springer International Publishing, 2016.

Other Talks

- **Altuntas, Alper**. "Formal Methods and Modeling HPC Software." NCAR Climate & Global Dynamics (CGD) Research Reports. Boulder, CO. November 29, 2018.
- **Altuntas, Alper**. Invited talk: Panel on "Facilitating the Adoption of Correctness Tools in HPC Applications." 2nd International Workshop on Software Correctness for HPC Applications (Correctness). Dallas, TX. November 12, 2018.
- **Altuntas, Alper**. "Adaptive Subdomain Modeling in ADCIRC++." 20th Annual ADCIRC Model Workshop, Vicksburg, MS. May 6, 2016.
- **Altuntas, Alper**. "Developments in Subdomain Modeling." 19th Annual ADCIRC Model Workshop, College Park, MD. March 31, 2015.

Poster

- **Altuntas, Alper** and John Baugh. "An Adaptive Reanalysis Technique and a Modern Software Architecture for Ocean Circulation Models." Computing & Systems (C&S) Research Symposium, North Carolina State University, Raleigh NC. April 22, 2016.

PEER REVIEWING

- Reviewer - Journal of Advances in Modeling Earth Systems (JAMES)
- Program Committee Member - Third International Workshop on Software Correctness for HPC Applications (Correctness 2019)

PROJECTS

Participated in the preparation of the following project proposals.

- "Development and Application of a Data-Driven Methodology for Validation of Risk Informed Safety Margin Characterization Models," US Department of Energy, Oct 1, 2016 to Sep 30, 2019, $3,520,000, PI: Dinh, Co-PIs: Gupta, Bolotnov, Baugh, Avramova (approved).
- "Tools and Techniques for Engineering Users of Storm Surge Models," US Army Corps of Engineers, Aug 16, 2016 to Aug 15, 2019, $274,816, PI: Baugh (submitted).
- "Downscaling Storm Surge Models for Engineering Applications" (extension), Department of Homeland Security, July 1, 2014 to June 30, 2015, $10,000, PI: Baugh (completed).
- "Prediction of Damage Caused by Typhoon and Wave Surge in the Coastal Area of Shizuoka Prefecture by Numerical Simulation," University Network of Shizuoka Prefecture, Jul 1, 2013 to Feb 1, 2014, ¥1,990,000, PI: Miyazaki, Co-PIs: Yuze, Baugh (completed).