Ronald M. Caplan

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Summary and Experience

Dr. Ron Caplan is a computational scientist at Predictive Science Inc. (PSI) with over ten years of experience in applying computational methods in applied mathematics and physics. His main research interests are in developing and optimizing numerical methods for simulating physics-based models and their implementations in parallel high-performance-computing environments including GPU accelerators. His research currently focuses on the continued development and optimization of PSI's thermodynamic magnetohydrodynamic code (MAS) used to study the solar corona and heliosphere, as well as providing computational solutions for additional projects including data analysis of solar images. He is an active member of the OpenACC Users Group, American Geophysical Union (AGU), American Physical Society (APS), Institute of Electrical and Electronics Engineers (IEEE), Association for Computing Machinery (ACM), and Society of Industrial and Applied Mathematics (SIAM).

Education

- **Ph.D.** in Computational Science at Claremont Graduate University (2012)
- **M.S.** in Computational Science at San Diego State University (2008)
- **B.A.** in Computer Science, minor in Astronomy and Planetary Science at the University of California, Santa Barbara (2003)

Skill Sets

Computational Science
- Finite difference methods for ordinary and partial differential equations
- HPC parallel programming utilizing OpenACC, CUDA, MPI, and OpenMP.
- Advanced computational linear algebra, including preconditioned sparse iterative solvers.
- FORTRAN, C, MATLAB, PYTHON, R, MAPLE, BASH, C++, IDL, JAVA

Mathematics
- Nonlinear dynamics and chaos (discrete and continuous)
- Nonlinear wave phenomenon
- Ordinary and partial differential equations
- Mathematical modeling

Physics and Astronomy
- Solar magnetohydrodynamics
- Bose-Einstein condensates
- Modern optics

Communication and Analysis
- Image processing
- Scientific database techniques (SQL)
- Scientific visualization (e.g. Visit)
- Writing and presentations for science and technology.

Selected Publications

- From MPI to MPI+OpenACC: Conversion of a legacy FORTRAN PCG solver for the spherical Laplace equation. R. M. Caplan, Z. Mikic, and J. A. Linker. Presented at 2017 NVIDIA GTC. arXiv:1709.01126 (2017)
- The Open Flux Problem. J.A. Linker, R.M. Caplan, C. Downs, P. Riley, Z. Mikic, R. Lionello, C. J. Henney, C. N. Arge, Y. Liu, M. L. Derosa, A. Yeates, and M. J. Owens. The Astrophysical Journal. 848,1 (2017) 70.
- Advancing parabolic operators in thermodynamic MHD models: Explicit super time-stepping versus implicit schemes with Krylov solvers. R. M. Caplan, Z. Mikic, J. A. Linker, and R. Lionello. Journal of Physics: Conference Series. ASTRONUM 2016. 837,1 (2017) 012016
- Synchronic coronal hole mapping using multi-instrument EUV images: Data preparation and detection method. R.M. Caplan, C. Downs, and J.A. Linker. *The Astrophysical Journal*. **823**,1 (2016) 53
- An Empirically Driven Time-Dependent Model of the Solar Wind. J. A. Linker, R.M. Caplan, C. Downs, R. Lionello, P. Riley, Z. Mikic, C.J. Henney, C.N. Arge, T. Kim, and N. Pogorelov. Journal of Physics: Conference Series. ASTRONUM 2015. 719,1 (2016) 012012
- Scattering and Leapfrogging of Vortex Rings in a Superfluid. R.M. Caplan, J. D. Talley, R. Carretero-González, P.G. Kevrekidis. *Physics of Fluids.* **26** (2014) 097101
- NLSEmagic: Nonlinear Schrödinger Equation Multidimensional Matlab-based GPU-accelerated Integrators using Compact High-order Schemes. R.M. Caplan. *Computer Physics Communications*. **184**,4 (2013) 1250-1271
- A Modulus-Squared Dirichlet Boundary Condition for Time-Dependent Complex Partial Differential Equations and its Application to the Nonlinear Schrödinger Equation. R.M. Caplan, and R. Carretero-González. *SIAM Journal on Scientific Computing*. **36**,1 (2014) A1-A19