

Dr. Toby Wood

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Current Position

August 2010 Postdoctoral Researcher in Applied Mathematics and Statistics,
– present Baskin School of Engineering, UCSC

Research Interests

Current research The dynamics of the solar ‘tachocline’ — transport of angular momentum and magnetic flux between the Sun’s convective envelope and radiative interior.

Turbulent pumping of magnetic flux by anisotropic compressible convection.

Chemical transport in stellar interiors by meridional flows and double-diffusive convection.

Other interests Anomalous, long-range transport of angular momentum by turbulence and wave breaking.

Instabilities in magnetized shear flows.

Stellar structure and evolution.

Publications

Journal articles “Transport by meridional circulations in solar-type stars”,
T. S. Wood & N. H. Brummell. *The Astrophysical Journal*, 2012, vol. 755, 99

“A new model for mixing by double-diffusive convection (semi-convection): I. The conditions for layer formation”, G. M. Mirouh, P. Garaud, S. Stellmach, A. L. Traxler & T. S. Wood. *The Astrophysical Journal*, 2012, vol. 750, 61

“The Sun’s Meridional Circulation and Interior Magnetic Field”, T. S. Wood, J. O. McCaslin & P. Garaud. *The Astrophysical Journal*, 2011, vol. 738, 47

“Polar confinement of the Sun’s interior magnetic field by laminar magnetostrophic flow”, T. S. Wood & M. E. McIntyre. *Journal of Fluid Mechanics*, 2011, vol. 677, pp 445–482

PhD thesis “The solar tachocline: A self-consistent model of magnetic confinement”, 2010, University of Cambridge

Conference proceedings “Magnetic confinement in the solar interior”, T. S. Wood
in *Astrophysical Dynamics – from Stars to Galaxies*,
proceedings IAU Symposium No. 271, 2010

“Crumpling of a thin ice sheet due to incident flow”, T. S. Wood,
in *Perspectives and Challenges in GFD*,
Proceedings of the Woods Hole GFD program, 2008

“Confinement of the Sun’s interior magnetic field: some exact boundary-layer solutions”, T. S. Wood & M. E. McIntyre
in *Unsolved Problems in Stellar Physics*, AIP Conference Series, vol. 948, 2007

Career and Education

	University of California, Santa Cruz
August 2010 – present	Postdoctoral researcher in Department of Applied Mathematics and Statistics, Baskin School of Engineering
	Queens’ College, University of Cambridge
2006 – 2010	PhD student in Solar Physics at DAMTP
2007	Smith–Knight & Rayleigh–Knight essay prize – Class I
2005 – 2006	Master of Mathematics <ul style="list-style-type: none">• <i>Part III (With Distinction)</i>
2002 – 2005	BA (Hons) in Mathematics <ul style="list-style-type: none">• <i>Part II (First Class)</i> — Awarded College Exhibition• <i>Part IB (First Class)</i> — Awarded College Exhibition• <i>Part IA (First Class)</i> — Awarded Foundation Scholarship

Seminars and Presentations

2012	“Layered Semiconvection in Stars and Planets” at <i>Double Diffusive Systems</i> , UCSC
2012	“The Solar Tachocline” at the Woods Hole GFD program, Massachusetts
2012	“The Dynamics of the Solar Interior” AMS department seminar at UCSC, California
2012	“Semiconvection in Stars and Planets” at LANL workshop <i>Stellar Hydrodynamics</i> in Santa Fe, New Mexico
2012	“The Solar Interior Rotation and the Tachocline Problem” astronomy colloquium at UCSC, California
2012	“Angular Momentum Transport and Magnetic Confinement in the Solar Tachocline” at CMTFO winter school <i>Principles of Magnetic and Flow Self-Organization</i> in San Diego, California
2011	“Magnetic Confinement in the Solar Tachocline” at LWS/SDO-3/SOHO-26/GONG workshop <i>Solar Dynamics and Magnetism</i> in Stanford, California
2011	“Rotationally Induced Mixing in Solar-Type Stars” at KITP program <i>Asteroseismology in the Space Age</i> in Santa Barbara, California
2011	“Magnetic Confinement and the Solar Tachocline” at <i>Waves and Physics</i> meeting in Gargano, Italy
2011	“Magnetic Confinement: Meridional Circulation vs. Magnetic Flux Pumping” at PCTS workshop <i>Differential Rotation in Stars</i> , Princeton, New Jersey
2011	“The Rotation of the Solar Interior” invited seminar at UCLA, California
2011	“Transport Across the Solar Tachocline” at Consortium for Heliophysics symposium No. 4 <i>Turbulent Flows in the Sun, Heliosphere, and Geospace</i> , Berkeley, California
2010	“Lithium Destruction and Magnetic Confinement in the Solar Interior” at ISIMA conference <i>Transport Processes in Astrophysics</i> , UCSC, California
2009	“Tachocline Confinement of the Sun’s Internal Magnetic Field” at AGU fall meeting, San Francisco, California
2009	“Magnetic Confinement in the Solar Tachocline” invited seminar at University of Leeds, England
2009	“The Sun’s Interior Magnetic Field” at <i>Waves and Instabilities</i> workshop in Porquerolles, France

- 2009 “The Solar Interior: Rotation, Stratification and Magnetic Fields” invited seminar at ENS Paris, France
- 2008 “Problems with Surface Tension” at the Woods Hole GFD program, Massachusetts
- 2008 “Tachocline Confinement of The Sun’s Internal Magnetic Field” at UK MHD, University of Salford, England
- 2008 “The Sun’s Interior Magnetic Field” at BAMC, University of Manchester, England
- 2008 “Spindown of the Solar Interior”, part of the Directions in Research series at University of Cambridge, England
- 2007 “Magnetic Confinement in the Solar Interior” at UK MHD, Newcastle, England 2007

Teaching

- Tutoring of 2nd year mathematics undergraduates in fluid dynamics, electrodynamics and quantum mechanics
- Private tutoring of 1st year mathematics in vector calculus
- Mentoring of graduate students at ISIMA summer school, UCSC 2010
- Mentoring of graduate student Luis Acevedo-Arreguin at UCSC

Synergistic Activities

- Joint organizer of *Double Diffusive Systems* meeting at UCSC, 2012
- President of the Cambridge University Graduate Mathematics Society, 2007/2008
- Co-Investigator on funding proposals to NSF and NASA
- Referee for The Astrophysical Journal

Computing Skills

- Programming C, Perl, Visual Basic, Shell scripting
- Visualisation Vapor, Matlab, IDL

November 8, 2012