Dr. Damien Przybylski

Curriculum Vitae

Max-Planck-Institut für Sonnensystemforschung
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Personal Information

Citizenship Australian,Polish
Date of birth 12/05/1988

Research Interests

Computational magnetohydrodynamics - Waves and mode conversion processes - Spectral synthesis and radiative transfer - Chromospheric dynamics and heating - Helioseismology.

Research Experience

My research interests and experience are in computational magnetohydrodynamics and radiative transport in application to solar physics. I am interested in numerical code development and utilisation for high-resolution realistic simulations of wave and magnetic phenomena in solar and space physics. I have experience with simulations of linear, non-linear and non-ideal magnetohydrodynamics (MHD) in the solar atmosphere and interior. In my PhD I performed forward modelling of magnetic structures and synthesising the output radiation allowing for comparison with observational data. I have experience with the modelling of solar magnetic fields, spectral line synthesis and spectropolarimetric studies of wave phenomena. I also study the effects of MHD mode conversion to understand the implications of solar magnetic fields for helioseismic measurements through linear MHD simulations. In my Postdoctoral position at the MPS I am working on extending the MURaM code into the chromosphere. This includes the implementation of non-local thermodynamic equilibrium radiation transport, time dependant atomic populations and non-ideal MHD processes.

Education

2013–2017 **Doctor of Philosophy**, *Oscillatory and radiative properties of solar magnetic flux concentrations,* Dr Sergiy Shelyag and Prof. Paul Cally, Monash University, 9 Rainforest Walk, Clayton Campus, Victoria 3800, Australia.

2011–2012 **Bachelor of Science (Honours 1st Class)**, *Application of the Constrained Interpolation Polynomial - Method of Characteristics to the simulation of ultra low frequency waves in the magnetosphere* A/Prof. Colin Waters and Dr Murray Sciffer, University of Newcastle, University Drive, Callaghan, NSW 2308, Australia.

2007–2011 **Bachelor of Science/Bachelor of Mathematics**, University of Newcastle, University Drive, Callaghan, NSW 2308, Australia.

Employment History

03.2017-current **Postdoctoral Position on the *SOLMAG* ERC Advanced Grant**, *Max-Planck-Institut für Sonnensystemforschung*, Justus-von-Liebig-Weg 3, 37077 Göttingen, Germany.

07.2012-11.2012 **Research Assistant**, *University of Newcastle*, University Drive, Callaghan, NSW 2308, Australia.

Awards and Grants

2013 – 2017 **Australian Postgraduate Award Scholarship**.

2017 **Researcher**, *Numerical modelling of MHD effects and sunspot interior structure and dynamics*, NCMAS, 180kSU on the NCI Raijin and 0.9 MSU on iVEC Magnus clusters.

2016 **Researcher**, *Radiative magneto-hydrodynamic modelling of interconnected solar interior and atmosphere*, NCMAS, 100kSU on the NCI Raijin and 1.8 MSU on iVEC Magnus clusters.

2015 – Q 3 **Solarnet Mobility of Young Researchers Travel Grant**, *Flights and subsistence costs to spend 6 weeks at the IAC in Tenerife working with Elena Khomenko on "Simulations of Torsional Oscillations in a Flux Tube"*.

2015 – Q 3 **Astronomical Society of Australia PHD Travel Grant**, *$1000 AUD for travel to the Hinode and Solarnet III conferences*.

2015 **Researcher**, *Radiative magneto-hydrodynamic modelling of interconnected solar interior and atmosphere*, NCMAS, 500kSU on the NCI Raijin and 1.8 MSU on iVEC Magnus clusters.

2015 – Q 1&2 **Chief Investigator**, *Investigating the Acoustic and Radiative Properties of Sunspots*, Astronomy Supercomputer Time Allocation Committee Supercomputing Grant, 500kSU on the Green II cluster.

2014 – Q 3&4 **Chief Investigator**, *Investigating the Acoustic and Radiative Properties of Sunspots*, Astronomy Supercomputer Time Allocation Committee Supercomputing Grant, 500kSU on the Green II cluster.

Teaching Experience

2011-2012 **Lab Demonstrator**, *Advanced Physics I & II, Classical Mechanics*, School of Mathematical and Physical Sciences, The University of Newcastle.

2012 **Teaching Assistant**, *Mathematics I*, School of Mathematical and Physical Sciences, The University of Newcastle.

2014-2017 **Teaching Assistant**, *Nature & Beauty of Mathematics, Multi-variable Calculus, Mathematics for Engineering, Advanced Engineering Mathematics*, School of Mathematical Sciences, Monash University.

Numerical Experience

- Proficient in Fortran, IDL, and Python
- Experience with Open MPI and C/C++
- Experience with HPC on a number of clusters, including NCI Raijin, Pawsey IVEC, and MPG Hydra supercomputers.

Referees

Professor Paul Cally
Professor of Solar Physics
School of Mathematical Sciences
Monash University
Clayton, Victoria, Australia
phone: *+61 3 9905 4471*
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Dr Sergiy Shelyag
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Department of Mathematics, Physics and Electrical Engineering
Northumbria University
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Dr Elena Khomenko
Senior Researcher
Instituto de Astrofísica de Canarias
Santa Cruz de Tenerife, Spain
phone: *+34 922605319*
e-mail: *khomenko@iac.es*

Conference Talks & Posters

2017 **UK National Astronomy Meeting**, *Talk*, Dissipation of Alfvén wave through ion-neutral interactions, University of Hull, Hull, UK.

2016 **Astronomical Society of Australia Annual Meeting**, *Poster*, Simulations of wave heating in the partially ionized chromosphere, Monash University, Melbourne, Australia.

2016 **Australian National Institute for Theoretical Astrophysics Annual Meeting**, *Talk*, Simulations of wave heating in the partially ionized chromosphere, Monash University, Melbourne, Australia.

2015 **Hinode 9**, *Poster*, Signatures of mode conversion in a sunspot simulation, Queens University, Belfast, Ireland.

2015 **Solarnet III**, *Talk*, Signatures of mode conversion in a sunspot simulation, Kiepenheuer Institute for Solar Physics, Freiburg, Germany.

2014 **European Solar Physics Meeting**, *Poster*, Oscillatory and Radiative Properties of a Sunspot Model, Trinity College, Dublin,Ireland.

2014 **HELAS-SOHO-SPACEINN**, *Poster*, Oscillatory and Radiative Properties of a Sunspot Model, Max-Plank-Institut für Sonnensystemforschung, Göttingen,Germany.

2012 **Australian Space Sciences Conference**, *Talk*, Modelling plasma wave mode coupling in the magnetosphere, RMIT, Melbourne,Australia.

Meetings/Workshops Attended

2013 **Harley Wood Winter School**, *Held at Philip Island*, Victoria, Australia.

2016 **Australian National Institute for Theoretical Astrophysics**, *Local Organising Committee - Held at Monash University*, Victoria, Australia.

Publications

2016 Shelyag, S., Khomenko, E., De Vicente, A., & **Przybylski, D.**, *Heating of the partially ionized solar chromosphere by waves in magnetic structures*, ApJl, 819, L11.

2016 Rijs, C., Rajaguru, S. P., **Przybylski, D.**, Moradi, H., Cally, P. S., Shelyag, S., *3D simulations of realistic power halos in magneto-hydrostatic sunspot atmospheres: linking theory and observation*, ApJ, 817, 45.

2015 Moradi, H., Cally, P. S., **Przybylski, D.**, & Shelyag, S., *Directional time-distance probing of model sunspot atmospheres*, MNRAS, 449, 3074.

2015 **Przybylski, D.**, Shelyag, S., & Cally, P. S., *Spectropolarimetrically Accurate Magnetohydrostatic Sunspot Model for Forward Modeling in Helioseismology*, ApJ, 807, 20.

2015 Rijs, C., Moradi, H., **Przybylski, D.**, & Cally, P. S., *MHD Wave Refraction and the Acoustic Halo Effect around Solar Active Regions: A 3D Study*, ApJ, 801, 27.

2014 Shelyag, S., & **Przybylski, D.**, *Centre-to-limb spectro-polarimetric diagnostics of simulated solar photospheric magneto-convection: Signatures of photospheric Alfvén waves*, PASJ, 66, S9.