Fachreddin Tabataba-Vakili

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Nationality	German

Research Interests

Characterisation of giant planet atmospheres.
Modelling of planetary atmospheres, with focus on terrestrial- and giant plant atmospheres.
Habitability and detectability of biosignature gases in exoplanet atmospheres.
Geophysical fluid dynamics. Atmospheric chemistry.

Education

2013-2017 **DPhil Physics**
Atmospheric, Oceanic and Planetary Physics, Trinity College, University of Oxford
Thesis: "Dynamical circulation regimes of planetary (and exo-planetary) atmospheres"

2011-2013 **M.Sc. Physics** (1.6, on a scale of 1 to 5, where 1 is best)
Technische Universität Berlin
Thesis: "Modelling the infuence of cosmic rays on the atmospheric chemistry of Earth-like exoplanets"

2007-2011 **B.Sc. Physics** (2.0, same scale as above)
Technische Universität Berlin
Thesis: "Effects of cosmic rays on trace gases in Earth-like atmospheres"

2007 **Abitur** (German higher education entrance qualification)
John F. Kennedy School, Berlin

2006 **High School Diploma**
John F. Kennedy School, Berlin

Employment and Other Research Experience

since 2017 **NASA Jet Propulsion Laboratory, California Institute of Technology**
Postdoctoral Research Scholar
Characterization of circumpolar cyclones in Jupiter's polar region including velocity measurements, analysis of velocity spectra and simple models explaining their stability.
Coordination of Earth-based, supporting observations for the Juno spacecraft.

2013-2017 **Atmospheric, Oceanic and Planetary Physics, Dept. of Physics, University of Oxford**
DPhil Student
Parameter study of diurnal effects on slowly-rotating planets, spectral fluxes of kinetic and potential energy using simple general circulation model (PUMA).
Lorenz energy budget of Mars from reanalysis of observation data to compare w/ atmospheric energetics of Earth and parameter study runs.

Employment and Other Research Experience (cont.)

2012-2013 **Institute of Planetary Research, German Aerospace Center (DLR) and Department for Astronomy and Astrophysics, TU Berlin**
1-year M.Sc. thesis project
Radiative and photochemical effects of stellar and galactic cosmic ray fluxes under M dwarf conditions and their effect on planetary transmission and emission spectra using a 1-dimensional radiative-convective model with coupled photochemistry.

2011-2013 **Leibniz-Institute for Astrophysics Potsdam (AIP)**
Student Research Assistant
Development of parallelised C routines to improve data reduction time, a stellar flatfielding GUI, and other improvements for p3d, an IDL-based integral field spectrometry data reduction tool. Development of Phython script to initiate p3d on multiple processors.

2010 **Department for Astronomy and Astrophysics, TU Berlin**
3-month B.Sc. thesis project
Calculation of dissociation rates of atmospheric trace gases due to secondary cosmic ray flux.

Computing Skills

Programming	Bash, Python, Fortran, C, Matlab, IDL, Mathematica
Scientific Models/Tools	- PUMA simple global circulation model with dry, semi-gray radiation -MITgcm global circulation model used for Jupiter simulations - Panoply visualisation software for atmospheric data - 1D radiative Earth-like atmosphere model with coupled photochemistry - p3d integral field spectrometer data reduction tool
General purpose	LaTeX, Beamer, Linux, Windows, Word, Excel, Powerpoint, Outlook, Photoshop

Teaching Experience

2015-2016 **College Invigilator, Trinity College, University of Oxford**
Supervision of students during exam.

2014-2016 **Demonstrator, Physics Teaching Laboratories, University of Oxford**
Supervision and marking for a programming course in Matlab for physics students. (3-6 hours per week during term)

Prizes and Memberships

since 2014	Member of the European Geosciences Union (EGU)
2013-2016	festo Bildungsfond scholarship award
2013-2016	STFC studentship award
since 2011	Member of Mensa
since 2008	Member of the German Physical Society (DPG)
2006	President's Educational Award for Outstanding Academic Achievement

Languages

German (native), English (fluent), French (basic knowledge)

Fachreddin Tabataba-Vakili: Publications

Journal Articles

- **F. Tabataba-Vakili**, T. Momary, G.S. Orton, et al."Long-term location tracking of polar cyclones in Jupiter's atmosphere" in prep.
- **F. Tabataba-Vakili**, P.L. Read. "Effects of diurnal and seasonal forcing in slow-rotating terrestrial atmospheres" in prep.
- **F. Tabataba-Vakili**, Y. Wang, P.L. Read, R.M.B. Young. "Comparative terrestrial atmospheric circulation regimes in simplified global circulation models: III. Orbital obliquity and greenhouse effect." in prep.
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- A. Sanchez-Lavega, R. Hueso, G. Eichstädt, G. Orton, J. Rogers, C.J. Hansen, T. Momary, **F. Tabataba-Vakili**, S. Bolton. "The rich dynamics of Jupiter's Great Red Spot from JunoCam images." *Nature Astronomy.* submitted.
- D. Grassi, A. Adriani, M.L. Moriconi, A. Mura, **F. Tabataba-Vakili**, A. Ingersoll, G. Orton, C. Hansen, F. Altieri, G. Filacchione, G. Sindoni, B.M. Dinelli, F. Fabiano, S. J Bolton, J.E.P. Connerney, S. Levin, S.K. Atreya, J.I. Lunine, T. Momary, F. Tosi, A. Migliorini, G.Piccioni, R. Noschese, A. Cicchetti, C. Plainaki, A. Olivieri, D. Turrini, S. Stefani, R. Sordini, M. Amoroso. "First estimate of wind fields in the Jupiter polar regions from JIRAM-Juno images." *Journal of Geophysical Research - Planets.* submitted.
- P. L. Read, **F. Tabataba-Vakili**, A. Valeanu, Y.Wang, R.M.B. Young, P. Augier, E. Lindborg"Comparative terrestrial atmospheric circulation regimes in simplified global circulation models: II. energy budgets and spectral transfers." *Quarterly Journal of the Royal Meteorological Society.* submitted.
- Y. Wang, P.L. Read, **F. Tabataba-Vakili**, R.M.B. Young. "Comparative terrestrial atmospheric circulation regimes in simplified global circulation models: I. From cyclostrophic superrotation to geostrophic turbulence." *Quarterly Journal of the Royal Meteorological Society.* submitted.
- S. Brown, M. Janssen, V. Adumitroaie, S. Atreya, S. Bolton, S Gulkis, A. Ingersoll, S. Levin, C. Li, L. Li, J. Lunine, S. Misra, G. Orton, P. Steffes, and **F. Tabataba-Vakili**."The Global Distribution of Lightning and Convection on Jupiter Revealed by the Juno Microwave Radiometer " *Nature.* in press.
- A.A. Simon, **F. Tabataba-Vakili**, R. Costentino, R.F. Beebe, M.H. Wong, G.S. Orton. "Historical and Contemporary Trends in the Size, Drift, and Color of Jupiter's Great Red Spot" *Astronomical Journal* 155-4 (2018): 151. doi: 10.3847/1538-3881/aaae01
- A. Adriani, A. Mura, G. Orton, C. Hansen, F. Altieri, M.L. Moriconi, J. Rogers, G. Eichstdt, T. Momary, A.P. Ingersoll, G. Filacchione, G. Sindoni, **F. Tabataba-Vakili**, B.M. Dinelli, F. Fabiano, S.J. Bolton, J.E.P Connerney, S.K. Atreya, J.I. Lunine, F. Tosi, A. Migliorini, D. Grassi, G. Piccioni, R. Noschese, A. Cicchetti, C. Plainaki, A. Olivieri, D. Turrini, S. Stefani, R. Sordini and M. Amoroso "Clusters of cyclones encircling Jupiter's poles" *Nature* 555, no. 7695 (2018): 216. doi: 10.1038/nature25491
- J.-M. Grießmeier, **F. Tabataba-Vakili**, A. Stadelmann, J. L. Grenfell, and D. Atri. "Galactic cosmic rays on extrasolar Earth-like planets-II. Atmospheric implications." *Astronomy & Astrophysics* 587 (2016): A159. doi: 10.1051/0004-6361/201425452

- **F. Tabataba-Vakili**, J. L. Grenfell, J-M. Grießmeier, and H. Rauer. "Atmospheric effects of stellar cosmic rays on Earth-like exoplanets orbiting M-dwarfs." *Astronomy & Astrophysics* 585 (2016): A96. doi: 10.1051/0004-6361/201425602

- J.-M. Grießmeier, **F. Tabataba-Vakili**, A. Stadelmann, J. L. Grenfell, and D. Atri. "Galactic cosmic rays on extrasolar Earth-like planets-I. Cosmic ray flux." *Astronomy & Astrophysics* 581 (2015): A44. doi: 10.1051/0004-6361/201425451

- **F. Tabataba-Vakili**, P. L. Read, S. R. Lewis, L. Montabone, T. Ruan, Y. Wang, A. Valeanu, and R.M.B. Young. "A Lorenz/Boer energy budget for the atmosphere of Mars from a" re-analysis" of spacecraft observations." *Geophysical Research Letters* 42 (2015): 8320-8327. doi: 10.1002/2015GL065659.

- C. Sandin , P. Weilbacher, **F. Tabataba-Vakili**, S. Kamann, and O. Streicher. "Automated and generalized integral-field spectroscopy data reduction using p3d." *SPIE Astronomical Telescopes+ Instrumentation*, pp. 84510F-84510F. International Society for Optics and Photonics, 2012. doi: 10.1117/12.926092

Selected Conference Papers

- **F. Tabataba-Vakili**, G.S. Orton, C. Li, R.M.B. Young, P.L. Read, A.P. Ingersoll, "GCM Studies of Jovian Polar Dynamics." presented at 2017 Fall Meeting, AGU, New Orleans, LA, 11-15 Dec. (poster)

- **F. Tabataba-Vakili**, G. S. Orton, A. Adriani, G. Eichstaedt, D. Grassi, A. P. Ingersoll, C. Li et al. "Dynamical analysis of Jovian polar observations by Juno" (oral), *AAS/Division for Planetary Sciences Meeting*, Provo, Utah. October 2017.

- C. Li, **F. Tabataba-Vakili**, and A. P. Ingersoll. "Shallow water modeling of Jovian polar cyclone and vortice" (oral), *AAS/Division for Planetary Sciences Meeting*, Provo, Utah. October 2017.

- **F. Tabataba-Vakili**, P. L. Read. "Slowly rotating planets with diurnal cycle: A parameter study of the atmospheric dynamics using a simple GCM" (poster), *International Venus Conference 2016*, Oxford, UK. 4-8 April 2016.

- **F. Tabataba-Vakili**, P. L. Read. "Effects of diurnal cycles on planetary circulation regimes of terrestrial atmospheres using simple GCMs" (oral), *Comparative Climates of Terrestrial Planets II*, NASA Ames Research Center, USA. 8-11 September 2015.

- A. Valeanu, P.L. Read, Y. Wang, S.R. Lewis, L. Montabone, and **F. Tabataba-Vakili**. "Mars Energy Spectrum studies from Assimilated MCS data using the UK MGCM" (oral). *EGU General Assembly Conference 2015*, Vienna, Austria. 12-17 April 2015.

- **F. Tabataba-Vakili**, P.L. Read, S.R. Lewis, L. Montabone, T. Ruan, A. Valeanu, Y. Wang, R.M.B. Young. "Seasonal variation of the atmospheric energy budget on Mars" (poster). *European Planetary Science Congress 2014*, Cascais, Portugal. 7-12 September 2014.

- **F. Tabataba-Vakili**, J.L. Grenfell, J-M Grießmeier, and H. Rauer (oral). "Modelling the Infuence of Cosmic Rays on the Atmospheric Chemistry of Earth-like Exoplanets". *527. Wilhelm und Else Heraeus-Seminar: Plasma and Radiation Environment in Astrospheres and Implications for the Habitability of Extrasolar Planets*, Bad Honnef, Germany. 10-15 March 2013.