

Curriculum Vitae: Caitlin Ann Griffith

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Education

1991 State University of New York at Stony Brook, Ph. D. Physics
1986 State University of New York at Stony Brook, M. A. Physics
1982-84 Traveled throughout Asia and Africa
1982 Johns Hopkins University, B.A. Mathematics

Professional Experience

2009-now Professor, University of Arizona
2002-09 Associate Professor, University of Arizona
2000-02 Associate Professor, Northern Arizona University
1994-99 Assistant Professor, Northern Arizona University
1992-94 NRC Research Associate at NASA Ames Research Center

Visiting Positions

2015 Visiting Researcher at Observatorio Nacional, Rio de Janeiro, Brazil
2015 Visiting Researcher at Observatorio Nacional, Rio de Janeiro, Brazil
2012 Visiting Researcher at L'Observatoire de Paris, Meudon France
2009 Visiting Researcher at Universite Reims Champagne-Ardenne France
2008 Visiting Researcher at L'Observatoire de Paris, Meudon France
2002 Visiting Researcher at L'Observatoire de Paris, Meudon France
2003 Visiting Researcher at L'Observatoire de Paris, Meudon France

Awards and Grants

National Science Foundation Young Investigator Award 1995-99
National Research Council Fellowship (NASA Ames) 1992-1994

NASA Planetary Astronomy Grant, 2001-2004
"Investigations of Titan's Troposphere and Surface"

NASA Planetary Atmospheres Grant 1999-2000
Unsolicited Proposal to Support Conference: "From Giant Planets to Cool Stars"

NASA Origins of Solar System Grant 1998-2001
"Spectroscopic Investigations of Extra-solar Planets and Brown Dwarfs"

NASA Planetary Astronomy Grant 1997-2001
"Infrared Spectroscopy of Planetary Satellites"

Research Corporation, Cottrell Grant 1996-1998
"Radiative Transfer Calculations of Titan's Near-IR Spectrum"

National Science Foundation and NASA Grant 1995-1996
"Spectral Images of Shoemaker-Levy 9 Impact Sites"

NASA Planetary Astronomy Grant 1995-1997
"The Origin and Evolution of Titan's Atmosphere"

NASA Planetary Astronomy Grant 1998-2000, 2002-2004, 2005-2007, 2008-2011
"Study of Titan's atmosphere"

NASA Planetary Atmosphere Grant 2005-2007, 2011-2014
"Study of weather in Titan's atmosphere"

NASA Cassini Data Analysis Grant 2007-2009, 2012-2015
“Study of weather in Titan’s atmosphere”
Participating Scientist, Cassini Mission 2012-2015
Grant from Brazilian Government with Alvaro Alvarez-Candal:
Cientistas Sem Fronteiras (2014—2017)
NASA Solar Systems Grant, 2017-2020
“How Humid is Titan?”

Science Teams & Professional Committee Memberships

Cassini Mission Participating Scientist (2012-2015)
NRC Decadal Study (2009-2010)
NASA Planetary Science Subcommittee Member (2008-2009)
Member of the Cassini Visual and Infrared Mapping Spectrometer Team 2004-present
Member-at-Large, American Association for the Advancement of Science 2001-2005
DPS Committee Member 2002-2005
NASA's Planetary Astronomy Program Management Working Group 1998-2001
NASA's Solar System Exploration Subcommittee 1996-2000
National Academy of Science NRC Steering Group member for the
Workshop on Exploration of Substellar-Mass Objects 1997-1998
NASA's Mission to the Solar System, Roadmap Development Team 1996-1997
NASA's Infrared Telescope Observing Team: SL9 impact into Jupiter 1994

Professional activities & Review Panels

1995, 2009, 2012: Hubble Space Telescope Review Panel
2009-2011: Telescope Time Allocation Committee: Arizona Telescopes
2005-2009: Chair of the Telescope Time Allocation Committee for
Planetary Sciences, National Optical Astronomical Observatories
1998-2000: Telescope Time Allocation Committee:
NASA's Infrared Telescope Facility, Mauna Kea, Hawaii
1999: Organize Conference entitled "From Giant Planets to Cool Stars"
A collaboration with Dr. Mark Marley.
Conference to unite planetary and stellar scientists to address the atmospheric &
interior structures of brown dwarfs, objects intermediate in mass between planets &
stars. Sponsored by NASA's Planetary Atmospheres Program & N. A. U.
1994, 1996, 1998, 2003: NASA Planetary Astronomy Review Panel
2011: NASA Planetary Atmospheres Review Panel
1995: NSF Career Proposal Review Panel
1996: NSF Planetary Astronomy Review Panel
1998-2000: Telescope Time Allocation Committee:
NASA's Infrared Telescope Facility, Mauna Kea, Hawaii

Examples of Publicity:

Nature News, 13 June 2012
TV Universe Series, “Wildest Weather in the Cosmos.”(2008)
Chemical and Engineering News, 14 May 2007, “Probing Titan’s Smog”
BBC News, 18 September 2006 “Ethane Cloud seen on Titan moon”
USA Today, 17, September 2006, “Clearing up a cloudy Titan Mystery”
New York Times, 25 October 2005 “The Haze over Titan?”
Australian Broadcasting Center (ABC) TV Show “Descent to Titan” 17 February 2005
Folha de São Paulo, 7 February 2005, “Cientistas saem à procura de vida em Titã” (Brazilian NYT)
Christian Science Monitor, 13 May 2004, “Lure of the rings”

Folha de São Paulo, 20 July 2003, “O senhor dos anéis” (Brazilian NYT)
Astronomy Magazine, 28 April 2003 “Icy Titan”
BBC News, 25 April 2003 “Titan’s icy surface revealed”

Public Service and Outreach:

Public Talk on the Cassini Mission Reims, France, In French, 2009
Student Lecture Series, National Observatory, Rio de Janeiro, In Portuguese & English, 2006
Televised Questions & Answers with public & journalists at a bar in Paris, In French, 2006
Public talk on Titan and the Cassini mission at Steward Observatory: 6 Dec. 2004
Public talk on Titan’s lower atmosphere at LPL on 10 July 2004
Public Lecture, “The Cassini Mission”, Faro, Portugal. In Portuguese, 2003

Invited Lectures (examples)

- DPS American Astronomical Society plenary talk 2013, Denver
- Royal Society (London) March 12, 2013
- Cassini PSG in Sardinia June 13, 2012
- European Planetary Science Congress, Sept. 24, 2010, Rome
- In the Spirit of Lyot 2010, Oct. 26, 2010, Paris
- Royal Society (London) December 3, 2007
- Division of Planetary Sciences, 38th meeting, Pasadena, 2006
- European Planetary Science Conference, Berlin, 2006
- University of Leiden, Extrasolar planets and brown dwarfs, Leiden 2006
- NASA Outer Planets Assessment Group, Tucson, 2006
- Rencontres de Blois, France June 2006
- National Academy of Sciences Frontiers Conference 2005
- Tutorial Lecture at the AGU Dec 13 2004
- Titan Workshop, University College London June 8, 2004
- COSPAR meeting, Paris July 9, 2004
- Cassini PSG Meeting, Paris July 2004
- General Assembly of IAU, Sydney Australia Aug. 2003

Invited Colloquia (examples)

- Ohio State University 2014
- Observatoire de Paris/Meudon 2012
- Oxford University November 2011
- University of Reims 2010
- Observatoire de Paris at Meudon, June 2009
- University College London, December 2, 2008
- Université Reims Champagne-Ardenne, October 2008
- University of Rio de Janeiro, 5 Part Lecture Series, Rio de Janeiro, 2006
- California Institute of Technology April 11, 2006
- RPI March 28, 2005
- Space Science Institute, Baltimore Jan 2003
- Universidade de Evora, Portugal June 2002
- Univ. of California, Santa Cruz Jan 2001

Teaching

PhD Students:

Paulo Penteado Graduation date: 2009 (Now: Scientific Applications Software Engineer, NASA JPL)

Johanna Teske Graduation date: 2014 (Now: Carnegie Origins Postdoctoral Fellow)

Robert Zellem Graduation date: 2015 (Now: Postdoc: NASA, JPL Mark Swain)

Kyle Pearson Estimated Graduation date: 2020

Undergraduate Students:

Thomas Greathouse 1993-1995

Daniel Sands 2003-2005

Jake Turner 2011-2013

Kyle Pearson 2013-2014

Tymon Khasi

Graduate-level classes

Radiative Transfer and Remote Observations

Observational Techniques

Exoplanets (currently designing this course)

Undergraduate courses

Introductory Astronomy

Classical Mechanics

Planetary Atmospheres

Publications:

Griffith, C. A., et al. Ice-rich Corridor exposed on Titan's Surface of Organic Sediments. Submitted to *Nature* (2017)

Pearson, K. A. ,Palofox, C. A. Griffith, Searching for Exoplanets using Artificial Intelligence. *MNRAS*, In Press. (2017)

Turner, J., et al. , C. A. Ground-based near-UV observations of 15 transiting exoplanets: constraints on their atmospheres and no evidence for asymmetrical transits. *Monthly Notices of the Royal Astronomical Society*, **431**, 789-819 (2016).

Griffith, C. A. , Not just a storm in a teacup, *Nature*, 514, 40-41, (2015)

Tinetti, G. The EChO science case, *Experimental Astronomy*, 40, 329—391 (2015)

Zellem, R. T., The 4.5 μm Full-orbit Phase Curve of the Hot Jupiter HD 209458b ApJ, 790, 39, (2015)

Griffith, C. A. Disentangling degenerate solutions from primary transit and secondary eclipse spectroscopy of exoplanets. *Phil. Trans. R. Soc. A*. **372**, 1471, (2014)

Griffith, C. A. *et al.* 2014. Storms, Clouds and Weather in "Titan: Surface, Atmosphere and Magnetosphere", *Cambridge University Press*, Eds: Mueller-Wodarg I., Griffith, CA Lellouch. E., Cravens T., (2014)

<http://www.cambridge.org/gb/academic/subjects/astronomy/planetary-science/titan-interior-surface-atmosphere-and-space-environment>

- Teske, J. et al. C/O Ratios of Stars with Transiting Hot Jupiter Exoplanets. *ApJ*, 788, 39, (2014)
- Mueller-Wodarg I., Griffith, C.A., Lellouch, E., Cravens (Eds.) Titan: Surface, Atmosphere and Magnetosphere”, *Cambridge University Press*, (2014)
<http://www.cambridge.org/gb/academic/subjects/astronomy/planetary-science/titan-interior-surface-atmosphere-and-space-environment>
- Griffith, C. A. et al. 2013. Titan’s Evolving Climate in “Comparative Climatology of the Terrestrial Planets”,
University of Arizona Press, Eds: Stephen Mackwell, Mark Bullock, and Jerry Harder., (2013)
<http://www.lpi.usra.edu/features/books/climatology/>
- Teske, J. et al. Carbon and Oxygen Abundances in Cool Metal-rich Exoplanet Hosts: A Case Study of the C/O Ratio of 55 Cancri. *ApJ*, 778, 132, (2013)
- Teske, J. et al., Carbon and Oxygen Abundances in the Hot Jupiter Exoplanet Host Star XO-2N and its Binary Companion. *ApJ*, 768, L12 (2013)
- Teske, J., Turner, J., Mueller, M. Griffith, C. A. Optical observations of the transiting exoplanet GJ 1214b.
Monthly Notices of the Royal Astronomical Society, **431**, 1669-1677, (2013).
- Tinetti et al. EChO. Exoplanet characterisation observatory. *Experimental Astronomy*, **34**, 311-35 (2013)
- Griffith, C.A. et al. Possible tropical lakes on Titan from observations of dark terrain. *Nature* **486** 237, (2012)
- Griffith, C.A. et al. Radiative Transfer Analysis of Titan’s Tropical Atmosphere,
Icarus, 218, 975 (2012)
- Waldman, I.P. et al. Ground-based Near-infrared Emission Spectroscopy of HD 189733b. *ApJ*, 744, 35 (2012)
- Le Mouelic et al. Dissipation of Titan's north polar cloud at northern spring equinox.
Planetary & Space Sci. 60 86 (2012)
- Soderblom J. M. et al. Modeling specular reflections from hydrocarbon lakes on Titan.
Icarus, 220, 744-751 (2012)
- Lavvas, P., C.A. Griffith, and R. Yelle. Condensation in Titan's atmosphere at the Huygens landing site. *Icarus*, 215, 732 (2011)
- Moses, J.I. et al. Disequilibrium Carbon, Oxygen, and Nitrogen Chemistry in the Atmospheres of HD 189733b and HD 209458b *ApJ*, 737, 15 (2011)
- Beaulieu, J.-P et al. (including Griffith). Methane in the Atmosphere of the Transiting Hot Neptune GJ436B? *Astrophys. J.* , **731**, 16, (2011)
- Mousis, O. et al. (including Griffith). On the Volatile Enrichments and Heavy Element Content in HD189733b, *Astrophys. J.* , **727**, 77 (2011)
- Tinetti et al. including Griffith. Probing the Terminator Region Atmosphere of the Hot-Jupiter XO-1b with Transmission Spectroscopy,

- Astrophys. J. Letts.*, **712** L139-L142 (2010)
- Swain, M.R., Deroo, P., Griffith, C.A. *et al.* A ground-based near-infrared emission Spectrum of the exoplanet HD189733b. *Nature*, **463**, 637-639 (2010)
- Penteado, P.F. *et al.* Latitudinal variations in Titan's methane and haze from Cassini VIMS observations, *Icarus*, **206**, 352 (2010)
- Penteado, P.F. and C.A. Griffith, Ground-based measurements of the methane distribution on Titan, *Icarus*, **206**, 345 (2010)
- Tinetti *et al.* including Griffith. Probing the Terminator Region Atmosphere of the Hot-Jupiter XO-1b with Transmission Spectroscopy, *Astrophys. J. Letts.*, **712** L139-L142 (2010)
- Stephan, K. *et al.* (including Griffith) Specular reflection on Titan: Liquids in Kraken Mare., *Geophys. Res. Letts.* **37**
- Swain *et al.* including Griffith. Water, methane and carbon dioxide present in the dayside spectrum of the exoplanet HD 209458b *Astrophys. J.*, **704** 1616-1621 (2009)
- Griffith, C. A. *et al.* Characterization of clouds in Titan's tropical atmosphere, *Astrophys. J.*, **702**, L105 (2009)
- Mousis, O. *et al.* (including Griffith) Elemental abundances and minimum mass of heavy elements in the envelope of HD 189733b *A&A*, **507**, 1671-1674 (2009).
- Griffith, C. A. Storms, polar deposits and the methane cycle in Titan's Atmosphere. *Phil. Trans. R. Soc.* **367**, 713-728. (2009)
- Coustenis, A. *et al.* *Experimental Astronomy*, **23**, 893-946 (2009)
- Rodriguez, S. *et al.* *Nature* **459**, 678-682 (2009)
- Griffith, C. A., C. P. McKay and F. Ferri Titan's Tropical Storms in an Evolving Atmosphere. *Astrophys. J. Let.* **687**, L41-L44. (2008)
- Graves, S. D. B, McKay, C.P., Griffith, C.A., Ferri, F., Fukchignoni, M. *Planetary and Space Science*, **56**, 346-357 (2008)
- Jaumann, R. *et al.* *Icarus*, **197**, 526-538 (2008)
- Boudon *et al.* *Reflats de la Physique*, **11**, 13-16 (2008)
- Adamkovics *et al.* *J. of Geophys. Res.*, **113**, 2 (2008)
- Coradini *et al.* *Icarus*, **193**, 233-251 (2008)
- Jaumann, R. *et al.* *Icarus* **193**, 407-419 (2008)
- Griffith, C. A. "Titan's Lower Atmosphere", *American Institute of Physics AIP Conference Proceedings* **930**, pg 1-36, (2007)
- Griffith, C. A. *et al.* Evidence for a polar ethane cloud on Titan. *Science*, **313**, 1620 (2006)

- Griffith, C. A. Titan's exotic weather. *Nature*, **442**, 362, (2006)
- McCord, T., ... Griffith, C. A. et al. The composition of Titan's surface from Cassini VIMS, *Planetary & Space Science*, 54, 1524-1539, (2006)
- Adamkovics, M., de Pater, M. Hartung, F. Eisenhauer, R. Genzel and C.A. Griffith. Titan's bright spots: Multiband spectroscopic measurement of surface diversity and hazes. *J. of Geophysical Research*. **111**, E07S06 (2006)
- Jaumann, R. ... Griffith, C. A. et al. High-resolution Cassini-VIMS mosaics of Titan and the icy Saturnian satellites. *Planetary & Space Science*, 54, 1146-1155, (2006)
- Brown, R.H., Baines, K.H., Griffith, C.A., and others. Observations of the Saturn system during approach and orbital insertion, with Cassini's Visual and Infrared Mapping Spectrometer (VIMS) *Astronomy & Astrophysics*, 446(2), 707-716 (2006)
- Baines, K. H., Drossart, P. Momary, T. W., Formisano, V., Griffith, C. A., and others. Atmospheres of Saturn and Titan in the near-infrared: first results from Cassini/VIMS. *Earth, Moon and Planets*, 96(3-4), 119-147 (2005)
- Griffith, C. A. *et al.* The evolution of Titan's midlatitude clouds. *Science*, **310**, 474 (2005).
- Barnes J. W. *et al.* (including C.A. Griffith) Discovery of a 5 um bright spot on Titan: Evidence for surface diversity. *Science*, In Press. (2005)
- Griffith, C. A. and C. P. McKay. The formation of Titan's clouds, *Icarus*, Submitted (2005)
- Griffith, C.A., Penteado, P., Greathouse, T.K., Roe, H.G. & Yelle, R. V. Observations of Titan's Mesosphere, *Ap. J. Letts.*, **629**, 57-60 (2005)
- Penteado, P., Griffith, C.A., Greathouse, T. K., de Bergh, C. Measurements of CH₃D and CH₄ in Titan from Infrared Spectroscopy. *Ap. J. Letts.*, **629**, 53-56 (2005)
- Greathouse, T.K., Lacy, J.H., Bezar, B., Moses, J.I., Griffith, C.A., Richter, M. J. Meridional variations of temperature C₂H₂ and C₂H₆ abundances in Saturn's atmosphere at south summer solstice. *Icarus*, **177**, 18-31 (2005)
- Lorenz, R.D. Griffith, C.A., Lunine, J., McKay, C. P., Renno, N.O. *Geophys. Res. Let.* **32**, 1201 (2005)
- Adamkovics, M., de Pater, I., Roe, H., Gibbard, S., Griffith, C.A. Spatially resolved spectroscopy at 1.6 um of Titan's atmosphere and surface *Geophys. Res. Lett.* **31**, 19929-19933 (2004)
- Griffith, C. A., B. Bezar, T. Greathouse, E. Lellouch, J. Lacy, D. Kelly, M. J. Richter, "Meridional Transport of HCN from SL9 impacts on Jupiter", *Icarus*, **170**, 58-69 (2004)
- Griffith, C.A., T. Owen, T.R. Geballe, J. Rayner, P. Rannou, Evidence for the Exposure of Water Ice on Titan's Surface, *Science*, 300. 628-630 (2003)
- Yelle, R. V. and C.A. Griffith, HCN Fluorescence on Titan, *Icarus*, **166**, 107-115 (2003)

Geballe, T., S. J. Kim, K. S. Noll, & C. A. Griffith. High resolution 3 micron Spectroscopy Of molecules in the mesosphere and troposphere of Titan, *Ap. J.* **583**, L39-L42 (2003)

Betremieux, Y., R.V. Yelle, and C.A. Griffith. HST observation of the atmospheric structure of Jupiter's equatorial region: Evidence for tropospheric C₂H₂. *Icarus* **163**, 414-427 (2003).

Brown, M. E., A. Bouchez, C.A. Griffith, Direct detection of variable tropospheric clouds near Titan's south pole *Nature*, **420**, 795-797 (2002)

Young, E. F, P. Rannou, C. P. McKay, C. A. Griffith, *Astron. J.* 123, 3473-3486 (2002)

Yelle, R.V., C.A. Griffith, & L. Young. The structure of Jupiter's stratosphere at the Galileo Probe entry site. *Icarus* 152, 331-346 (2001).

Griffith, C.A., J.L Hall, T. R. Geballe, Detection of Daily Clouds on Titan *Science*, 290, 509 (2000)

Griffith, C.A. Disequilibrium chemistry in brown dwarfs. In "From Giant Planets to Cool Stars", eds. C.A. Griffith & M.S. Marley, A.S.P. Conference Series, 202, 519 (2000).

Griffith, C.A. & R.V. Yelle. Equilibrium chemistry in a brown dwarf's atmosphere: Cesium in Gliese 229B. *Astrophys. J., Letters.* 532, L59-L63 (2000).

Griffith, C.A., & R.V. Yelle. Disequilibrium chemistry in a brown dwarf's atmosphere: Carbon monoxide in Gliese 229B. *Astrophys. J., Letters.* 519, L85-L88 (1999).

Griffith, C.A., T. Owen, G. Miller, and T. Geballe. Transient clouds in Titan's lower atmosphere. *Nature*, 395, 575-578 (1998).

Griffith, C.A., R.V. Yelle & M.S. Marley. The dusty atmosphere of the brown dwarf Gliese 229B. *Science*, 282, 2063-2067 (1998).

Lara, L., B. Bezard, C.A. Griffith, J.H. Lacy, and T. Owen. High-resolution ten-micron spectroscopy of ammonia and phosphine lines on Jupiter. *Icarus*, 131, 317-333 (1998).

Griffith, C.A., B. Bezard, T. Greathouse, D.M. Kelly, J.H. Lacy and K. Noll. Thermal infrared spectroscopy of Shoemaker-Levy 9 impact sites: Spatial and vertical distributions of NH₃, C₂H₄, and 10 micron dust emission. *Icarus*, 128, 275-293 (1997).

Noll, K.S., D. Gilmore, R.F. Knacke, M. Womack, C.A. Griffith, and G. Orton. Carbon monoxide in Jupiter after comet Shoemaker-Levy 9. *Icarus*, 126, 324-335 (1997).

McKay, C.P., S.C. Martin, C.A. Griffith, R.M. Keller. Temperature lapse rate and methane in Titan's troposphere. *Icarus*, 129, 498-505 (1997).

Bezard, B., C.A. Griffith, D.M. Kelly, J.H. Lacy, T. Greathouse, and G. Orton. Thermal infrared imaging spectroscopy of Shoemaker-Levy 9 impact sites: Temperatures and HCN retrievals. *Icarus*,

125, 94-120 (1996).

Bezard, B., C.A. Griffith, D.M. Kelly, & J.H. Lacy. Search for NH₃ in Jupiter's stratosphere ten months after SL9 collision. *Icarus*, 125, 331-339 (1996).

Lissauer, J.J., S.J. Wolk, C.A. Griffith, & D.E. Backman. The Epsilon Aurigae Secondary: A hydrostatically supported disk. *Astrophys. J.*, 465, 371-384 (1996).

Griffith, C.A., & K. Zahnle. Influx of cometary volatiles to Titan: The atmospheres of 1000 Titans. *JGR Planets*, 100, 16907-16922 (1995).

Bezard, B., C.A. Griffith, J. Lacy, T. Owen. Non-detection of hydrogen cyanide on Jupiter. *Icarus*, 118, 384-391 (1995).

Orton, G., M. et al. The NASA Infrared Telescope Facility investigation of comet Shoemaker-Levy 9 and its collision with Jupiter: Preliminary Results. *Science*, 267, 1277 (1994).

Griffith, C.A., Evidence that Titan's surface is Heterogeneous. *Nature*, 364, 511-513 (1993).

Griffith, C.A., B. Bezard, T. Owen, and D. Gautier. The tropospheric abundances of NH₃ and PH₃ in Jupiter's Great Red Spot, from Voyager IRIS observations. *Icarus*, 98, 82-93 (1992).

Griffith, C.A., T. Owen. Observing the surface of Titan through near-infrared windows in its atmosphere. *ESA SP-338*, 199-204 (1992).

Lellouch, E., A. Coustenis, J.P. Maillard, K. Strong, N. Deme, C. Griffith & B. Schmitt. The spectrum of Titan in the 1.06 and 1.28 micron windows. *ESA SP-338*, 353-358 (1992).

Griffith, C.A. Investigations of Titan's troposphere and surface and Jupiter's Great Red Spot with infrared observations. Ph.D Thesis. State University of New York at Stony Brook (1991).

Griffith, C.A., T. Owen and R. Wagener. Titan's surface and troposphere, probed with ground-based, near-infrared observations. *Icarus*, 93, 362-378 (1991).

Toon, O.B., C.P. McKay, C.A. Griffith and R.P. Turco. A physical model of Titan's aerosols. *Icarus*, 95, 24-53 (1991).

Books:

Eds. Griffith, C. A. and M.S. Marley A.S.P. Conference Series 212 (2000)

Eds. Mueller-Wodarg I., Griffith, C.A. Lellouch, E., Cravens T *Titan: Surface, Atmosphere and Magnetosphere* (Cambridge U Press) In Press (2014)