

LISA KALTENEPPER (Dr. MSc. MEng.)

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EDUCATION

- Ph.D.**, Astrophysics, Karl Franzens Univ Graz / ESTEC (A. Hanslmeier, M. Fridlund) 2004
"Search for Extraterrestrial Planets: Darwin mission Target Stars & Array Architectures"
graduated summa cum laude
- M.Sci.**, Astrophysics, Karl Franzens Univ Graz (A. Hanslmeier, R. Rebolo)
1999 "Extrasolar Planet Search: Formation of Extrasolar Planets and Detection Methods"
graduated summa cum laude
- Summer research student at Caltech on the LIGO project (R. DeSalvo) 2000
Research fellow at the Institute of Astrophysics Canary Island (R. Rebolo) 98/99
International Space University (ISU), student Business&Management Department 1998
- M.Eng.**, Physics & Engineering, Univ. of Technology Graz advisor: T. Neger 2001
"Application of Optical Tweezers in Medicine & Biology" *graduated summa cum laude*
- Georgia Institute of Technology, research fellow (6 months) 00/01
Johns Hopkins University, Specialization in biophysics/biomedical engineering 99/00

FELLOWSHIPS, AWARDS, HONORS

- P. Hertelendy Award and Prize Lecture of the CfA 2007
Harvard Smithsonian Center for Astrophysics Postdoctoral Fellowship 2005 - current
Austrian National Award for Outstanding Academic Achievements 2005
PhD graduation Sub Auspices (Awarded personally by the Austrian president) 2004
National Award of the Ministry of Educations for Outstanding Academic Achievement(PhD) 2004
National Award of the Ministry of Educations for Outstanding Academic Achievement(MSc) 2000
Research Award for Academic Achievement, TU Graz 2000
Research Award Johns Hopkins Univ., USA 2000
Awards of Academic Achievement, Tech. Univ. Graz 1998 through 2001
Awards of Academic Achievement, Karl Franzens University Graz 1996 through 2001
Joint Study Award of Johns Hopkins Univ., USA 1999
SOKRATES Award of the European Union to study at the IAC Tenerife 1998
European Space Agency Award to attend the International Space University 1998

INTERNATIONAL SCIENCE PANELS

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| TPF-I: Science Working Group | external expert | 2005 – current |
| Darwin: Darwin Science Advisory Committee | member as part of ESA | 2002 – 2004 |
| | external expert | 2005 – current |

PRESS RELEASE

- "Astronomers reveal first Alien ID chart" <http://www.cfa.harvard.edu/press/pr0625.html> Oct.2006

INTERVIEWS & MEDIA COVERAGE:

New Scientist (podcast), National Geographics, USA Today, BBC, Channel7 News, Christian Science Monitor, spacescience.com, several webbased forums and German national newspapers

RESEARCH EXPERIENCE

- CfA Postdoctoral Fellow, Harvard Smithsonian CfA, USA** 2005 – current
- Modeling planetary atmospheres (solar system planets, super Earth, Ocean planet etc.)
 - Verifying model/interpreting space and ground based data from TESS (Mars Global Surveyor), Omega (Mars Express) & Earthshine experiments
 - Establishing design and science requirements for future missions searching for biomarkers to maximize scientific return of JWST, Darwin, Terrestrial Planet Finder
 - Building a model for Earth's atmospheric evolution over geological time and its biomarkers
 - Simulating surface and cloud signatures for Earth current and over its geological evolution
 - Establishing design requirements for future space and ground based missions to detect biomarkers on Earth & Earth-like extrasolar planets within practical instrument constraints
 - Establishing guidelines and evaluation criteria for the reliability of biomarker detection
- Consultant to ESTEC Advanced Concepts Study Dep/ AURORA Technology NL** 2003 – 2004
- Analyzed and optimized new designs for infrared space based interferometers
 - Established the Darwin target star catalogue
 - Established space based precursor (SMART3) science requirements and target list
 - Modeled realistic observation scenarios for ground and space based missions
 - Gave input (scientific and engineering) on industrial phase A study for Darwin Design
 - Co-author of the Internal ESA Darwin Design Assessment Studies provided to industry
 - Simulated planet detection signals (background sources, color information extraction)
 - Optimized search strategy for maximum scientific return, SNR-integration time trade off
 - Evaluated models of planetary atmospheres and biomarkers
 - Verified/Evaluated results of internal IDL Darwin simulator, built a mathcad simulator
- Young Graduate Trainee ESA/ESTEC: Dep. of Future Projects, The Netherlands** 2001 - 2002
- Built a mathcad simulator to compare Interferometer configurations for planet search
 - Established standard comparison and evaluation criteria for mission comparison
 - Evaluated and optimizing different free flyer interferometer configuration
 - Analyzed new designs of beam combination schemes and metrology options
- Research fellow, University of Technology Georgia, USA** 2000 – 2001
- Designed and evaluated applications of optical tweezers in medicine and biology
 - Calibrated the force applied in optical tweezers
 - Cultured bacteria, ran DNA sequencing
- Summer student research, California Institute of Technology, USA** 2000
- Set up experiments and evaluated material behavior of damping cascades for LIGO
- Research fellow at Astrophysics Institute Canary Islands (IAC), Spain** 1998 – 1999
- Observed at El Teide Observatory (Spain) on optical and infrared telescopes
 - Undertook ground based observations to detect brown dwarfs and extrasolar giant planets
 - Tested and evaluated a new observation technique (PSF subtraction)
 - Simulated and reduced data for Infrared and optical ground based observations

- Moderator at Science and Science Fiction Forum, Austria** May 2003
Moderated the Science and Science Fiction Forum discussion panels (Vienna)
- Advisor to the Space Generation Forum** 2000 - 2001
Advised the Space Generation Forum on space based issues
- Moderator at United Nations, Austria** June 1999
Moderated and Organized the Space Generation Forum (UNISPACE III Conference)

TEACHING

Visiting Professor

- Ecole Normale Supérieure de Lyon (group of F. Selsis) Nov/Dec 2006
Ecole Normale Supérieure de Lyon (group of F. Selsis) Nov/Dec 2007

Team Tutor: team management and group leadership

- ESA/ASA Summerschool Alpbach (15 students, 2 week intense course) July 05
ESA/ASA Summerschool Alpbach, (15 students, 2 week intense course) July 07
2 week intense design course for European science/engineering graduate/undergraduate students to provide new ideas and mission concepts for small satellite missions.

Tutor responsibilities (15 students):

- building the team, leading discussions, initiating brainstorming and new design concepts, teaching main design and science key points,
- organizing the final report and 1 hour presentation of the mission by all students
- teaching students how to interact in an international, interdisciplinary environment

Invited Colloquium and Seminar Speaker

- Arizona State University (K. Hodges) March 07
Museum of Natural History (B. Oppenheimer), JPL (S. Unwin) Feb 07
Univ. of Colorado. (S. Raymond), CalTech (Y. Yung) Jan 07
Observatory Geneva (M. Mayor), Observ de Paris (J. Schneider), ENS Lyon (F. Selsis) Dec 06
Univ. de Paris Sur (A. Leger) Nov 06
Penn State Univ. (J. Kasting) May 06
Harvard Smithsonian Center for Astrophysics April 06
Univ. of Vienna (R. Dvorak) Feb. 06
Michelson Science Center (G. van der Belle) May 05
ESTEC/ESA (M. Fridlund) Sept. 04

LANGUAGES

GERMAN: native ENGLISH, SPANISH: fluent ITALIAN, DUTCH: good PORTUGUESE: basic

CONFERENCES

Session chair & Convener

- European Planetary Science Congress, Berlin: Biomarkers and their detectability Sept. 06
European Planetary Science Congress, Potsdam: Concepts of habitability Sept. 07

International Advisory Committee

- Les Houches Winter School "The Physics and Astrophysics of Extra-solar Planets" Feb. 08

Local Organizing Committee

- Harvard Smithsonian Center for Astrophysics: Physics of Extrasolar Planets May 08

Invited speaker:

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| Observatory Vienna, Austria, "Fingerprint of life in a planet's atmosphere" | July 07 |
| Alpbach Summer School, Austria, "Signature of life on extrasolar planets" | July 07 |
| ESO symposium, Santiago de Chile: "Exoplanet search, Biosignatures, and targets" | March 07 |

Invited Colloquiums on

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| 'Spectral evolution of an Earth-like planet and its implications for future ground and space missions' | |
| Arizona State University (K. Hodges) | March 07 |
| Museum of Natural History (B. Oppenheimer), JPL (S. Unwin) | Feb. 07 |
| Univ. of Colorado., Boulder (S. Raymond), | Jan. 07 |
| CalTech, L.A. (Y. Yung) | Jan. 07 |
| Observatory Geneva, Geneva (M. Mayor) | Dec. 06 |
| Observ de Paris, Meudon (J. Schneider) | Dec. 06 |
| ENS Lyon, Lyon (F. Selsis) | Dec. 06 |
| Univ. de Paris Sur, Paris (A. Leger) | Nov. 06 |
| Univ. of Vienna (R. Dvorak) | Feb. 06 |

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| 3 rd International TPF/Darwin Workshop, L.A.: "Evolution of Earth's atmosphere over geologic time and observability of various biomarkers at visible and infrared wavelengths" | Nov. 06 |
| European Planetary Science Congress, Berlin: "Evolving Earth: Evolution of Biomarkers and their detectable spectrum" (session chair & convener) | Sept. 06 |
| Pale Blue Dot III, Chicago: "Techniques and future observation of terrestrial planets" | Sept. 06 |
| ESOF2006, Munich: "Possible spectra signature of life in planetary atmosphere" | May 06 |
| Colloquium Penn State Univ., State College, "Search for Exo-terrestrial Planets: Decoding Their Spectra" (J. Kasting) | May 06 |
| AbSciCon 2006, D.C.: "Future missions on extrasolar planets and what they can tell us" | March 06 |
| Colloquium CfA, Boston, "Search for Exo-terrestrial Planets: Decoding Their Spectra" | April 06 |
| ISSI, Bern: "Evolution of Biomarkers over geological timescale" | Feb. 06 |
| Colloquium Michelson Science Center, LA: "Search for Exo-terrestrial Planets and biomarkers in their Spectra" (G. van der Belle) | May 05 |
| Colloquium ESTEC/ESA, Leiden: "Updates on the Darwin mission concept and the search for Exo-terrestrial Planets" (M. Fridlund) | Sept. 04 |
| COSPAR, Paris: "Darwin and Search for Exo-terrestrial Planets" | July 04 |

Speaker:

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| AAS, Seattle, 'Evolution of biomarkers on Earthlike planets' | Jan. 07 |
| 6th European Workshop on Astrobiology, "Evolving Earth over time: Observability biomarkers at visible and infrared wavelengths" | Oct. 06 |
| European Geophysical Union, "Evolution of atmospheric biomarkers over Earth's history and the search for extrasolar planets" | April 06 |
| AbSciCon, 2006, D.C., "Search for Atmospheric Biomarkers and their Evolution over Time" (session co-chair) | March 06 |
| IAUC200, Nice, "Biomarkers and their evolution over time" | Nov. 05 |
| NAI 2005 mtg, "Darwin and the search for life" | April 05 |
| SPIE: "Requirements on the stellar rejection for the Darwin mission" | July 04 |

OUTREACH ACTIVITIES

Scientific Advisor:

- The Habitable Planet Project, Harvard (web based initiative for the classroom) 2007
 Exoplanets and beyond, CfA (bringing cutting-edge science into the K-12 classroom) 2008
 Science at Stake: webbased Initiative to provide journalists and the general public with insight into the newest developments in science 2006 - current

Public lectures

- CfA Public lecture, Boston, USA: "Epochs of Life" Nov. 06
 Willstone Highschool, 8th grade, lecture at star party March 07
 Skyscrapers Astro Society, USA "How to find Fingerprints of life on exoplanets" July 07

Lecturer: MIT Teachers workshop on astronomy and the classroom 2005

Interviews:

- BBC News March 04
 Channel 7 News, National Geographics, New Scientist Nov. 06
 Smithsonian Magazine (special issue on 30 profiles of young upcoming scientists) Jan. 07
 Smithsonian Women's Committee Project (webbased TV interview) Feb. 07

Panel Discussion:

- Harvard Alumni Conference Panel Discussion "Extrasolar planet search" April 07
 (w. D. Latham, D Charbonneau, D. Sasselov, S. Stewart-Mukhopadhyay)
 Pale Blue Dot III Panel Discussion "Detecting Extrasolar planets" Nov. 07
 (w. C. Beichman, M. Meyer, A. Boss)

PROFESSIONAL ASSOCIATIONS

AAS, Europlanet Network, ISSI, CfA Women in Science, ÖWF (Austrian Space Forum)

PUBLICATIONS

Kaltenegger, L., Jucks, K., Traub, W., Spectral Evolution of an Earth-like Planet, ApJ 658, 598, 2007

Kaltenegger, L., Fridlund, M., Interferometric Space Missions for the Search for Terrestrial Exoplanets: Requirements on the Rejection Ratio, Astrophysics and Space Science 2006

Kaltenegger, L., Jucks, K., Traub, W., Atmospheric Biomarkers and their Evolution over Geological Timescales, Direct Imaging of Exoplanets: Science & Techniques. Proceedings of the IAU Colloquium #200, Edited by C. Aime and F. Vakili. Cambridge, UK: Cambridge University Press, 2006., pp.259-264

Kaltenegger, L., Fridlund, M., Characteristics of proposed 3 and 4 telescope configurations for Darwin and TPF-I, Direct Imaging of Exoplanets: Science & Techniques. Proceedings of the IAU Colloquium #200, Edited by C. Aime and F. Vakili. Cambridge, UK: Cambridge University Press, 2006., pp.255-258

Kaltenegger, L., Eiroa, C., Stankov, A., Fridlund, M., Target star catalogue for Darwin: Nearby Habitable Star Systems, Direct Imaging of Exoplanets: Science & Techniques. Proceedings of the IAU Colloquium #200, Edited by C. Aime and F. Vakili. Cambridge, UK: Cambridge University Press, 2006., pp.89-92

Kaltenegger, L., Fridlund, M., The Darwin mission: Search for extra-solar planets, Advances in Space Research, Volume 36, Issue 6, p. 1114-1122, 2005

- Kaltenegger, L., Search for extraterrestrial planets: The Darwin mission. Target stars and array architectures, PhD thesis, Karl-Franzens University Graz, 2004
- Kaltenegger, L., Karlsson, A: Requirements on the stellar rejection for the Darwin mission, SPIE 5491, 2004
- Kaltenegger, L., Fridlund, M., Absil, O., Details on Darwin and the Search for Extrasolar Planets, Scientific Frontiers in Research on Extrasolar Planets, ASP Conf., Vol 294, 2003
- Kaltenegger, L., et al., Characterisation of disks around YSOs with GENIE, ESA SP-539, 2003
- Kaltenegger, L., Karlsson, A, Fridlund, M, Absil, O, Overview of the Darwin mission, ESA SP-539, ISBN 92-9092-849-2, 2003, p. 459 - 464
- Kaltenegger, L., Karlsson, A., Hanslmeier, A. , Darwin: a nulling space interferometer, ESA SP-518, Noordwijk, Netherlands: ESA Publications Division, ISBN 92-9092-828-X, 2002, p. 519 – 520
- Kaltenegger, L., Fridlund, M., Kasting, J., Review on habitability and biomarkers, ESA SP-514, Noordwijk: ESA Publications Division, ISBN 92-9092-824-7, 2002, p. 277 - 282
- Kaltenegger, L., Karlsson, A., Neger, T, Configurations of a nulling space interferometer for the search for extrasolar planets, 34th COSPAR Sci. Assembly, 2002 USA., p.1889
- Kaltenegger, L. Application of optical traps in medicine and biology', Master thesis Univ. of Technology Graz, 2001
- Kaltenegger, L., Extrasolar Planet Search: Formation and Detection Methods', Master thesis Karl-Franzens Univ 1999
- Kaltenegger, L., Karlsson, A., Configurations of a Nulling Space Interferometer with stellar rejection over a limited bandwidth, 4th Annual ROE Workshop, Royal Observatory, 2001
- Kaltenegger, L., What does it take for a Moon to Support Life? , Exploration and Utilisation of the Moon. ESA SP-462, 2000. ISBN: 92-9092-689-2., p.199
- Kaltenegger, L., Rebolo, R., Rosa-Zapatero, M., PSF Technique Applied for Extrasolar Planet Search at Young, Nearby Stars, ASP 212. 2000, p.331
- Kaltenegger, L., Neger T.: Optical Tweezers: Application of optical traps in medicine and biology, General assembly of the Austrian Physics Association 2001

Internal ESA reports: Main-author: The Darwin target star list, The GENIE/Darwin target star list, Multiple planetary signals, Biomarkers in the IR, Biomarkers in the Visible, Characteristics of the closest Darwin target stars, Habitable Zone around different stars, IR spectra and its information, Required stellar rejection for the Darwin mission, Required wavelength band in the IR, characterisation of different proposed Darwin concepts

CO-AUTHOR

- Scalo, J., Kaltenegger, L., Segura, A. et al., M stars as targets for terrestrial exoplanet searches and biosignature detection, Astrobiology, Feb 2007
- Lawson, P., Traub, W., et al. 2006, Navigator Science Plan "Earth-Like Exoplanets: The Science of NASA's Navigator Program", <http://planetquest.jpl.nasa.gov/documents/NavigatorScience2006.pdf>
- Traub, W., Kaltenegger, L, Jucks, K., Turnbull, M., 2006, Direct imaging of Earth-like planets from space (TPF-C), SPIE, Volume 6265
- Eiroa, C., Fridlund, M., Kaltenegger, L. , The Darwin target list: observational properties of the G-type stars, ESA SP-539, ISBN 92-9092-849-2, 2003, p. 403 - 407
- den Hartog, Roland, Absil, O., Kaltenegger, L., Gondoin, P., Wilhelm, R., Fridlund, M., Could GENIE detect hot Jupiters?, ESA SP-539, ISBN 92-9092-849-2, 2003, p. 399 - 402
- Absil, O., Kaltenegger, L., Eiroa, C., den Hartog, R., Gondoin, P., Wilhelm, R., Fridlund, M., Can GENIE characterize debris disks around nearby stars?, ESA SP-539, 2003, p. 323 - 328
- Absil, O., den Hartog, R., Erd, C., Gondoin, P., Kaltenegger, L., Fridlund, M., Rando, N., Wilhelm, R , GENIEsim: the GENIE simulation software, ESA SP-539, 2003, p. 317 - 321

Gondoin, P., Absil, O., den Hartog, R., Kaltenecker, L., et al, The Ground-based European Nulling Interferometry Experiment (Darwin-GENIE), ESA SP-539, 2003, p. 121 - 131

Karlsson, A., Kaltenecker, L., The technology of Darwin, ESA SP-539, 2003, p. 41 - 46

Absil, O, Karlsson, A, Kaltenecker, L, Inherent modulation: a fast chopping method for nulling interferometry, Interferometry in Space. SPIE4852, pp. 431-442 (2003).

Fridlund, M, Kaltenecker, L, ESA's search for extra-solar terrestrial planets: mission update of the Darwin project, ESA SP-518, ISBN92-9092-828-X, 2002, p.359–364

Internal ESA reports Co-author: Assessment reports on different proposed Darwin configuration, Systematic noise problems, Emma design, Emma star catalogue, etc.

PUBLIC ARTICLES AND BOOK CHAPTERS

Kaltenecker, L., Earth's evolution and how to detect it on an Earth-analog from space, Mercury Magazine, Feb 2007

Kaltenecker, L. & Selsis, F., Biomarkers set in context, in Extrasolar Planets, Wiley-VCH, 2007

Fridlund, M & Kaltenecker, L., Design and Requirements for Earth-like planet detection, in Extrasolar Planets , Wiley-VCH, 2007

INTERESTS

Rock climbing, salsa, photography, travel, languages, opera, music, reading, skiing, film, kayaking