

Dr. Kyle M Becker

Research Associate and Assistant Professor
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Education

Ph.D. Applied Ocean Sciences, 2002, Massachusetts Institute of Technology and Woods Hole Oceanographic Institution, Joint Program in Oceanography and Oceanographic Engineering.
M.S. Acoustics, 1995, The Pennsylvania State University, Graduate Program in Acoustics.
B.S. Mechanical Engineering, 1991, Boston University

Research Interests and Experience

Statistical characterization of scattering from rough seafloors. Sound propagation in shallow-water waveguides. Adaptation of alternative linear and non-linear signal processing techniques for determining the modal content of propagating fields in waveguides with spatially varying properties. Application of exact mathematical methods for reconstructing ocean sub-bottom velocity profiles. Experienced in both at-sea experiments and numerical modeling with the goal of determining the geoacoustic properties of the seabed from measured acoustic fields.

Current Sponsored Research

Effects of Seabed and Water-Column Variability on Shallow-Water Waveguide Characterization. (Sponsor: Office of Naval Research, Contract No. N00014-04-1-0248)

Characterizing and Modeling the Torpedo Clutter Environment. Co-PI with Dr. Anthony P. Lyons. (Sponsor: Office of Naval Research, Contract No. N00014-03-1-0245)

Modeling the Torpedo Clutter Environment. Co-PI with Dr. Anthony P. Lyons. (Sponsor: Office of Naval Research, Contract No. N00014-00-G-0058)

Hull SONAR acoustic anomaly investigation. Co-Pi with Dr. Gerald C. Lauchle. (Sponsor: ManTech Systems Engineering Corp. for the Naval Surface Warfare Center, Carderock Division, Award No. 30KH0)

Special Research Awards:

ONR Entry-Level Faculty Award in Ocean Acoustics: Geoacoustic inversion for spatially and temporally varying shallow-water environments. (To be awarded CY 2005-2007).

ONR Postdoctoral Fellowship Award in Ocean Acoustics: Methods of Bottom Characterization of Shallow-Water Acoustic Waveguides. (Sponsor: Office of Naval Research, Contract No. N00014-02-1-0334) ended 31/12/03

Teaching Experience

ACS 597K Underwater Acoustic Propagation Modeling – Summer 2004 (new course)

ACS 597A/598K Underwater Acoustics – Spring 2004 (new course)/Fall 2004 (D.E.)

Woods Hole Oceanographic Institution Paul M. Fye Graduate Teaching Fellow – Fall 1997. Performed as teaching assistant for Ocean and Seabed Acoustics I, a graduate level course offered through the department of Ocean Engineering at MIT.

Student Involvement

Faculty advisor Megan S. Dewitt, Graduate Program in Acoustics.

Special member of doctoral candidate Stephen Lutz, Graduate Program in Acoustics.

Provide funding (grant N00014-03-1-0245) and at-sea research experience (Geoclutter 2003, NPAL 2004) for doctoral candidate Shawn F. Johnson, Graduate Program in Acoustics

Professional and Academic Activities

Member Acoustical Society of America (ASA)

Member of technical committee on Underwater Acoustics (ASA)

Member of technical committee on Acoustical Oceanography (ASA)

Acoustical Oceanography Representative to Technical Program Organizational Meeting for 143rd meeting of ASA, Pittsburgh, PA

Session Chair, 2pUW Propagation in Sediments and Inverse Methods, 143rd Meeting of ASA.

Acoustical Oceanography Representative to Technical Program Organizational Meeting for 147th meeting of ASA, New York, NY

Session Chair, 1pAO Geoacoustic Inversion, 147th Meeting of ASA.

Coordinator: Best Student Paper in Underwater Acoustics Award, 147th meeting of ASA

Student Representative, MIT/WHOI Joint Program in Oceanography/Ocean Engineering

Tau Beta Pi National Engineering Honor Society

Fieldwork

MOMAX Cruise, March 1997, R/V Oceanus Chief Scientist: G.V. Frisk (WHOI)

LWAD 99-1, February 1999, R/V Gyre, Chief Scientist: J. F. McEachern

FORA shakedown test, May 2002, R/V Oceanus, Chief Scientist: J.R. Preston (PSU)

T-Mast-02, July 2002, R/V Knorr, Chief Scientist: J. Hanson

Geoclutter, April/May 2003, R/Vs Oceanus and Cape Henlopen, Chief Scientist: N. Makris (MIT)

BASSEX, Sept/Oct. 2004, R/V Roger Revelle, Chief Scientist: Prof. A.B. Baggeroer (MIT)

Publications and Proceedings

K.M. Becker, "Effect of Various Surface Height Distribution Properties on Acoustic Backscattering Statistics", IEEE J. Oceanic Eng. special issue on Non-Rayleigh Reverberation and Clutter. 29(2), (April 2004).

D.A. Abraham, A.P. Lyons, and K.M. Becker, "The Effect of Multipath on Reverberation Envelope Statistics," to appear in *Proceedings of the Seventh European Conference on Underwater Acoustics, ECUA 2004*, Delft, The Netherlands, (5-8 July, 2004).

K.M. Becker and J.R. Preston, "The ONR Five Octave Research Array (FORA) at Penn State," Proceedings of the Oceans 2003 Marine Technology and Science Conference, San Diego, CA (September 2003).

K.M. Becker, G.V. Frisk, and S.D. Rajan, "Application of Modal Inverse Techniques to the ONR/SPAWAR Inverse Techniques Workshop Data," IEEE J. Oceanic Eng., 28(3), (July 2003).

K.M. Becker and G.V. Frisk, "A study on the effects of sound speed fluctuations due to internal waves in shallow water on horizontal wavenumber estimation", in *Impact of Environmental Variability on Acoustic Predictions and Sonar Performance*, eds F. Jensen, Kluwer, pp 385-392 (2002).

G.V. Frisk, L.L. Souza, and K.M. Becker, "Application of the Gelfand-Levitan Method to Inverse Problems in Seabed Acoustics," *Proceedings of the 2001 SIAM Annual Meeting*, San Diego, CA, (9-13 July 2001).

G.V. Frisk, K.M. Becker and J.A. Doust, "Modal Mapping in Shallow Water Using Synthetic Aperture Horizontal Arrays", *Proceeding Oceans*, 2000 MTS/IEEE Conference and Exhibition, Providence, RI, (11-14 September 2000).

G.V. Frisk and K.M. Becker, "Modal Evolution and Inversion in Laterally Varying Shallow-Water Waveguides", *Proceeding of the International Conference on Acoustics, Noise and Vibration*, Montreal, Quebec, Canada 8-12 August 2000

+K.M. Becker and G.V. Frisk, "Wavenumber Extraction Techniques for a Three-Dimensionally Varying Shallow Water Waveguide: A Comparison", *Proceeding of the 16th International Congress On Acoustics*, 135th meeting of the Acoustical Society of America, Seattle, WA, June 1998

G.V. Frisk, K.M. Becker, L.N. Connor, J.A. Doust, and C.J. Sellers "High-Resolution, Three-Dimensional Measurements of Low-Frequency Sound Propagation in Shallow Water", *Proceeding of the 16th International Congress On Acoustics*, 135th meeting of the Acoustical Society of America, Seattle, WA, June 1998

K.M. Becker, "The Amateur Scientist: Scanning Underwater Surfaces," *Scientific American*, Vol. 271 (2), August 1994, pp 90-93.

Presentations

C. Barber and K.M. Becker, "Issues for improved characterization of the acoustic field due to radiated noise of ships in shallow water environments," 148th meeting of the Acoustical Society of America, San Diego, CA (15-19 November 2004).

K.M. Becker, "Accounting for bias in horizontal wavenumber estimates due to source motion", *Acoustic Inversion Methods and Experiments for Assessment of the Shallow Water Environment*, 2nd workshop, Ischia, Italy (28-30 June 2004).

K.M. Becker, "Effects of sound speed fluctuations in the water column on geoacoustic parameter estimates". 147th meeting of the Acoustical Society of America, New York, NY (24-28 May 2004).

K.M. Becker and G.V. Frisk, "Modal inverse methods: An overview," 145th meeting of the Acoustical Society of America, Nashville, TN (28 April-2 May 2003).

G.V. Frisk and K.M. Becker, "Evidence for single-mode propagation and its implications for range-dependent geoacoustic inversion in the SWAT experiment," *First Pan-American/Iberian Meeting on Acoustics and 144th meeting of the Acoustical Society of America*, Cancun, Mexico (2-6 December 2002).

L.L. Souza, G.V. Frisk, and K.M. Becker, "Range-dependent modal eigenvalue estimation in the SWAT experiment," *First Pan-American/Iberian Meeting on Acoustics and 144th meeting of the Acoustical Society of America*, Cancun, Mexico (2-6 December 2002).

G.V. Frisk, L.L. Souza, and K.M. Becker, "Application of the Gelfand-Levitan Method of inversion for the sound velocity profile in the seabed: theory and experiment," *First International Conference "Inverse Problems: Modeling and Simulation"*, Fethiye, TURKEY, 14-21 July 2002.

K.M. Becker and G.V. Frisk, "Evaluation of an autoregressive spectral estimation technique for determining horizontal wave-number content in shallow water," 143rd meeting of the Acoustical Society of America, Pittsburgh, PA 3-7 June 2002

+K.M. Becker and G.V. Frisk, "Modal mapping in range and azimuth for shallow-water waveguides," 141st meeting of the Acoustical Society of America, Chicago, IL 4-8 June 2001.

K.M. Becker and G.V. Frisk, "Application of the Gelfand-Levitan method to geoacoustic inversion in shallow water," 140th meeting of the Acoustical Society of America, Newport Beach, CA 3-8 December 2000.

+K.M. Becker, G.V. Frisk, and S.D. Rajan, "Geoacoustic inversion results from the modal mapping experiment," 139th meeting of the Acoustical Society of America, Atlanta, GA 30 May-3 June 2000.

+L.L. Souza, K.M. Becker, and G.V. Frisk, "Practical approaches for utilizing the plane-wave reflection coefficient as input data for inferring geoacoustic properties of the seabed," 139th meeting of the Acoustical Society of America, Atlanta, GA 30 May-3 June 2000.

K.M. Becker and G.V. Frisk, "High-resolution modal mapping in a complex shallow-water environment," 2nd convention of the European Acoustics Association: Forum Acusticum 99 and 137th Regular meeting of the Acoustical Society of America, Berlin, Germany, 15 - 19 March 1999

+K.M. Becker, G.V. Frisk, and L.N. Connor, "Modal evolution in a three-dimensionally varying shallow water waveguide," 134th meeting of the Acoustical Society of America, San Diego, CA 1-5 December 1997.

L.N. Connor, G.V. Frisk, K.M. Becker, and C.J. Sellers, "Two- dimensional acoustic field measurements in a complex, shallow-water waveguide," 134th meeting of the Acoustical Society of America, San Diego, CA 1-5 December 1997.

K.M. Becker, G.V. Frisk, L.N. Connor, and B.J. Doust, "Three- dimensional modal mapping in shallow water using simulated acoustic field data," 133rd meeting of the Acoustical Society of America, State College, PA 15-20 June 1997.

G.V. Frisk, L.N. Connor, K.M. Becker, and B.J. Doust, "Modal mapping in a complex shallow water environment," 133rd meeting of the Acoustical Society of America, State College, PA, 15-20 June 1997.

K.M. Becker, "Effect of surface height distributions on underwater acoustic backscattering statistics," 129th meeting of the Acoustical Society of America, Washington DC, 30 May - 3 June 1995.

K.M. Becker, "Five-axis programmable positioning system for underwater acoustic measurements at Penn State," 128th meeting of the Acoustical Society of America, Austin, TX, 28 November - 2 December 1994.

+ indicates Best Student Paper Award

Employment

Research Associate, Acoustics Group, Pennsylvania State University, Applied Research Laboratory, State College, PA (October 2001-Present)

Graduate Research Associate, Woods Hole Oceanographic Institution, Woods Hole, MA (June 1995 - October 2001)

Acoustical Consultant, Sentech, Inc., Stoneham, MA (July 1998-June 2001)

Graduate Research Associate, Pennsylvania State University, Applied Research Laboratory, State College, PA (January 1992 - June 1995)