

COLLEGE OF ARTS AND SCIENCE
CURRICULUM VITAE

General Data

Name:	Kendall L. Carder
Initial Date of USF Employment/	October 1, 1969
Present Rank:	Professor (9-14-79)
Tenured:	September 13, 1974

Education

<u>Institution</u>	<u>Field of Study</u>	<u>Degree</u>	<u>Date</u>
Fresno State College	Physics	B.S.	1964
Oregon State University	Oceanography	M.S.	1967
Oregon State University	Oceanography	Ph.D.	1970

Employment

1982-Present Professor, Department of Marine Science, University of South Florida.
1980-1982 Ocean Productivity Program Manager and Acting Polar Program Manager, NASA Headquarters, Washington, D.C.
1979-1980 Professor, Department of Marine Science, University of South Florida.
1974-1979 Associate Professor, Department of Marine Science, University of South Florida.
1969-1974 Assistant Professor, Department of Marine Science, University of South Florida.
1965-1969 Research Assistant, School of Oceanography, Oregon State University.
1964-1965 Teaching Assistant, Physics Department, Oregon State University.

Areas of Specialization

Optical Oceanography: Optical measures of ocean particle concentrations and properties.
Ocean Remote Sensing from space: quantification of chlorophyll, turbidity, bathymetry, red tides
Particle Dynamics: Factors affecting particle size, density, settling speeds, and shape.
Particle Size Distributions: Factors influencing the vertical and horizontal oceanic distribution of suspended particles and their effect on the submarine light field.
Relative indices of refraction of marine particles.
In situ holographic microscopy and particle velocimetry
Ocean remote sensing for optical properties, chlorophyll, harmful algal blooms, colored dissolved organic matter, shallow-water bathymetry and bottom albedo
Three-dimensional optical modeling of entire marine environments
Optical communication
Active and passive camouflaging and detection of underwater objects

Honors and Awards

Valedictorian, McLane High School, Fresno, California, 1960.
Arakelian Foundation Scholarship, Fresno State College, 1961-62.
Participated in the Fifteenth General Assembly of the International Association for the Physical Sciences of the Ocean, Tokyo, Japan, September 13-25, 1970.
One of 40 international scientists invited to participate in the International Association for the

Physical Sciences of the Ocean Symposium - "Optical Aspects of Oceanography, Copenhagen, Denmark, June 19-23, 1972.

Chosen by United States Navy and Office of Naval Research in November, 1972, to be among first group of United States oceanographers to use Navy's deep-diving nuclear submersible. One of 30 international scientists invited to participate in the symposium "Suspended Solids in Water" sponsored by the Office of Naval Research in Santa Barbara, California, March 20-22, 1973.

Participated in the Sixteenth General Assembly of the International Union of Geodesy and Geophysics, Grenoble, France, August 25 - September 6, 1975.

Participated in the CICAR II International Symposium on the Caribbean held in Caracas, Venezuela, July 1976.

Invited to participate in High Energy Benthic Boundary Layer Experiment Workshop sponsored by Office of Naval Research, Keystone, Colorado, March 19-24, 1979.

Invited to participate in NOAA/AOML Workshop on the Gulf of Mexico, Miami, Florida, October 1-5, 1979.

Invited to participate in NASA's Imaging Spectrometry Science Advisory Group Meeting at the Jet Propulsion Laboratory, Pasadena, California, April 30, 1985.

Selected as a member of the NASA/EOS High Resolution Imaging Spectrometer Facility Team, 1989.

Selected as a member of the NASA/EOS Moderate Resolution Imaging Spectrometer Facility Team, 1989.

Selected as **USF's Faculty Researcher of the Year by the USF Chapter of Sigma Xi**, the Scientific Research Society, 1991-92.

Invited and funded to present two lectures at Ocean University, Xingdao, China, 11-13 October 1996.

Received one of the **USF Outstanding Research Achievement Awards in 2003**, the inaugural year for such awards

Received **2003 NASA Goddard Space Flight Center Group Achievement Award for "Outstanding Teamwork"** as part of the Earth Observing System (EOS) Aqua Mission Team (May 16, 2003)

Received the **2003 National Aeronautics and Space Administration Group Achievement Award as part of the Aqua Mission Team** (August 27, 2003);

Received the **2003 NASA Certificate of Recognition for the creative development of technically significant software entitled "Ocean Processing Software for NASA: Moderate Resolution Imaging Spectrometer: Combined Ocean Color"** (August 23, 2003);

Received **Alan Berman NRL Award in 2004** for Lee, Z.P. and K.L. Carder, "Absorption spectrum of phytoplankton pigments derived from hyperspectral remote-sensing reflectance", *Remote Sens. Environ.* 89: 361-368.

Received for **2004 the Award for Excellence in Teaching and Mentorship at the Master's Level as Major Professor for Jennifer Patch Cannizzaro, 2004 Outstanding Thesis Recipient**

National/International Scientific Advisory Groups

Member of NASA's Imaging Spectrometer Science Advisory Group.

Member of NASA's Ocean Color Science Working Group.
 Member of NASA/EOS High Resolution Imaging Spectrometer (HIRIS) Facility Team (spacecraft sensor).
 Member of NASA/EOS Moderate Resolution Imaging Spectrometer (MODIS) Facility Team for Terra and Aqua spacecraft sensors
 Member of NSF/National Research Council's Minority Graduate Fellowship Evaluation Panel in Biological Sciences.
 Member, NSF, JGOFS Panel.
 Member, ONR Marine Light-Mixed Layer Science Advisory Group.
 Member, NASA's SPARMOWG Aircraft Science Working Group.
 USF Research of the Year 1992, Sigma Xi.
 Member, ONR "Significant Interactions Governing Marine Aggregation" Science Advisory Group.
 Member, NOAA Advisory Workshop on Coastal Remote Sensing.
 Member, Japan's ADEOS (Advanced Earth Observing Satellite) OCTS (Ocean Color and Temperature Scanner Science Team, Nippon Aeronautics and Space Development Agency (NASDA).
 Member, Taiwan's Ocean Color Imager Science Team.
 Session Chairman for Radiometry of the Atmosphere and Ocean, COSPAR Symposium "Space Remote Sensing of Subtropical Oceans, Taipei, Taiwan. March 1994
 Member, NASA/TRW Science Team for the Hyper-Spectral Imager (HSI) to fly on the Lewis spacecraft, Summer 1996.

National Scientific Advisory Groups (Current)

Member of NASA's Ocean Color Science Working Group.
 Member of NASA's SeaWiFS Ad Hoc Science Advisory Group (spacecraft sensor).
 Member of NASA/EOS Moderate Resolution Imaging Spectrometer Facility Team (spacecraft sensor).

Other Professional or Related Activities (Previous)

1964-1969 Over 80 days of cruise experience on *R/V YAQUINA*.
 1970 Co-investigator on *USCGS ROCKAWAY* during July and August from New York to Tangier.
 1972 Co-investigator of *R/V TRIDENT* cruise 111 and 112 from Barbados to Dakar, Senegal, and then to Monrovia, Liberia, January - March, 1972.
 1972 Co-investigator on *R/V TRIDENT* cruise 127 from Vera Cruz, Mexico, to Miami, Florida, November - December 1972.
 1973 Co-investigator on *R/V TRIDENT* cruise 131 from Puerto Rico to Puerto Rico, February - March 1973.
 1974 Chief Scientist on *R/V TRIDENT* cruise 158 from Georgetown, Guyana, to Bridgetown, Barbados, October 1974.
 1974 Chief scientist on *R/V TRIDENT* cruise 159 from Bridgetown, Barbados to St. Thomas, November 1974.
 1977 Co-investigator on *R/V GYRE* cruise 77-78 from Barranquilla, Columbia to St. Petersburg, Florida, August 1977.

- 1980 Co-investigator on the *R/V RESEARCHER* cruise to the Sargasso, Miami to Miami, June 1980.
- 1980 Chaired "Oceanic Lidar" Workshop, NASA Goddard, Beltsville, Maryland, November 14-15, 1980.
- 1981 Organized and a member of NASA's ad hoc Lidar Science Committee chaired by John Steele (WHOI).
- 1981-1982 Program Scientist for the NIMBUS-7 Coastal Zone Color Scanner.
- 1981-1982 Program Scientist for the NIMBUS-7 Scanning Multifrequency Microwave Radiometer.
- 1981-1983 Organized and a member of NASA's Satellite Ocean Color Science Working Group chaired by John Walsh (BNL).
- 1982 Organized NASA's DMSP/SSMI Sea Ice Science Working Group chaired by Norbert Untersteiner (University of Washington).
- 1982 Initiated NASA's Satellite Derived Sea Surface Temperature Intercomparison Workshop chaired by Eni Njoku (JPL).
- 1982 Participated in ONR Advisory Group Meeting on Bioluminescence and Optics, Berkeley, California, December 5-6, 1982.
- 1982 Convener of Session on Deep Sea Sedimentation II, AGU Fall Meeting, San Francisco, California, December 8, 1982.
- 1983 Participated in NSF/NRC Minority Graduate Fellowship Evaluation Panel in Biological Sciences, Washington, D.C., February 10-12, 1983.
- 1983 Participated in Ocean Color Science Working Group Workshop, NASA/Goddard, Maryland, July 7-9, 1983.
- 1984 Appointed to Algorithm Development Subcommittee of Ocean Color Science Working Group, NASA.
- 1984 Participated in NASA Ocean Color Science Working Group Workshop, New Orleans, Louisiana, January 25, 1984.
- 1984 Served as member on the NSF/National Research Council's Minority Graduate Fellowship Evaluation Panel in Biological Sciences, Washington, D.C., February 23-24, 1984.
- 1984 Participated in NASA Ocean Color Group Science Meeting, Ft. Lauderdale, Florida, November 29-30, 1984.
- 1984 Appointed as consultant to and member of NASA Imaging Spectrometer Science Advisory Group.
- 1985 Served as member on the NSF/NRC Minority Graduate Fellowship Evaluation Panel, Washington, D.C., February 20-21, 1985.
- 1985 Chaired the Oceans and Inland Waters subcommittee writing the science requirements for NASA's next generation of high resolution ocean and land viewing remote-sensing satellite sensors (meetings in April/ May and October, 1985, and February 1986).
- 1986 Chaired the NSF Minority Graduate Fellowship Panel for Biological Sciences in Washington, D.C., February 10-14, 1986.
- 1986 Participated in NASA's Ocean Color Science Working Group Workshop planning ocean color remote sensing science objectives for the next decade at Sterling Forest, N.Y., May 5-8, 1986.
- 1986 Member of NASA's Imaging Spectrometer Science Advisory group providing

- science requirements for the High Resolution Imaging Spectrometer (HIRIS).
- 1986 Rapporteur of the Optical Instrumentation Panel of ONR's Marine Aggregate Dynamics Workshop in Monterey, California, September 24-27, 1986.
- 1987 Invited to participate in the NASA/EOSAT SeaWiFS Working Group to define the characteristics of a wide field ocean color sensor on LANDSAT 6.
- 1987-1990 Member of NASA's Imaging Spectrometer Science Advisory Group.
- 1987 Member of NASA's Ocean Color Science Working Group (see above).
- 1988 Participated in SeaWiFS Prelaunch Science Working Group Meeting, Columbia, Maryland, October 12-14, 1988.
- 1988-2000 Member of NASA's Sea-WiFS Science Team (spacecraft sensor).
- 1989-2001 Selected as a member of the NASA/EOS Moderate Resolution Imaging Spectrometer (MODIS) Facility Team (spacecraft sensor).
- 1989-1996 Selected as a member of the NASA/EOS High Resolution Imaging Spectrometer (HIRIS) Facility Team (spacecraft sensor).
- 1990 NSF, JGOFS Panel Member, Fall '90.
- 1990-1993 Member of ONR Marine Light-Mixed Layer Science Advisory Group.
- 1991 Participant on MLML Cruise '91 on *R/V Endeavor* May-June. Cruise from Iceland to Narragansett, RI.
- 1992-1994 Member of NASA's SPARMOWG Aircraft Science Working Group.
- 1992-2000 Member of U.S./Japan Ocean Color Advisory Group on Space Remote Sensing.
- 1992-1996 Member of ONR "Significant Interactions Governing Marine Aggregation" Science Advisory Group.
- 1994 Member NOAA Advisory Workshop on Coastal Remote Sensing. Invited.
- 1994 External Review Panel for Naval Research Laboratory's 6.1 Basic Research Program. (Washington, DC).
- 1994 Participated in South Carolina Sea Grant Consortium. Invited presentation on remote sensing of interfaces.
- 1995 External Review Panel for Naval Research Laboratory's 6.1 Basic Research Program. (Washington, DC).
- 1994-1998 Member of Japan's ADEOS (Advanced Earth Observing Satellite) OCTS (Ocean Color and Temperature Scanner) Science Team, Nippon Aeronautics and Space Development Agency (NASDA).
- 1995-1998 Invited Member of Taiwan's Ocean Color Imager Science Team.
- 1995 Session Chairman for Radiometry of the Atmosphere and Ocean, COSPAR Symposium "Space Remote Sensing of Subtropical Oceans (SRSSO)", Taipei, Taiwan.
- 1995-1998 Invited Member of the NASA/TRW Science Team for the Hyperspectral Imager (HSI) to fly on the Lewis spacecraft.
- 1996-1999 Member, ONR's Coastal Benthic Optical Properties (COBOP) Steering Committee.
- 1999 External Review Panel for Naval Research Laboratory 6.1 Basic Research Program in Oceanography (Stennis Flight Center, MS).
- 1997-2000 Member, ONR's Coastal Benthic Optical Properties (COBOP) Steering Committee
- 1996-2000 Member, Instrument Team for NASA's Landsat Satellite
- 1969-present Member of American Geophysical Union, Optical Society of America

Professional Organizations and Offices

American Geophysical Union
Optical Society of America
Sigma Xi
American Society of Photogrammetry and Remote Sensing

Major Civic and Public Service Activities

President, Bay Area Alumni Chapter of Sigma Chi, 1978
Member, Pier Park Aquarium Committee, 1982-1983
Vice President, Sertoma International, St. Petersburg Chapter, 1984-1985
President, St. Petersburg Sertoma Club, 1986-1987
President-Elect, St. Petersburg Sertoma Club, 2007-2008
Pastor - Parish Committee, Riviera Methodist Church

University, College, Departmental, or SUS Councils or Committees

Previous

Policy and Procedure for College Distribution of Indirect Cost Funds (Ad Hoc)
Curriculum Committee, Department of Marine Science
Ship Committee, Department of Marine Science
Chairman, Marine Science Computer Committee
USF Research Council
Promotion and Tenure Committee
Admissions and Awards Committee
Chairman, Promotion and Tenure Committee, Department of Marine Science
Budget Committee, Department of Marine Science
Member, Tenure Committee, College of Arts and Sciences
Chairman, Faculty Recruiting Committee, Department of Marine Science
Member, Personnel Committee (including creden./joint appt.)
Chair, Dean Search, College of Marine Science

Current

Computer Committee, Department of Marine Science
Member, Tenure and Promotion Committee, Department of Marine Science
Member, Personnel Committee, Department of Marine Science

Research and Creative Activities

Patents

- Utility Patent Application (August 25, 2004) upgrading Provisional Patent Application 60/497,666 by USF for P.N. Reinersman and K.L. Carder for *Method and Program Product for Determining a Radiance Field in an Optical Environment*
- Utility Patent Application 10/815,489 (April 1, 2004) by USF for Kaltenbacher et al. (w. K.L. Carder) for *A 3-D Imaging System*.

- Provisional Patent Application USF Ref. No.: 07A063PR (July 24, 2007) for Reinersman, Carder, and Costello for *Monochromatic Contrast Reduction of Objects*.

Publications - Books

- Carder, K. L., 1970. Particles in the eastern equatorial Pacific Ocean, their distribution and effect upon optical parameters. University Microfilms, Ann Arbor, Michigan.
- Carder, K. L. (ed.). 1981. *Oceanic Lidar*, NASA Conf. Publ. 2194, 33 pp.
- Spinrad, R., K. L. Carder, and M. J. Perry (eds.). 1994. *Ocean Optics*, Oxford University Press, London, 283 pp.

Publications - Articles in Refereed Publications

- Neshyba, S., G. F. Beardsley, Jr., V. T. Neal, and K. L. Carder, 1968. Light scattering in the central Arctic Ocean: some winter profiles. *Science* 162: 1267-1268.
- Beardsley, G. F., Jr., H. Pak, K. L. Carder and B. Lundgren, 1970. Light scattering and suspended particles in the eastern equatorial Pacific Ocean. *J. Geophys. Res.* 75(15):2837-2845.
- Carder, K. L., G. F. Beardsley, Jr., and H. Pak, 1971. Particle size distributions in the eastern equatorial Pacific. *J. Geophys. Res.* 76(21):5070-5077.
- Carder, K. L., R. D. Tomlinson and G. F. Beardsley, Jr., 1972. A technique for the estimation of indices of refraction of marine phytoplankters. *Limnol. Oceanogr.* 17(6):833-839.
- Carder, K. L. and F. C. Schlemmer, II, 1973. The distribution of particles in the eastern Gulf of Mexico: an indicator of circulation. *J. Geophys. Res.* 78(27):6286-6299.
- Carder, K. L., K. A. Fanning, P. R. Betzer and V. Maynard, 1977. Dissolved silica and the circulation in the Yucatan Strait and deep eastern Gulf of Mexico. *Deep-Sea Res.* 4(12):1149-1160.
- Lerman, A., K. L. Carder, and P. R. Betzer, 1977. Elimination of fine suspensoids in the oceanic water column. *Earth and Planet. Sci. Let.* 37:60-70.
- McMaster, R. L., P. R. Betzer, K. L. Carder, L. Miller, and D. W. Eggimann, 1977. Suspended particle mineralogy, water masses, and bottom currents on the west African Shelf. *Deep-Sea Res.* 24:651-665.
- Carder, K. L. 1978. A holographic micro-velocimeter for studying the dynamics of ocean particles. *Opt. Eng.* 18(5):524-525.
- Gartner, J. A., and K. L. Carder, 1979. A method to determine specific gravity of suspended particles using an electronic particle counter. *J. Sed. Pet.* 49(2):631-633.
- Haddad, K., and K. L. Carder, 1979. The 1978 Red Tide bloom on the west coast of Florida. *Coastal Ocean. Climat. News* 1(2):15.
- Haddad, K. D., and K. L. Carder, 1979. Intrusion of Loop water onto the West Florida Shelf: one possible initiation mechanism of *Gymnodinium breve* blooms. In: *Proceedings of the Second International Conference on Toxic Dinoflagellate Blooms*, D. L. Taylor (ed.), Elsevier, New York, pp. 269-274.
- Carder, K. L. and D. J. Meyers, 1980. Holography of settling particles: shape parameters. *Opt. Eng.* 19(5):734-738.
- Eggimann, D. W., P. R. Betzer, and K. L. Carder, 1980. Particle transport from the west African shelves of Liberia and Sierra Leone to the deep sea: A chemical approach. *Mar. Chem.* 9:283-306.
- Carder, K. L., R. G. Steward, and P. R. Betzer, 1982. In situ holographic measurements of the

- sizes and settling rates of oceanic particulates. *J. Geophys. Res.* 87(C8):5681-5685.
- Fanning, K. A., K. L. Carder, and P. R. Betzer, 1982. Sediment re-suspension by coastal waters: a potential mechanism for nutrient re-cycling on the ocean's margins. *Deep-Sea Res.* 29(8A):953-965.
- Doyle, L. J., K. L. Carder and R. G. Steward, 1983. The hydraulic equivalence of mica. *J. Sed. Petr.*, 53(2):0643-0648.
- Payne, P. R., K. L. Carder and R. G. Steward, 1984. Image Analysis Techniques for Holograms of Dynamic Oceanic Particles. *Applied Optics* (23):204-210.
- Carder, K. L. and R. G. Steward, 1985. A Remote-Sensing Reflectance Model of the Red Tide Dinoflagellate off West Florida. *Limnol. Oceanogr.* 30:288-300.
- Carder, K. L., R. G. Steward and P. R. Payne. 1985. A Solid-State Spectral Transmissometer and Radiometer. *Opt. Eng.* 24(5):863-868.
- Carder, K. L., R. G. Steward, P. R. Betzer, D. L. Johnson, and J. M. Prospero. 1986. Dynamics and composition of particles from an aeolian input event to the Sargasso Sea. *J. Geophys. Res. (Atmospheres)*. 91(D1):1055-1066.
- Doyle, L. J., K. L. Carder, and R. G. Steward, 1985. The hydraulic equivalence of Mica-Reply. *J. Sed. Petrol.* 55:293-294.
- Carder, K. L., R. G. Steward, H. H. Paul and G. A. Vargo. 1986. Relationships between chlorophyll and ocean color constituents as they affect remote sensing reflectance models. *Limnol. Oceanogr.* 31(2):403-413.
- Vargo, G. A., K. L. Carder, W. Gregg, E. Shanley, C. Heil, K. A. Steidinger, and K. D. Haddad. 1987. The potential contribution of primary production by red-tides to the West Florida shelf ecosystem. *Limnol. Oceanogr.* 32(3): 762-767.
- Betzer, P. R., K. L. Carder, R. A. Duce, J. T. Merrill, N. W. Tindale, M. Uematsu, D. K. Costello, R. W. Young, R. A. Feely, J. A. Breland, R. E. Bernstein, and A. M. Greco. 1988. Long-range transport of giant mineral aerosol particles. *Nature* 336:54-56
- Betzer, P. R., K. L. Carder, M. Uematsu, R. A. Duce, J. Merrill, D. Costello, R. W. Young, R. A. Feely, J. A. Breland, N. Tindale, R. E. Bernstein, and A. M. Greco. 1988. A pulse of Asian Dust to the central North Pacific: Long range transport of giant mineral aerosols. *Nature*, 336(6199):568-571.
- Carder, K. L., R. G. Steward, G. Harvey, and P. Ortner. 1989. Marine humic and fulvic acids: Their effects on remote sensing of ocean chlorophyll. *Limnol. Oceanogr.* 34(1):68-81.
- Laws, E. A., G. R. Ditullio, P. R. Betzer, D. M. Karl, and K. L. Carder. 1989. Autotrophic production and elemental fluxes at 26°N 155°N in the North Pacific subtropical gyre, *Deep-Sea Res.* 36(1):103-120.
- Roesler, C.S., M.J. Perry, and K.L. Carder, 1989. Modeling *in situ* phytoplankton absorption from the total absorption spectra from productive inland marine waters, *Limnol. Oceanogr.* 34: 1510-1523.
- Costello, D. K., K. L. Carder, P. R. Betzer, and R. W. Young. 1989. In situ holographic imaging of settling particles. Applications for individual particle dynamics and ocean flux measurements. *Deep-Sea Res.* 36:1595-1605.
- Gregg, W. W., and K. L. Carder, 1990. A simple spectral solar irradiance model for cloudless maritime atmosphere. *Limnol. Oceanog.* 35(8):1657-1675.
- Laws, E. A., G. R. DiTullio, K. L. Carder, P. R. Betzer, and S. Hawes. 1990. Primary productivity in the deep blue sea. *Deep-Sea Res.* 37:715-730.
- Carder, K. L., W. W. Gregg, D. K. Costello, R. Haddad, and J. M. Prospero, 1991.

- Determination of Saharan dust radiance and chlorophyll from CZCS imagery. *J. Geophys. Res.* 96 (D3):5369-5378.
- Young, R. W., K. L. Carder, P. R. Betzer, D. K. Costello, R. A. Duce, G. R. Ditullio, N. W. Tindale, E. A. Laws, M. Uematsu, J. T. Merrill, and R. A. Feely, 1991. Atmospheric iron inputs and primary productivity: phytoplankton responses in the North Pacific. *Global Biogeochemical Cycles*, 5(2):119-134.
- Carder, K. L., S. K. Hawes, K. A. Baker, R. C. Smith, R. G. Steward, and B. G. Mitchell, 1991. Reflectance model for quantifying chlorophyll *a* in the presence of productivity degradation products. *J. Geophys. Res.* 96, No. C11:20,599-611.
- Walsh, J. J., K. L. Carder, and F. E. Müller-Karger. 1992. Meridional fluxes of dissolved organic matter in the North Atlantic Ocean. *J. Geophys. Res.* 97, 15,625-15,637.
- Hamilton, M., C. O. Davis, S. H. Pilon, W. J. Rhea, and K. L. Carder. 1993. Examination of chlorophyll distribution in Lake Tahoe, using Airborne Visible and Infra-Red Imaging Spectrometer (AVIRIS). *Remote Sensing of the Environment*, Special Issue on Imaging Spectrometry, G. Vane, ed., 44:217-230
- Carder, K. L., P. Reinersman, R. F. Chen, F. Müller-Karger, C. O. Davis, and M. Hamilton. 1993. AVIRIS calibration and application in coastal oceanic environments. *Remote Sensing of the Environment*, Special Issue on Imaging Spectrometry, G. Vane, ed. 44:205-216.
- Carder, K.L., R.G. Steward, R.F. Chen, S. Hawes, Z. Lee and C.O. Davis, 1993. AVIRIS calibration and application in coastal ocean environments: Tracers of soluble and particulate constituents of the Tampa Bay coastal plume, *Photogram. Engin. Remote Sens.*59(3):339-344.
- Carder, K.L., and D.K. Costello. 1994. Optical effects of large particles. In: *Ocean Optics*, Spinrad, Carder, Perry, eds. Oxford University Press, London, p. 243-257.
- Spinrad, R., K.L. Carder and M.J. Perry, (eds.). *Ocean Optics*, Oxford University Press, London, 283 pp.
- Lee, Z., K. L. Carder, S. K. Hawes, R. G. Steward, T. G. Peacock, and C. O. Davis. 1994. A model for interpretation of hyperspectral remote sensing reflectance. *Applied Optics*, Vol.33(24), 5721-32.
- Carder, K.L., Z.P. Lee, J. Marra, R.G. Steward, and M.J. Perry. 1995. Calculated quantum yield of photosynthesis of phytoplankton in the marine light-mixed layers (59°N/21°W). *JGR-Oceans* 100, 6655-6663.
- Costello, D.K., K.L. Carder, and W. Hou. 1995. Aggregation of a diatom bloom in a mesocosm: bulk and individual-particle optical measurements. *Deep-Sea Research* 42, 29-45.
- Reinersman, P. and K.L. Carder. 1995. Monte Carlo simulation of the atmospheric point spread function with application to correction for adjacency effect. *Applied Optics* Vol. 34, 4453-4471.
- Hochman, H.T., J.J. Walsh, K.L. Carder, A. Sournia and F.E. Muller-Karger. 1995. Analysis of ocean color components within stratified and well-mixed waters of the western English Channel. *J. Geophys. Res.* 100, 177-10,787.
- Lee, Z.P., K.L. Carder, T.G. Peacock, C.O. Davis, and J.L. Mueller. 1996. A method to derive ocean absorption coefficients from remote-sensing reflectance. *Applied Optics* 35(3), 453-462.
- Lee, Z.P., K.L. Carder, J. Marra, R.G. Steward, and M.J. Perry. 1996. Estimating primary production at depth from remote sensing. *Applied Optics* 35(3), 463-474.
- Bissett, W.P., J.S. Patch, K.L. Carder and Z.P. Lee. 1997. Pigment packaging and chlorophyll *a*-

- specific absorption in high-light oceanic waters. Manuscript revision submitted to *Limnology and Oceanography* 42(5):961-968.
- Pichard, S.L., L. Campbell, K. Carder, J.B. Kang, J. Patch, F.R. Tabita and J.H. Paul. 1997. Analysis of Ribulose Biphosphate Carboxylase Gene Expression in Natural Phytoplankton Communities by group-specific gene probing. *Marine Ecology Prog. Ser.* 149:239-257.
- Esaias, W.E., M.R. Abbott, I. Barton, J.W. Campbell, K.L. Carder, D.K. Clark, R.H. Evans, F.E. Hoge, H.R. Gordon, W.M. Balch, R. Letelier, and P.J. Minnett, 1998. An overview of MODIS capabilities for ocean science observations, *IEEE Trans. GeoSci. And Remote Sens.* 36(4): 1250-1265.
- Reinersman, P.N., K.L. Carder and Feng-I R. Chen. 1998. Satellite-sensor calibration verification with the cloud-shadow method. *Appl. Opt.* (37)24, 5541-5549.
- O'Reilly, J.E., S. Maritorena, B. G. Mitchell, D.A. Siegel, K.L. Carder, S.A. Garver, M. Kahru and C. McClain. 1998. Ocean color chlorophyll algorithms for SeaWiFS. *J. Geophys. Res.* 103, C11, 24-937-24,953.
- Lee, Z., K.L. Carder, C.D. Mobley, R.G. Steward and J.S. Patch. 1998. Hyperspectral Remote Sensing for shallow waters: 1. A semianalytical model. *Appl. Opt.* 37(27), 6329-6338.
- Lee, Z.P., K.L. Carder, R.G. Steward ,T.G. Peacock, C.O. Davis and J.S. Patch. 1998. An empirical algorithm for light absorption in ocean water based on color. *J. Geophys. Res.* 103 (C12); 27,967-27,978.
- Bissett, W.P., J.J. Walsh, D.A. Dieterle, K.L. Carder. 1999. Carbon cycling in the upper waters of the Sargasso Sea: I. Numerical simulation of differential carbon and nitrogen fluxes, *Deep-Sea Res.* (46)2: 205-269.
- Bissett, W.P., K.L. Carder, J.J. Walsh, D.A. Dieterle. 1999. Carbon cycling in the upper waters of the Sargasso Sea: II. Numerical simulation of apparent and inherent optical properties, *Deep-Sea Res.* (46)2: 271-317.
- Carder, K.L., F.R. Chen, Z.P. Lee, S.K. Hawes, D. Kamykowski. 1999. Semianalytic Moderate Resolution Imaging Spectrometer algorithms for chlorophyll a and absorption with bio-optical domains based on nitrate-depletion temperatures. *J. Geophys. Res.* 104(C3): 5403-5421.
- Lee, Z.P., K.L. Carder, C.D. Mobley, R.G. Steward, and J.S. Patch. 1999. Hyperspectral remote sensing for shallow waters: 2. Deriving bottom depths and water properties by optimization. *Appl. Opt.* 38(18), 3831-3843.
- Zhang, M., K.L. Carder, F.E. Muller-Karger, Z.P. Lee, and D.B. Goldgof. 1999. Noise reduction and atmospheric correction for coastal applications of LANDSAT Thematic Mapper Imagery, *Remote Sens. Environ.* 70: 167-180.
- Hu, C., K.L. Carder, and F. Muller-Karger. 2000 Atmospheric correction of SeaWiFS imagery over turbid coastal waters: a practical method, *Remote Sensing Environ.* 74: 195-206.
- Hu, C., K.L. Carder, and F. Muller-Karger. 2000 Atmospheric correction of SeaWiFS imagery: assessment of alternative bands, *Appl. Opt.* 39(21): 3573-3581.
- Ming-Xia, H., Z.Liu, K.Du, L. Li, R. Chen, K.L. Carder, and Z. Lee. 2000. Retrieval of chlorophyll from remote sensing reflectance in the China seas. *Appl. Opt.* 39(15): 2467-2474.
- Lee, Z. and K.L. Carder. 2000. Band-ratio or spectral curvature algorithms for satellite remote sensing? *Appl. Opt.* 39(24): 4377:4380.
- Andrefouet, Serge, F.E. Muller-Karger, E.J. Hochberg, C. Hu, K.L. Carder. 2001. Change detection in shallow coral reef environments using Landsat 7 ETM+ data, *Remote Sensing of the Environment* 78:150-162.

- Lee, Z.P., K.L. Carder, R.F. Chen and T.G. Peacock. 2001. Properties of the water column and bottom derived from AVIRIS data, *J. Geophys. Res.* 106(C-6):11,639-11,651.
- Carder, K.L., D.K. Costello, L.C. Langebrake, W. Hou, J.T. Patten, and E.A. Kaltenbacher, 2001. Real-time AUV data for command, control, and model inputs. *IEEE Jour. of Ocean Eng.* 26(4): 742-751.
- Hu, C., K.L. Carder, F.E. Muller-Karger. 2001. How precise are SeaWiFS ocean color estimates? Implication of digitization-noise errors. *Remote Sensing of the Environment* 76:0034-457.
- Hu, C., F.E. Muller-Karger, S. Andrefouet, K.L. Carder. 2001. Atmospheric Correction and Cross-Calibration of Landsat-7/ETM+ Imagery Over Aquatic Environments: A multiplatform approach using SeaWiFS/MODIS. 2001. *Remote Sensing of the Environment* 78:99-107.
- D'Sa, E.J., C. Hu, F.E. Muller-Karger and K.L. Carder, 2002. Estimation of colored dissolved organic matter and salinity fields in Case 2 waters using SeaWiFS: Examples from Florida Bay and Florida Shelf, *Proc. Indian Acad. Sci. (Earth Planet. Sci.)* 111(3): 197-207.
- Hu, C. and K.L. Carder, 2002. Atmospheric correction for aircraft sensors: Comment on a scheme used for CASI, *Remote Sens. Environ.* 79: 134-137.
- Hu, C., F. Muller-Karger, Z. Lee, K. Carder, et al., 2002. Satellite images track "black water" event off Florida coast, *EOS Trans. Amer. Geophys. Un.* 83(26): 281, 285.
- Lee, Z. P., K. L. Carder and R. Arnone. 2002. Deriving Inherent Optical Water Properties From Water Color: A Multi-Band Quasi-Analytical Approach. *Applied Optics* (41) 27, 5755-5772.
- Lee, Z. P. and K. L. Carder. 2002. Effect of Spectral Band Numbers on the Retrieval of Water Column and Bottom Properties from Ocean Color Data. *Applied Optics* (41) 12, 2191-2201.
- Liu, C. C., K. L. Carder, R. L. Miller and J. E. Ivey, 2002, Fast and accurate model of underwater scalar irradiance. *Applied Optics* (41) 24, 4962-4974.
- Cattrall, C., K.L. Carder, K. Thome, and H. Gordon, 2002. Solar-reflectance-based calibration of spectral radiometers, *Geophys. Res. Lett.* 29(20), 1029-1033.
- Carder, Liu, Costello, Patten, Hou, Davis, accepted. 2003. Illumination and turbidity effects on observing faceted bottom elements with uniform Lambertian albedos, *Limnol. Oceanogr.* 48(1), 355-363.
- Carder, K.L., F.R. Chen, J.P. Cannizzaro, J.W. Campbell, and B.G. Mitchell. (2003). Performance of MODIS semi-analytic ocean color algorithm for chlorophyll-a. *Advances in Space Research*, in press (on-line version published at www.sciencedirect.com).
- Cattrall, C., K.L. Carder, H. Gordon, and K. Thome, 2003. Columnar aerosol single-scattering albedo and phase function retrieved over the ocean by sky radiance: Measurements of Saharan dust, *J. Geophys. Res. (Atmospheres)*108(D9): 4287.
- Hou, W., K.L. Carder, D.K. Costello, K. Du and C.C. Liu, 2003. Using unmanned underwater vehicles as research platforms in coastal ocean studies, *Oceanic and Coastal Sea Research*, vol. 2, pp. 211-217.
- Hu, C. F.E. Muller-Karger, D.L. Biggs, K.L. Carder, B. Nababan, D. Nadeau, and J. Vanderbloemen, 2003. Comparison of ship and satellite bio-optical and physical properties in the Northeastern Gulf of Mexico, *Int. J. Remote Sens.* 24(13): 2597-2612.
- Carder, K.L., F.R. Chen, J.P. Cannizzaro, J.W. Campbell, and B.G. Mitchell, 2004. Performance of the MODIS semi-analytical ocean color algorithm for chlorophyll-a, *Advances in Space Res.*33: 1152-1159.
- Lee, Z.P. and K.L. Carder, 2004. Absorption spectrum of phytoplankton pigments derived from hyperspectral remote-sensing reflectance, *Remote Sens. Environ.*89: 361-368. **Note: Alan**

Berman NRL award winner for 2004.

- Otis, D.B., K.L. Carder, D.C.English, and J.E. Ivey, 2004. CDOM transport from the Bahamas Banks, *Coral Reefs* 23: 152-160.
- Reinersman, P.N. and K.L. Carder, 2004. Hybrid numerical method for solution of the radiative transfer in one, two, or three dimensions, *Applied Optics* 43(13): 2734-2743.
- Lee, Z.P. and K.L. Carder, 2005. Hyperspectral remote sensing. In R.L. Miller (eds), *Remote Sensing of Coastal Aquatic Environments*, Chapt. 8, Springer, Netherlands, pp. 181-204.
- Lee, Z.P., K.L. M. Darecki, K.L. Carder, C.O. Davis, D. Stramski, and W.J. Rhea, 2005. Diffuse attenuation coefficient of downwelling irradiance: An evaluation of remote sensing methods, *J Geophys. Res.* 110(C02017):148-227.
- Cannizzaro, J. P., K. L. Carder, F. R. Chen, J. J. Walsh, Z. Lee, and C. A. Heil. 2004. A Novel Classification Technique for Detection Of Red Tide Blooms in the Gulf of Mexico. [In: Steidinger et al., eds.], Harmful Algae 2002, *Proceedings, Xth International Conference on Harmful Algae*, pp 282-287. [now **published, refereed**; not reported earlier].
- Hu, C., Muller-Karger, F.E., Taylor, C., Carder, K.L., Kelble, C., Johns, E., Heil, C.A. 2005. Red tide detection and tracing using MODIS fluorescence data: A regional example in SW Florida coastal waters. *Remote Sensing of Environment*, 97, 311-321. **R**
- Lee, Z. and Carder, K. L. 2005. Hyperspectral Remote Sensing. In: *Remote Sensing of Coastal Aquatic Environments*, R.L. Miller et al. (eds.). Springer, Netherlands, 181-204. **R**
- Lee, Z., Cdarecki, M., Carder, K.L., David, C.O., Stramski, D. and Rhea, W. J. 2005. Diffuse attenuation coefficient of downwelling irradiance: an evaluation of remote sensing methods. *J. Geophys. Res.* VOL. 110, doi:10.1029/2004JC002573. **R**
- Lenes, J.M., J.J. Walsh, D.B. Otis, and K.L. Carder, 2005. Iron fertilization of Trichodesmium off the west coast of Barbados: A one-dimensional numerical model. *Deep-Sea Res.* 52: 1021-1041. **R**
- Liu, C.-C., R.L. Miller, K.L. Carder, Z.P. Lee, E.J. D'Sa and J.E. Ivey, 2006. Estimating the underwater light field from remote sensing of ocean color. *Journal of Oceanography*, 62(3), pp. 235-248. (SCI) (NSC 94-2611-M-006-002) **R**
- Montes, M.A., Carder, K., Brown, E., Foy, R.J., 2005. Estimating phytoplankton biomass and PAR attenuation in coastal waters of Alaska using airborne remote sensing. *Remote Sensing of Environment* 98(4),481-493. **R**
- Neeley, M.B., E. Bartels, J.P. Cannizzaro, K.L. Carder, P. Coble, D. English, C. Heil, C. Hu, J. Hunt, J. Ivey, G. McRae, E. Mueller, E. Peebles, and K. Steidinger, 2004. Florida's black water event, In: Harmful Algae 2002, Steidinger et al., eds., Florida Marine Research Institute, Florida Institute of Oceanography, UNESCO, St. Petersburg, FL, pp. 377-379. [not reported earlier]. **R**
- Warrior, H. and K.L. Carder, 2005. Production of hypersaline pools in shallow water by evaporation, *Geophys. Res. Lett.* 32, L18604, doi: 10.1029/2005GL023078. **R**
- Cannizzaro, J. and K.L. Carder, 2006. Estimating chlorophyll *a* concentrations from remote sensing reflectance in optically shallow waters, *Remote Sens. Environ.* 101: 13-24. **R**
- Hu, C. Z. Lee, F.E. Muller-Karger, K.L. Carder and J.J. Walsh, 2006. Ocean color reveals phase shift between marine plants and yellow substance, *IEEE Geoscience and Remote Sens. Lett.* 3: 262-266. **R**
- Liu, C.-C., R.L. Miller, K.L. Carder, Z.P. Lee, E.J. D'Sa, J.E. Ivey, and I.-I. Lin, 2006. Estimating the underwater light field from remote sensing of ocean color, *J. Oceanogr.* 62, 235-248. **R**

- English, D.C., and K.L. Carder. 2006. Determining bottom reflectance and water optical properties using unmanned underwater vehicles under clear or cloudy skies, *J. Atmos. and Oceanic Tech.* 23(2): 314-324. **R**
- Montes-Hugo, M.A., M. Vernet, R. Smith, K. Carder, (submitted). Phytoplankton size-structure on the western shelf of the Antarctic Peninsula: A remote sensing approach, *Int. J. Remote Sens.* **R**
- McIntyre, M.L., D.F. Naar, K.L. Carder, B.T. Donahue and D.J. Mallinson, 2006. Coastal bathymetry from hyperspectral remote sensing data: comparisons with high-resolution multi-beam bathymetry, *Mar. Geophys. Res.* 27:129-136. **R**
- Filippi, A. M., K. L. Carder, and C. O. Davis, 2006. Vicarious calibration of the Ocean PHILLS hyperspectral sensor using a coastal tree-shadow method, *Geophysical Research Letters*, VOL. 33, LXXXXX, doi:10.1029/2006GL027073, 2006, **R**
- Lee, Z.P., A. Weidemann, J. Kindle, R. Arnone, K.L. Carder, and C. O. Davis. Submitted. Euphotic zone depth from ocean-color remote sensing: A validation of an IOP-based approach, *J. Geophys. Res.*, **R**
- Davis, C.O., K.L. Carder, B.C. Gao, Z.P. Lee, W.P. Bissett, in press. The development of imaging spectrometry of the coastal ocean, IGAARS. **R**
- J.J. Walsh, J. Jolliff, B. Darrow, J. Lenos, S. Milroy, A. Remsen, D. Dieterle, K. Carder, R. Chen, et al. 2006. Red tides in the Gulf of Mexico: Where, when, and why?, *J. Geophys. Res.* 111(C11003), doi:10.1029/2004JC002813. **R**
- Carder, K.L., Walsh, J.J., Cannizzaro, J.P., Hunting red tides from space. In: King, M., Partington, K., Williams, R. (Eds.), *Our Changing Planet: A View from Space*. Cambridge University Press, Cambridge, UK, November 2007. **R**
- Warrior, H. and K.L. Carder (2007), An optical model for heat and salt budget estimation for shallow seas, *J. Geophys. Res.*, doi:1029/2006JC004057. **R**
- Cannizzaro, J.P., K.L. Carder, F.R. Chen, G.A. Vargo and C.A. Heil. A novel technique for detection of the toxic dinoflagellate, *Karenia brevis*, in the Gulf of Mexico from remotely sensed ocean color data. Kirkpatrick and Walsh (eds) *Contin. Shelf Res.* (in press). **R**
- J.J. Walsh, J.M. Lenos, J.K. Jolliff, S.P. Milroy, B.A. Darrow, D.A. Dieterle, R.H. Weisberg, L. Zheng, K.L. Carder, R. Chen, and C.A. Heil, in revision. Verification of initial conditions for future coupled biophysical models of toxic red tides of *Karenia brevis* within the Gulf of Mexico, *Harmful Algae*. **R**

Publications – Chapters, Symposium Articles

- Betzer, P. R., K. L. Carder, and D. W. Eggimann, 1974. Light scattering and suspended particulate matter on a transect of the Atlantic Ocean at 11°N. In: *Suspended Solids in Water*, R. Gibbs (ed.), Plenum Press, N.Y., 295-314.
- Carder, K. L., P. R. Betzer, and D. W. Eggimann, 1974. Physical, chemical, and optical measures of suspended particle concentrations: Their inter-comparison and application to the west African Shelf. In: *Suspended Solids in Water*, R. Gibbs (ed.), Plenum Press, N.Y., 173-195.
- Betzer, P. R., D. W. Eggimann, K. L. Carder, D. R. Kester, and S. B. Betzer, 1977. Seasonal patterns of suspended calcium carbonate concentrations during the dry and wet seasons in the Eastern Caribbean. In: *The Fate of Fossil Fuel CO₂*, N. Andersen and A. Malahoff (eds.), Plenum Press, N.Y., 63-79.
- Carder, K. L., 1978. A holographic micro-velocimeter for studying the dynamics of ocean

- particles. In: *Ocean Optics V*, M. White and R. Stevenson (eds.), *SPIE*, Vol. 160, Bellingham, Washington 63-66.
- Carder, K. L. and D. J. Meyers, 1980. New optical techniques for particle studies in the bottom boundary layer. In: *Ocean Optics VI*, S. Tucker (ed.), *SPIE*.
- Carder, K. L., R. G. Steward, and P. R. Payne, 1984. A solid-state spectral transmissometer and radiometer. In: *Ocean Optics VII*, M. Blizard (ed.), *SPIE*.
- Carder, K. L., D. J. Collins, M. J. Perry, H. Clark, J. Mesias, J. Cleveland and J. Greenier. The interaction of light with phytoplankton in the marine environment. In: *Ocean Optics VII Symposium*, *SPIE*, Orlando, April, 1986.
- Carder, K. L., D. Costello, and R. G. Steward, 1986. State-of-the-Art Instrumentation for measuring ocean aggregates. In: *Aggregate Dynamics in the Sea*, Aldredge and Hartwig (eds.), Office of Naval Research, Asilomar, CA., p. 131-180.
- Carder, K. L., J. M. Melack, and M. Abbott. 1987. High-resolution Spaceborne Imaging Spectrometry: Science opportunities for the 1990's--Oceans and Inland waters. Chapters 2.B2, 2.C2, 2.E3, 4B. In: *Imaging Spectrometry Science Advisory Group's Science Plan*. NASA-JPL, 74 p.
- Carder, K. L., T. G. Peacock, R. G. Steward, P. R. Payne and W. Peck. 1988. Spectral transmissometer and radiometer design and initial results. In: *Wave Propagation and Remote Sensing Through Varied Media*, M. Blizard (ed.), *SPIE*, 925:189-195.
- Peacock, T. G., K. L. Carder, C. O. Davis, and R. G. Steward. 1990. Effects of fluorescence and water Raman scattering on models of remote sensing reflectance. In: *Ocean Optics X*, R. Spinrad (ed.), *SPIE*. p. 303-319.
- Costello, D. K., K. L. Carder, and R. G. Steward. 1991. Development of the Marine Aggregated Particle Profiling and Enumerating Rover (MAPPER). In: *Underwater Imaging, Photography, and Visibility*, *SPIE*, Vol. 1537. p. 161-172.
- Carder, K. L., R. G. Steward, R. F. Chen, S. Hawes, Z. Lee, and C. O. Davis. 1992. AVIRIS Calibration and Application in Coastal Oceanic Environments: Tracers of Soluble and Particulate Constituents of the Tampa Bay Coastal Plume. Proceedings of the First Marine Thematic Conference on Remote Sensing for Marine and Coastal Environments, ERIM, New Orleans, LA. p. 487-500.
- Lee, Z., K. L. Carder, S. K. Hawes, R. G. Steward, T. G. Peacock, and C.O. Davis. 1992. An interpretation of high spectral resolution remote sensing reflectance. *Optics of the Air-Sea Interface: Theory and Measurement*. Leland Estep, ed. Proc. SPIE 1749, 49-64.
- Costello, D. K., K. L. Carder, and W. Hou. 1992. Structured visible diode laser illumination for quantitative underwater imaging. In: *Ocean Optics XI*. Gary D. Gilbert, ed. Proc. SPIE 1750, 95-103.
- Hawes, S.K., K. L. Carder and G. R. Harvey. 1992. Quantum fluorescence efficiencies of fulvic and humic acids: effects on ocean color and fluorometric detection. In: *Ocean Optics XI*. Gary D. Gilbert, ed. Proc. SPIE 1750, 212-223.
- Carder, K.L., Z.P. Lee, R.F. Chen and C.O. Davis. 1993. Unmixing of Spectral Components Affecting AVIRIS Imagery of Tampa Bay. In: *Imaging Spectrometry of the Terrestrial Environment*, SPIE 1937, 77-90.
- Carder, K.L., P. Reinersman, and R.F. Chen. 1993. AVIRIS calibration using the cloud-shadow method. *Proc. 4th JPL AVIRIS Workshop*. Vol. 1. p. 15-18. R. Green, ed.
- Costello, D.K., W. Hou, and K.L. Carder. 1994. Some effects of the sensitivity threshold and spatial resolution of a particle imaging system on the shape of the measured particle size

- distribution. *Ocean Optics XII*, SPIE 2258. Jules S. Jaffe, Ed., Bergen, Norway.
- Costello, D.K., K.L. Carder, and R.G. Steward. 1994. New instrumentation and Platforms for Subsurface Optical Measurements *Ocean Optics XII*, SPIE 2258. Jules S. Jaffe, Ed., Bergen, Norway.
- Costello, D.K., K.L. Carder, R.F. Chen, T.G. Peacock, and N.S. Nettles. 1995. Multi-spectral imagery, hyper-spectral radiometry, and unmanned underwater vehicles: Tools for the assessment of natural resources in coastal waters. In: *Visual Communications and Image Processing '95*, SPIE. Taipei, Taiwan.
- Zhongping Lee, Kendall Carder, Robert Steward and Brad Weigle. 1997. Bottom Depth and Type for Shallow Waters: Hyperspectral Observations from a Blimp. Proceedings of the Fourth International Conference on Remote Sensing for Marine and Coastal Environments, Orlando, Florida, 17-19 March 1997. pp. II-449-468.
- Patty Pratt, Kendall L. Carder, and David K. Costello. 1997. Remote Sensing Reflectance Algorithms Developed to Correct Underwater Coral Imagery for the Effects of Optical Thickness To Assist in Benthic Classification. Proceedings of the Fourth International Conference on Remote Sensing for Marine and Coastal Environments, Orlando, Florida, 17-19 March 1997. pp. II-449-458.
- Melissa Carder, Kendall L. Carder and B.L. Weigle. 1997. Skylight Correction of Video Images: An Airship Shadow Approach. *Proceedings IV International Conference on Remote Sensing for Marine and Coastal Environments*, Orlando, Florida, pp. II-631-640.
- S. Hawes, K. Carder, F.R. Chen and Robert Evans. 2000. "MODIS CDOM and Chlorophyll: A First Look Using SeaWiFS and AVHRR Data" submitted for presentation to SPIE's 45th Annual Meeting, 7/30-8/4/2000, San Diego, CA.
- Lee, Z.P., J.E. Ivey, K.L. Carder and R.G. Steward. 2000. Pure water coefficient around 400nm: lab measured versus field observed. In *Ocean Optics XV*, S. Ackleson and J. Marra (eds.) Proc. SPIE (CDROM)
- Carder, K.L., C. Hu and F.E. Muller-Karger, "Digitization Errors in Satellite Ocean Color Data: Implications Based on SeaWiFS". Poster Presentation at AGU Ocean Sciences Meeting, January 24-28, 2000.
- Hou, W., L.A. Renadette, A. Farmer, K.L. Carder, D.K. Costello and T.G. Peacock, "Bottom Reflectance of Various Benthic Types based on *in-situ* multi-channel imagery". Poster Presentation at AGU Ocean Sciences Meeting, January 24-28, 2000.
- Costello, D.K. and K.L. Carder, "Bottoms-Up! The hemispherical-directional reflectance of sand, corals and seagrass and the effect on the upwelling light field. Poster Presentation at AGU Ocean Sciences Meeting, January 24-28, 2000.
- Lee, Z. and K.L. Carder, "Spectral channels and their influence on remote sensing retrieval: 1. Shallow waters". Presentation at AGU Ocean Sciences Meeting, January 24-28, 2000.
- Lee, Z.P., K.L. Carder and F.R. Chen. Bathymetry and Environmental Properties observed from AVIRIS data. Presented at Sixth International Conference on Remote Sensing for Marine and Coastal Environments, Charleston, S.C., 1-3 May 2000.
- Carder, K.L., Z. Lee, F.R. Chen. Satellite Pigment Retrievals for Optically Shallow Waters. *Ocean Optics XV meeting*, October 16-20, 2000, Monaco.
- Lee, Zhongping, J.E. Ivey, K.L. Carder, R.G. Steward, J.S. Patch. Pure water absorption coefficient around 400 nm: Lab measured versus field observed. *Proceedings Ocean Optics XV*, October 16-20, 2000, Monaco (CDROM).
- Mueller, J.L., C. Pieras, J.B. Hooker, D.K. Clark, A. Morel, R. Frouin, B.G. Mitchell, R.R.

- Bidigare, C. Trees, J. Werdell, G.S. Fargion, R. Arnone, R.W. Austin, S. Bailey, W. Broenkow, S.W. Brow, K. Carder, C. Davis, J. Dore, M. Fienholz, S. Flora, Z.P. Lee, B. Holben, B.C. Johnson, M. Kahru, D.M. Karl, Y.S. Kim, K.D. Knobelspiesse, C.R. McClain, S. McClain, M. Miller, C.D. Mobley, J. Porter, R.G. Steward, M Stramska, L. Van Heukelem, K. Voss, J. Wieland, M.A. Yarbrough, and M. Yuen. 2002. Ocean Optics Protocols for Satellite Ocean Color Sensor Validation, Revision 3, Volume 1 & 2, J.L. Mueller and G.S. Fargion (eds.) NASA/TM-2002-210004/Rev3-Vol(1 &2).
- Costello, D. K., K.L. Carder, J. Ivey, D. English, and W. Hou. (In prep.). Measurement and Interpretation of Diffuse Attenuation and Reflectance in Clear, Deep-Water Environments: the Effects of Trans-spectral Phenomena, *Proceedings Ocean Optics XVI*, Santa Fe, NM, Office of Naval Res. CDROM, Arlington, VA, 6 p.
- Cannizzaro, J. P., K. L. Carder, F. R. Chen, and C. A. Heil, 2002, Remote Detection Of Red Tide Blooms On The West Florida Shelf: A Novel Classification Technique. *Proceedings, Ocean Optics XVI*, Santa Fe, NM, Office of Naval Res. CDROM, Arlington, VA, 6 p.
- Costello, D. K., K. L. Carder, J. E. Ivey, D. C. English, T. G. Peacock and W. Hou, 2002, Measurement And Interpretation Of Diffuse Attenuation And Reflectance In Clear, Deep-Water Environments: The Effects Of Trans-Spectral Phenomena. *Proceedings, Ocean Optics XVI*, Santa Fe, NM, Office of Naval Res. CDROM, Arlington, VA, 6 p.
- English, D. C., K. L. Carder, W. Hou, and D. K. Costello, 2002, Use Of Unmanned Underwater Vehicles To Determine The Spatial Distribution Of Reflectance And Optical Properties. . *Proceedings, Ocean Optics XVI*, Santa Fe, NM, Office of Naval Res. CDROM, Arlington, VA, 6 p.
- Filippi, A. M., R. L. Miller, J. R. Jensen, R. A. Leathers, C. O. Davis, K. L. Carder, T. V. Downes, 2002, Cybernetic Statistical Learning For Hyperspectral Remote Sensing Inverse Modeling In The Coastal Ocean. *Proceedings, Ocean Optics XVI*, Santa Fe, NM, Office of Naval Res. CDROM, Arlington, VA, 6 p.
- Hou, W., K. L. Carder, D. K. Costello, D. C. English, 2002, Coastal Bottom Feature Classification Using 2-D And 3-D Moment Invariants. *Proceedings, Ocean Optics XVI*, Santa Fe, NM, Office of Naval Res. CDROM, Arlington, VA, 6 p.
- Otis, D. B., K. L. Carder, D. C. English, J. E. Ivey, J. Patch, F. R. Chen, and H. Warrior, 2002, Using Seawifs Imagery And Optical Property Measurements To Investigate The Bahama Banks As A Source Of Gelbstoff To The Surrounding Deep Ocean. *Proceedings, Ocean Optics XVI*, Santa Fe, NM, Office of Naval Res. CDROM, Arlington, VA, 6 p.
- Reinersman, P. N. and K. L. Carder, 2002, A modular, hybrid method for solving the radiative transfer equation with arbitrary geometry in 1, 2, or 3 dimensions. *Proceedings, Ocean Optics XVI*, Santa Fe, NM, Office of Naval Res. CDROM, Arlington, VA, 6 p.
- Steward, R. G. and K. L. Carder, 2002, Compression Of Autonomous Hyperspectral Data. . *Proceedings, Ocean Optics XVI*, Santa Fe, NM, Office of Naval Res. CDROM, Arlington, VA, 6 p.
- Warrior, H., K. L. Carder, Z.P.Lee, Dan Otis and R. Chen. 2002. An improved optical model for heat and salt budget estimation for general ocean circulation models. *Proceedings, Ocean Optics XVI*, Santa Fe, NM, Office of Naval Res. CDROM, Arlington, VA, 6 p.
- Ayoub, Lore M; Hallock-Muller, Pamela; Carder, Kendall; English, David; Ivey, Jim - "Calibrating a Bioindicator of Photooxidative Stress on Coral Reefs", for Ocean Optics XVII, Fremantle, Australia, October 28, 2004. Office of Naval Res. CDROM, Arlington, VA, 6 p.
- Carder, Kendall L; Cannizzaro, Jennifer P; Chen, F. Robert; Bailey, Sean W; Werdell, P. Jeremy

- "Toward a Climate-Quality Chlorophyll Dataset: Global Validation of a Semi-Analytical Chlorophyll a Algorithm", for Ocean Optics XVII, Fremantle, Australia, October 28, 2004. Office of Naval Res. CDROM, Arlington, VA, 6 p.
- Chen, Feng-I R; Carder, Kendall L; Costello, David K - "Hyperspectral Retrievals of Bottom Depth and Albedo Using a Genetic Optimization Code", for Ocean Optics XVII, Fremantle, Australia, October 28, 2004. Office of Naval Res. CDROM, Arlington, VA, 6 p.
- Lee, ZhongPing; Darecki, Mirosław; Carder, Kendall; Marra, John; Davis, Curtiss; Arnone, Robert - "Applications of Ocean-Color Remote Sensing: An IOP-Centered System", for Ocean Optics XVII, Fremantle, Australia, October 28, 2004. Office of Naval Res. CDROM, Arlington, VA, 6 p.
- Carder, K.L., P. Reinersman, D.K. Costello, E. Kaltenbacher, J. Kloske, and M.Montes-Hugo, 2005. Optical Inspection of Ports and Harbors: Laser-Line Sensor Model Applications in 2 and 3 Dimensions, in SPIE Proceedings 5780(49), 11 pp, March, Orlando.
- Carder, K.L., Cannizzaro, J.P., Lee, Z. 2005. Ocean color algorithms in optically shallow waters: Limitations and improvements. [in: R. Frouin et al.], Remote Sensing of the Coastal Ocean Environment, SPIE Vol 5885, Bellingham, WA pp.06-1 to 06-11, August 2005, San Diego.
- Montes-Hugo, M.A. and K.L. Carder, 2005. Monte Carlo simulations as a tool to optimize target detection by AUV/ROV laser line scanners, SPIE Proceedings 5799(1), 12 pp March, Orlando.
- Carder, K.L., D. English, and C. Du. "An Autonomous Marine Optical System (AMOS) for monitoring the optical properties of port and harbor waters." SPIE Defense & Security Symposium, 17-21 April 2006, Gaylord Palms Resort and Convention Center in Orlando (Kissimmee), Florida USA.
- Carder, K.L, Reinersman, P.N.; Hallock, P., 2006. A 3-D model of light effects related to the bleaching of corals and foraminifera, Ocean Optics XVIII, October, Montreal (extended abstract on CDROM, ONR, Arlington, VA).

Publications - Technical Reports

- Carder, K. L. Independent Environmental Study of Thermal Effects of Power Plant Discharge. Environmental Status Report (July - August, 1970), Florida Power Corp., St. Petersburg, Florida, pp. 32-40.
- Carder, K. L., R. Klausewitz, and F. Schlemmer. Independent Environmental Study of Thermal Effects of Power Plant Discharge Environmental Status Report (October, November, December, 1970), Florida Power Corp., St. Petersburg, Florida, pp. 28-45.
- Humm, H. J., R. C. Baird, K. L. Carder, T. L. Hopkins, and T. E. Pyle. Investigation at the Anclote Power Plant Site. Environmental Status Report (October, December, 1970), Florida Power Corp., St. Petersburg, Florida, pp. 10-20.
- Carder, K. L., R. Klausewitz and F. Schlemmer. Independent Environmental Study of Thermal Effects of Power Plant Discharge. Environmental Status Report (January, February, March, 1971), Florida Power Corp., St. Petersburg, Florida.
- Humm, H. J., R. C. Baird, K. L. Carder, T. L. Hopkins, and T. E. Pyle. Investigation at the Anclote Power Plant Site. Environment Status Report (January, March, 1971), Florida Power Corp., 1971, pp. 72-76.
- Carder, K. L., R. Klausewitz and F. Schlemmer. Independent Study of Thermal Effects of Power Plant Discharge. Environmental Status Report (April, May, June, 1971), Florida Power Corp., St. Petersburg, Florida, pp. 13-33.

- Humm, H. J., R. C. Baird, K. L. Carder, T. L. Hopkins and T. E. Pyle. Investigation at the Anclote Power Plant Site. Environmental Status Report (April-June, 1971), Florida Power Corp., 1971, pp. 84-108.
- Baird, R. C., K. L. Carder, T. L. Hopkins, T. E. Pyle and H. J. Humm. Investigation at the Anclote Power Plant Site. Environmental Status Report (July-December 1971), Florida Power Corp., 1971, pp. 98-101.
- Pyle, T. E., K. L. Carder, and R. Klausewitz. Independent Environmental Study of Thermal Effects of Power Plant Discharge. Environmental Status Report (July-December 1971), Florida Power Corp., St. Petersburg, Florida, pp. 11-36.
- Betzer, P. R. and K. L. Carder, 1972. Office of Naval Research. "The Chemical, Physical and Biological Processes Influencing Particle-Sea Interactions in the Caribbean Sea and Gulf of Mexico."
- Baird, R. C., K. L. Carder, T. L. Hopkins, T. E. Pyle, and H. J. Humm. Investigation at the Anclote Power Plant Site. Environmental Status Report (January-June, 1972), Florida Power Corp., 1972, pp. 66-70.
- Carder, K. L. and R. H. Klausewitz. Independent Environmental Study of Thermal Effects of Power Plant Discharge. Environmental Status Report (January-June, 1972), Florida Power Corp., pp. 14-17.
- Carder, K. L., R. H. Klausewitz and B. A. Rodgers. Independent Environmental Study of Thermal Effects of Power Plant Discharge. Environmental Status Report July-September, 1972), Florida Power Corp., pp. 12-45.
- Betzer, P. R. and K. L. Carder, 1973. Office of Naval Research. "The Chemical, Physical and Biological Processes Influencing Particle-Sea Interactions in the Caribbean Sea and Gulf of Mexico."
- Carder, K. L., R. H. Klausewitz and B. A. Rodgers. Preliminary data on the nature of flow in the area of the intake channel of the Crystal River Power Plant. Technical Report No. 2, 1973, Florida Power Corp.
- Betzer, P. R. and K. L. Carder, 1974. Office of Naval Research. "The Chemical, Physical and Biological Processes Influencing Particle-Sea Interactions in the Caribbean Sea and Gulf of Mexico."
- Betzer, P. R. and K. L. Carder, 1975. Office of Naval Research. "The Chemical, Physical and Biological Processes Influencing Particle-Sea Interactions in the Caribbean Sea and Gulf of Mexico."
- Betzer, P. R. and K. L. Carder, 1976. Office of Naval Research. "The Chemical, Physical and Biological Processes Influencing Particle-Sea Interactions in the Caribbean Sea and Gulf of Mexico," 70 pages.
- Carder, K. L., S. L. Palmer, B. A. Rodgers and P. J. Behrens. Calibration of a Thermal Enrichment Model for Shallow Barricaded Estuaries. Final Report to Office of Water Research and Technology, Dept. of the Interior, Sept. 1976, 61 pp.
- Manheim, F. T., R. Steward and K. L. Carder, 1976. Bureau of Land Management. "Final Report on Transmissometry and Particulate Matter Distribution on the Eastern Gulf of Mexico Shelves," 1975-76.
- Betzer, P. R., K. L. Carder and K. A. Fanning, 1977. Office of Naval Research. "The Chemical, Physical and Biological Processes Influencing Particle-Sea Interactions in the Caribbean Sea and Gulf of Mexico," 50 pages.
- Steward, R. and K. L. Carder, 1977. Bureau of Land Management. Time Series

- transmissometry, MAFLA area, summer, 1976. October 17, 1977, 34 pages.
- Betzer, P. R., K. L. Carder and K. A. Fanning, 1978. Office of Naval Research. The Chemical, Physical, and Biological Processes Influencing Particle-Sea Interactions in the Caribbean Sea and Gulf of Mexico, January, 1978.
- Steward, R., K. Haddad and K. L. Carder, 1978. Bureau of Land Management. Transmissometry on the West Florida-Alabama-Mississippi Shelves, January 17, 1978, 26 pages.
- Carder, K. L. and P. R. Betzer, 1979. Technical report to Office of Naval Research. Holography of Settling Particles, 34 pages.
- Carder, K. L. and P. R. Betzer, 1980. Technical report to Office of Naval Research. Holography of Settling Particles, 42 pages.
- Carder, K. L. and P. R. Betzer, 1981. Technical report to Office of Naval Research. Holography of Settling Particles, 38 pages.
- Carder, K. L. and P. R. Betzer, 1982. Technical report to Office of Naval Research. "Optical Means of Measuring Particle-Sea Interactions in the Caribbean Sea and Gulf of Mexico," 44 pages.
- Walsh, J., W. Barnes, O. Brown, K. Carder, D. Clark, W. Esaias, H. Gordon, R. Holyer, W. Hovis, R. Kirk, R. Lasker, J. McCarthy, M. McElroy, J. Mueller, M. J. Perry, and R. Smith, 1982. Marine Resources Experiment Program (MAREX); Report of the Ocean Color Science Working Group, Goddard Space Flight Center, Greenbelt, Maryland, 112 pages.
- Perry, M. J., D. Blasco, O. Brown, K. Carder, R. Chapman, C. Davis, W. Harrison, and D. Kiefer, 1982. Report of the Working Group on Absorbers and Scatterers; In: Marine Bioluminescence and Optical Variability, M. A. Blizard, E. O. Hartwig, and B. J. Zahuranec (eds.); Office of Naval Research Berkeley, California, pp. 9-15.
- Carder, K. L. and R. G. Steward, 1983. Office of Naval Research Contract N00014-75-C-0539 Final Report. Optical Means of Measuring Particle-Sea Interactions in the Caribbean Sea and Gulf of Mexico, 99 pages.
- Carder, K. L. and R. G. Steward, 1984. Office of Naval Research Contract N00014-83-K-0082 Final Report. Evaluation of Stokes Settling Equation for Variable Density Aggregates, 26 pages.
- Costello, D. K., K. L. Carder, and R. G. Steward. 1989. Strategies for automatic classification of marine particles. *Optical Society of America*. Technical Digest V(18):79. Invited.
- Costello, D.K., K.L. Carder and R.G. Steward. 1994. Particle size spectra and optical properties. In: Mesocosm experiment data report to the Office of Naval Research under the Accelerated Research Initiative. *Significant Interactions Governing Marine Aggregation (SIGMA)*. 24 pp.
- Costello, D.K., K.L. Carder and R.G. Steward. 1994. New Instrumentation and Platforms for Subsurface Optical Measurements. *Ocean Optics XII*, Jules S. Jaffe, Editor, *SPIE* 2258:21-32.
- Costello, D.K., K.L. Carder, R.G. Steward and A. Alldredge. 1994. The Distribution and Optical Properties of Large Marine Particles: Data from a Culture Tank and Field Experiments. *EOS AGU/ASLO* 75, 3-35.
- Hou, W., D.K. Costello, K.L. Carder and R.G. Steward. 1994. High-resolution Marine Particle Data from MAPPER, a new *in situ* optical ocean instrument. *EOS AGU/ASLO* 75, 3, 21.
- Costello, D.K., K.L. Carder, W. Hou and R.G. Steward. 1994. 3-dimensional particle size spectra transmissometry and temperature profiles, and filter pad absorption data. In:

Monterey Bay Field Experiment Data Report to the Office of Naval Research under the Accelerated Research Initiative. *Significant Interactions Governing Marine Aggregation (SIGMA)*. 24 pp.

Costello, D.K., W. Hou and K.L. Carder. 1995. Bulk and individual-particle optical measurements, April 14-22, 1994, East Sound, San Juan Islands, WA. *In: Sigma Data Report 3: More than a Sequel. Friday Harbor Cruise report to the Office of Naval Research under the Accelerated Research Initiative. Significant Interactions Governing Marine Aggregation (SIGMA)*. 46 pp.

Costello, D.K., K. L. Carder, R.F. Chen, T.G. Peacock and N.S. Nettles. 1995. Multi-spectral imagery, hyper-spectral radiometry, and unmanned underwater vehicles: Tools for the assessment of natural resources in coastal waters. *In: Visual communications and Image Processing '95*. Lance T. Wu, Editor, *Proc. SPIE 2501:407-415*.

Young, L.R., K.L. Carder, R.G. Steward and R.F. Chen. 1995. Comparison of measured and modeled bottom reflectance spectra on the southeastern shelf of the Florida Keys. *In: Imaging Spectrometry*, Michael R. Descour, Jonathan M. Mooney, David L. Perry, Luanna Illing, Editors, *Proc. SPIE 2480:237-247*.

ANNUAL REPORTS ON GRANTS AND CONTRACTS LISTED BELOW

Publications - Reviews

Carder, K. L., 1977. Reviewed Elements of Oceanography (and Teacher's Guide) by M. J. McCormick and J. V. Thiruvathukal, 1st ed., 356 pages. *In: J. College Science Teaching* 6:3, p.182.

Carder, K. L., 1985. Reviewed Satellite Oceanography by George Maul. *In: Florida Scientist*.

Carder, K. L. Annual Reports for each of the grants and contracts listed below.

Prior Grants and Contracts

Carder, K. L., "Independent Environmental Study of Thermal Effects of Power Plant Discharge." Florida Power Corp.; research grant; \$29,440; May 9, 1970 to May 8, 1971; \$39,463; May 9, 1971 to May 8, 1972; \$46,110; May 9, 1972 to April 30, 1973; \$55,000; May 1, 1973-April 30, 1974; \$80,000; May 1, 1974 to April 30, 1976.

Carder, K. L., "Loop Currents of the eastern Gulf of Mexico." National Science Foundation; research grant; \$5,000; June 10, 1970 to June 9, 1971.

Carder, K. L., Travel grant to attend "The Ocean Worlds" in Tokyo. National Science Foundation; \$750; September 1970.

Carder, K. L., "A Study of the Chemical, Geological, and Physical Oceanography of the Anclote River Estuary and Adjacent Gulf of Mexico." Florida Power Corp.; research grant; \$74,022; Carder, K. L. and T. E. Pyle, \$90,028; June 15, 1972 to June 14, 1973; Carder, K. L., L. J. Doyle and T. E. Pyle, \$98,630; June 15, 1973 to June 14, 1974.

Betzer, P. R. and K. L. Carder, "The Chemical and Optical Properties of Nepheloid Waters of the North Atlantic Ocean with Special Reference to the Caribbean Sea, Gulf of Mexico and Gulf Stream System." Office of Naval Research; \$53,000; March 31 - December 31, 1972; \$93,989; January 1 - December 31, 1973; \$89,049; January 1 - December 31, 1974; \$114,650; January 1 - December 31, 1975; \$75,000; January 1 - December 31, 1976.

Betzer, P. R. and K. L. Carder. Nineteen days of ship time on *R/V TRIDENT* Cruises 127 and

130 to the Gulf of Mexico and Caribbean Sea, respectively. Office of Naval Research; \$51,300 paid to the University of Rhode Island to support *R/V TRIDENT*.

Carder, K. L., "Calibration of a Thermal Enrichment Model for Shallow Barricaded Estuaries." Office of Water Resources Research; \$70,000; May 1974 to May 1976.

Carder, K. L., Computer Message and Display of Hydrographic Data. Bureau of Land Management; \$4,320.

Baird, R. C., V. Maynard and K. L. Carder, "Long-term monitoring program, Anclote Estuary." Florida Power Corp.; \$97,578.

Carder, K. L., Size distribution of suspended particles from Anclote Estuary. Texas Instruments; \$12,500; February 1 - December 31, 1976.

Carder, K. L. and F. T. Manheim, Transmissometry for the MAFLA area. Bureau of Land Management; \$10,000; June 1 - November 15, 1976.

Betzer, P. R., K. L. Carder and K. A. Fanning, "The Chemical, Physical, and Biological Processes Influencing Particle-Sea Interactions in the Caribbean Sea and Gulf of Mexico." Office of Naval Research; \$120,000; April 1, 1977 to January 31, 1978; \$140,000; February 1, 1978 to January 31, 1979.

Carder, K. L., "Turbidity Measurements by Transmissometer, MAFLA Area." Bureau of Land Management; \$50,000; July 9, 1977 to September 9, 1978.

Carder, K. L., "Optical Means of Measuring Particle-Sea Interactions in the Caribbean Sea and Gulf of Mexico." Office of Naval Research; \$62,446; February 1, 1979 to January 31, 1980.

Carder, K. L. and P. R. Betzer, "Holography of Settling Particles." Office of Naval Research; \$82,000; February 1, 1980 through March 31, 1981.

Carder, K. L., and P. R. Betzer, "Optical Means of Measuring Particle-Sea Interactions in the Caribbean Sea and Gulf of Mexico." Office of Naval Research; \$65,000; April 1, 1981 to June 30, 1982; Carder, K. L., \$39,991; July 1, 1982 to April 30, 1983.

Carder, K. L., "Evaluation of Stokes Settling Equation for Variable Density Aggregates." Office of Naval Research; \$35,055; November 1, 1982 to February 29, 1984.

Walsh, J. J., K. L. Carder and O. Brown, "Simulation Analysis of Nonstationary CZCS Time Series from Continental Shelves." NASA; \$223,214; August 15, 1984 to August 14, 1985.

Betzer, P. R. and K. L. Carder, "Asian Dust Input to the Ocean System." NSF; \$212,011, March 15, 1985 to March 14, 1986; \$303,870, March 15, 1986 to March 14, 1987; \$207,367; March 15, 1987 to March 14, 1988.

Carder, K. L., "High Resolution Spectral Transmissometer and Radiometry Measurements and Optical Modeling". Jet Propulsion Laboratory; \$33,947; April 1, 1988 to June 30, 1989.

Blake, N., and K. L. Carder, "The Combined Utilization of Remote Sensing and Reproductive Data to Predict the Success of Calico Scallop Industry." Florida Sea Grant; \$50,929; April 1, 1988 to March 31, 1989.

Carder, K. L., "High Spectral Resolution MODIS and HIRIS Algorithms for Constituents in Case II Waters." NASA; \$30,000; December 15, 1989 to December 14, 1990; \$199,990; December 15, 1990 to December 14, 1991; Extended to January 14, 1992. Rewritten with new account number.

Carder, K. L., "High Resolution Spectral Transmissometer and Radiometry Measurements and Optical Modeling." Jet Propulsion Laboratory; \$41,000; January 1, 1990 to October 31, 1990.

Carder, K. L., "Measurement of Spectral Absorption, Beam Transmission and Remote Sensing Reflectance." Jet Propulsion Laboratory; \$39,981; December 14, 1990 to September 30,

1991. Extended to December 19, 1991.

Carder, K. L., "Classification of Ocean Light Disrupters Using an Intelligent Remote Imaging System (COLD IRIS)." Office of Naval Research; \$86,734; October 1, 1987 to September 30, 1988; \$86,255; October 1, 1988 to September 30, 1989; \$86,818; October 1, 1989 to September 30, 1990; \$112,968; October 1, 1990 to September 30, 1991; \$162,446; October 1, 1991 to September 30, 1992; \$99,596; October 1, 1992 to September 30, 1993; \$24,977, October 1, 1993 to September 30, 1994. Assigned new grant number October 1994.

Carder, K. L., "Development of an Average Cosine Meter." Office of Naval Research; \$102,729; October 1, 1988 to September 30, 1989; \$103,095; October 1, 1989 to September 30, 1990; \$90,447; October 1, 1990 to September 30, 1991; \$60,170; October 1, 1991 to September 30, 1992; \$20,645; October 1, 1992 to September 30, 1993; extended to 1994.

Carder, K. L., "Development and Validation of a Chlorophyll *a* SeaWiFS Algorithm for Case II Waters." NASA; \$74,999; September 15, 1992 to April 30, 1995.

Carder, K.L., "Ocean Measurements: Development of New Instrumentation Platforms and Sensors." National Oceanic and Atmospheric Administration; \$26,191 of \$500,000 (7 others); August 1, 1993 to July 31, 1995.

Carder, K.L. "Cold Iris - Phase II." Office of Naval Research; \$43,042.00; October 1, 1994 to September 30, 1995.

Carder, K.L., "Support of the Research Activities of a Marine Engineering Institute at the University of South Florida," (Development of the Bottom Classification/Albedo Package and Mapper System). Office of Naval Research; \$138,243 of \$2,000,000; June 1, 1994 to May 31, 1995. No-cost extension to May 31, 1996.

Carder, K.L. "Development of Sensing Systems and Unmanned Underwater Vehicles for Land Margin-Continental and Environmental Measurements," (Project SFS5). Office of Naval Research; \$231,841 of \$7,551,000; August 1, 1994 to July 31, 1995. No cost extension to July 31, 1996.

Carder, K.L., Costello, D.K. "Coastal Benthic Optical Properties of Coral Environments: ROV/AUV Optical Classification." Office of Naval Research; \$188,816 April 1, 1995 to February 28, 1997. (1245 233 L3)

Carder, K.L. "Analytic Recognition and Estimation of Aerosol Absorption in Remote Sensing Imagery: A Proposed Project for SeaWiFS." (Student Award) NASA; \$44,000; September 1, 1995 to August 31, 1997. (1245 248 K3)

Carder, K. L., "Development of In Situ Sensors to Complement Ocean Color Remote Sensing." NASA; March 1, 1983 to December 31, 1996. - Cumulative Funding: \$1,977,184. Continued through March 30, 1998. (2708-176-L3)

Carder, K.L. "Ocean Color Algorithm Evaluation for Remote Sensing of Coastal Estuarine Waters: U.S. South Atlantic Bight and Eastern Gulf of Mexico." Florida Seagrant. \$27,940; September 1, 1996 to August 31, 1997. (1245 310 L3)

Carder, K.L. "Bottom-Assessment and Water-Constituent Algorithms for the ETM in the Coastal Zone." NASA; \$112,000. August 1, 1996 to October 14, 1998. (1245 309 L3)

Carder, K.L. "Bottom-Assessment and Water-Constituent Algorithms for the ETM in the Coastal Zone." NASA; \$112,000. August 1, 1996 to October 14, 1998. (1245 309 L3)

Carder, K.L. "Analytic Recognition and Estimation of Aerosol Absorption in Remote Sensing Imagery: A Proposed Project for SeaWiFS." (Student Award) NASA; \$22,000; September 1, 1997 to August 31, 1998. (1245 359 K3) (previous award on 1245 248 K3)

Carder, K.L. "Ocean Color Algorithm Evaluation of Remote Sensing of Coastal Estuarine

Waters: U.S. South Atlantic Bight and Eastern Gulf of Mexico.” Florida Sea Grant; \$28,633. September 1, 1997 to August 31, 1999. (1245 349 L3) (Year 1 Funds in 1245 310 L3)

Carder, K.L. “Optical Sensor Augmentation of the Coastal Ocean Monitoring and Prediction System.” DOD/Office of Naval Research; \$299,374. March 31, 1999 to September 30, 2000. (1245 413 L3)

Carder, K. L., "High Spectral Resolution MODIS Algorithms for Ocean Chlorophyll in Case II Waters." NASA/GSFC; 10-year contract commenced 01/15/92 with incremental funding. Cumulative Amount \$6,318,168 to June 2003. (1245-063-L3)

Kendall L. Carder and David K. Costello: Optical Variability and Bottom Classification in Turbid Waters. Department of Defense, Office of Naval Research N00014-96-1-5013. \$498,870 FY96, \$498,844 FY97, \$495,009 FY98, \$499,914 FY99, \$499,759 FY00, \$499,838 FY01, \$499,952 FY02, \$499,947 FY03. (Plus I-4 Corridor Matching Funds: \$25,000 FY99)

Muller-Karger, F.E., P.I., Carder, K.L., co-P.I., “Bottom Assessment and Water Constituent Algorithms for the ETM in the Coastal Zone.” NASA/GSFC; August 1, 1996 to December 31, 2001; \$712,764. (1245 309 L3)

Kendall L. Carder and David K. Costello: Coastal Benthic Optical Properties of Coral Environments: ROV/AUV Optical Classification. Department of Defense, Office of Naval Research. N00014-97-1-0006. \$146,251 FY97, \$154,889 FY98, \$155,091 FY99, \$168,882 FY00, \$79,881 FY01. (Plus Shiptime awards \$25,000 FY98, \$60,000 FY99). (1245 312 L3)

Carder, K.L. “Stray Light & Atmospheric Adjacency Effects for Large-FOV, Ocean Viewing Space Sensors.” NASA/GSFC; \$520,841. September 23, 1997 to March 22, 2001. (1245 359 L3)

Eric Kaltenbacker, James Patten, David K. Costello and Kendall L. Carder: High-speed, Real-time Ocean Bottom Optical Topographer. Department of Defense, Office of Naval Research (N00014-01-1-0279), \$469,946 FY01, \$495,184 FY02, \$485,591 FY03.

Kendall L. Carder and David K. Costello: Data Mining the CoBOP Database to Separate Bottom Albedo from Bottom Roughness and Illumination Effects. Department of Defense, Office of Naval Research. \$49,922 FY02; \$49,985 FY03.

Federal Contracts (2004-2005):

Kendall L. Carder: Quantifying HAB Concentrations and Chlorophyll a in Coastal Waters. NASA. \$480,000 May 1 2004 to March 14, 2007.

Kendall L. Carder and David K. Costello: Optical Variability and Bottom Classification in Turbid Waters: Phase III. Department of Defense, Office of Naval Research N00014-9021-0211. \$499,947, April 1 2003 to April 30, 2005.

Kendall L. Carder and Phillip Reinersman: A Hybrid Modular Optical Model to Predict 2-D and 3-D Environments in Ports and Beneath Ship Hulls for AUV Sensor-Performance Optimization in MCM Activities. Department of Defense, Office of Naval Research N00014-03-1-0625 \$499,867 to April 30, 2005.

Kendall L. Carder and Phillip Reinersman: Collection of Initialization and Validation Data for a Hybrid Modular Optical Model to Predict 2-D and 3-D Environments in Ports and Beneath Ship Hulls. Department of Defense, Office of Naval Research N00014-03-1-0625 \$297,528, May 1 2004 to April 30, 2005.

Eric Kaltenbacker, David K. Costello and Kendall L. Carder: High-speed, Real-time Ocean Bottom Optical Topographer. Department of Defense, Office of Naval Research (N00014-01-1-0279), \$485,591, ends April 30, 2005.

Kendall L. Carder and David K. Costello: Optical Variability and Bottom Classification in Turbid Waters: Phase III. Department of Defense, Office of Naval Research N00014-9021-0211. \$399,996, May 1, 2005 to April 30, 2006.

Current Grants and Contracts:

Kendall L. Carder: Quantifying HAB Concentrations and Chlorophyll a in Coastal Waters. NASA. \$480,000 May 1 2004 to March 14, 2007.

Kendall L. Carder and David K. Costello: Optical Variability and Bottom Classification in Turbid Waters: Phase III. Department of Defense, Office of Naval Research N00014-9021-0211. \$399,950, May 1, 2005 to April 30, 2006.

Kendall L. Carder and David K. Costello: Optical Variability and Bottom Classification in Turbid Waters: Phase III. Department of Defense, Office of Naval Research N00014-9021-0211. \$399,990, May 15 2006 to April 30, 2007.

Eric Kaltenbacher, David K. Costello and Kendall L. Carder: High-speed, Real-time Ocean Bottom Optical Topographer. Department of Defense, Office of Naval Research (N00014-01-1-0279), \$485,591, May 1, 2006 to April 30, 2007.

Larry Langebrake, Kendall Carder, and John Bumgarner: Tagging, Tracking, and Locating using Microelectromechanical Systems. Blackbird Technologies, \$470,439, August 1, 2005 to October 31, 2006 extended until April 30, 2007.

Kendall L. Carder: Trans-Interface Optical Communication. Office of Naval Research N00014-07-1-0841, \$299,957, May 1, 2007 to April 30, 2008.

Kendall L. Carder and Phillip Reinersman: Active Camouflage of Underwater Assets, Office of Naval Research N00014-07-1-0842, \$449,911, May 1, 2007 to April 30, 2008.

Kendall L. Carder and David Costello: Center for Underwater Observability and Optical Communication, USF, \$850,990, May 1, 2007 to June 30, 2008.

Presentation of Papers/Major Speeches/Abstracts

Beardsley, F. F., and K. L. Carder. Light scattering and suspended particles in the eastern equatorial Pacific. Amer. Geophys. Union Annual Fall Meeting, December 16, 1969, San Francisco, California.

Carder, K. L., G. G. Beardsley, Jr., and H. Pak. Light scattering vectors, particle size distributions and oxygen profiles in the eastern equatorial Pacific. "The Ocean Worlds," Joint Oceanography Assembly, September 25, 1970, Tokyo, Japan.

Colbert, D. C. and K. L. Carder, 1971. Environmental Data Acquisition Telemetry System. *Proceedings of the IEEE International Conference on Engineering in the Ocean Environment*, San Diego, pp. 373-376.

Klauserwitz, R. H., and K. L. Carder. A variable-boundary tidal circulation model for shallow barricaded estuaries. Amer. Geophys. Union Annual Spring Meeting, April 17, 1972, Washington, D.C.

Schlemmer, F. C. II, and K. L. Carder. Particles as indicators of circulation in the eastern Gulf of Mexico. Amer. Geophys. Union Annual Spring Meeting, April 21, 1972, Washington, D.C.

Betzer, P. R., and K. L. Carder. Chemical and optical studies of oceanic particulate matter in the western North Atlantic Ocean between Barbados and Africa. Office of Naval Research seminar, October 31, 1972, Washington, D.C.

Betzer, P. R., and K. L. Carder. Light scattering, suspended particulate matter and particle size

distribution on a transect of the Atlantic Ocean at 11°N. Office of Naval Research Symposium, "Suspended Solids in Water," March 20-22, 1973, Santa Barbara, CA

Carder, K. L., and P. R. Betzer. Light scattering, total particulate loads and total particulate volumes as indicators of sediment transport along the west African shelf. Office of Naval Research Symposium, "Suspended Solids in Water, March 20-22, 1973, Santa Barbara, CA

Betzer, P. R., and K. L. Carder. Chemical, mineralogical and optical studies of suspended matter on the west African shelves of Sierra Leone and Liberia. Office of Naval Research seminar, November 22, 1973, Washington, D.C.

Carder, K. L., P. R. Betzer, and S. I. McClelland. Suspended particle size distributions along the Sierra Leone-Liberian shelf. American Geophysical Union Meetings, April 8, 1974, Washington, D.C.

Betzer, P. R., and K. L. Carder. A consideration of the physical-chemical processes affecting the distribution of suspended matter in the western Atlantic Ocean and Caribbean Sea. Office of Naval Research seminar, November 19, 1974, Washington, D.C.

Kester, D. R., P. R. Betzer, and K. L. Carder. Role of Rivers and Vertical Mixing of Oceanic Chemical Distributions. Seminar presented to department heads and admiral of the Office of Naval Research, December 4, 1974, Arlington, VA

Carder, K. L., S. I. McClelland, P. R. Betzer, and D. R. Kester. Evidence from suspended particles of downward advection of water near the Lesser Antilles. Amer. Geophys. Union Spring Annual Meeting, June 16, 1975, Washington, D.C. Invited.

Eggiman, D. W., P. R. Betzer, and K. L. Carder. A chemical study of particle transport from the west African shelf to the deep ocean. Amer. Geophys. Union Spring Annual Meeting, June 16, 1975, Washington, D.C. Invited.

Carder, K. L., P. R. Betzer, and S. I. McClelland. Light scattering, particle size distributions and particle composition as indicators of vertical and horizontal circulation near the Lesser Antilles. Sixteenth General Assembly of the International Union of Geodesy and Geophysics, August 29, 1975, Grenoble, France.

Betzer, P. R., D. W. Eggiman, K. L. Carder, D. R. Kester, and S. B. Betzer. Suspended carbonates in shallow and deep waters of the eastern Caribbean Sea during wet and dry seasons. Office of Naval Research Working Conference on the Fate of Fossil Fuel Carbon Dioxide, January 22, 1976, East-West Center, Honolulu, Hawaii.

Carder, K. L., S. I. McClelland, and P. R. Betzer. A preliminary report on a nepheloid layer associated with the Guyana Current. Progress in Marine Research in the Caribbean and Adjacent Regions, CICAR II Symposium, July 13, 1976, Caracas, Venezuela.

Betzer, P. R., D. W. Eggimann, K. L. Carder, and D. R. Kester. The Sources, Movements and Reactions of Suspended Clays, Carbonates, and Organic Matter During the Wet and Dry Seasons. Progress in Marine Research in the Caribbean and Adjacent Regions, CICAR II Symposium, July 15, 1976, Caracas, Venezuela.

Carder, K. L., D. Meyers, and P. R. Betzer. A technique for estimating the variation of particle density with particle size in a near-bottom nepheloid layer. Amer. Geophys. Union Fall Meeting, December 7, 1976, San Francisco, CA

Carder, K. L. The variation of density with size for particles in a nepheloid layer. Physics Department Colloquium, January 1977, Tampa, FL

Lerman, A., K. L. Carder, and P. R. Betzer. Residence times of fine particles in an oceanic water column. Amer. Geophys. Union Spring Meeting, May 13, 1977, Washington, D.C.

Carder, K. L., Time Series Transmissometry, MAFLA area. Summer, 1976. Report to Bureau

- of Land Management, November 4, 1977, New Orleans, LA
- Betzer, P. R., D. W. Eggimann, K. L. Carder, and D. R. Kester. The Sources, Movements and Reactions of Suspended Clays, Carbonates and Organic Matter in the Eastern Caribbean Sea During the Wet and Dry Seasons. S.E. Regional meetings of the American Chemical Society, November 9, 1977, Tampa, FL
- Carder, K. L. Oceanography and its relationship to the atmosphere. West Central Florida Chapter, American Meteorological Society, January 19, 1978, St. Petersburg, FL
- Carder, K. L. Transmissometry on the West Florida-Alabama-Mississippi Shelves. Report to Bureau of Land Management, January 26, 1978, New Orleans, LA
- Haddad, K. D., and K. L. Carder. Oceanic intrusion: one possible initiation mechanism of red tide blooms on the west coast of Florida. Second International Conference on Toxic Dinoflagellate Blooms, November 3, 1978, Key Biscayne, FL
- Carder, K. L., S. I. McClelland, P. R. Betzer, and D. R. Kester, 1978. A nepheloid layer associated with the Guiana Current, D. Atwood (ed.), *Proceedings of the CICAR II Symposium, Vol. 1*, FAO, Rome, pp. 375-385.
- Carder, K. L. Optical techniques in studying particle dynamics. Hydraulics Department, College of Engineering, Colorado State University, February 15, 1979, Fort Collins, CO Invited.
- Carder, K. L. Holography of settling particles. High energy Benthic Boundary Layer Experiment. Symposium of Office of Naval Research and NASA, March 21, 1979, Keystone, CO. Invited.
- Carder, K. L. New optical techniques for particle studies in the benthic boundary layer. Ocean Optics VI symposium, SPIE, October 24, 1979, Monterey, CA Invited.
- Carder, K. L., and R. G. Steward. In situ measurements of particle size, shape, and settling velocity by holography. American Geophysical Union Spring Meeting, May 1980, Toronto, Canada. Invited.
- Carder, K. L. The need for airborne and submerged Lidar systems to calibrate and enhance the scientific utility of CZCS images. Oceanic LIDAR Workshop, NASA Goddard, November 14, 1980.
- Carder, K. L. Satellite Oceanography. Marine Science Department, University of South Florida, November 25, 1980, St. Petersburg, Florida.
- Carder, K. L., R. G. Steward, and P. R. Betzer. In situ holographic measurements of the size and settling velocities of ocean particles. American Geophysical Union Fall Meeting, San Francisco, December 1980 (Abstract in *EOS 61*(46), p. 1017, 1980).
- Fanning, K. A., K. L. Carder, and P. R. Betzer. Turbulent Resuspension of sediment on continental margins: A potential mechanism for fertilizing coastal waters. American Geophysical Union Fall Meeting, San Francisco, December 1980 (Abstract in *EOS 61*(46), p. 1000, 1980).
- Payne, P., K. L. Carder, and R. G. Steward. A computerized holographic particle analysis system. American Geophysical Union Fall Meeting, San Francisco, December 1980 (Abstract in *EOS 61*(46), p. 1017, 1980).
- Carder, K. L. Satellite remote sensing of the oceans. E.P.A. Science Advisory Board Ecology Committee Task Group on Marine Ecosystem Monitoring, May 5, 1981, Washington, D.C. Invited.
- Carder, K. L. Recent developments in remote sensing of phytoplankton in the ocean: Coastal Zone Color Scanner. Biological Oceanography Bureaucrats, National Science Foundation,

- October 2, 1981. Invited.
- Carder, K.L. Community Lecture Series, University of South Florida, St. Petersburg, FL. November 10, 1982. Invited.
- Doyle, L. J., K. L. Carder, and R. G. Steward. The Hydraulic Equivalence of Mica. American Geophysical Union Fall Meeting, San Francisco, CA. December 8, 1982 (Abstract in *EOS* 63(45), p. 990, 1982).
- Carder, K. L. Oceanography from Space. Tampa Bay Chapter of American Meteorological Society, Tampa, FL. January 19, 1983. Invited.
- Carder, K. L., R. G. Steward, P. R. Betzer, D. L. Johnson, and J. Prospero. Chronology of an Aeolian Input Event to the Sargasso Sea. American Geophysical Union Fall Meeting, San Francisco, CA. December 7, 1983 (Abstract in *EOS* 64(45), p. 729, 1983).
- Steward, R. G., and K. L. Carder. Performance of Ocean Color Algorithms for Chlorophyll in the Presence of Gelbstoff and Suspended Sediment. Ocean Sciences Meeting, New Orleans, LA. January 1984 (Abstract in *EOS* 64(52), p. 1070, 1983).
- Carder, K. L., and R. G. Steward. Some Recent Techniques for Measuring Properties of Marine Aggregates. Ocean Sciences Meeting, New Orleans, LA. January 1984 (Abstract in *EOS* 64(52), p. 1019, 1983).
- Carder, K. L. A Model for Ocean Color Remote Sensing. University of South Florida Physics Department, March 16, 1984. Invited.
- Carder, K. L. Remote Sensing in Oceanography. Department of Natural Resources, St. Petersburg, FL. May 10, 1984. Invited.
- Carder, K. L., R. G. Steward, and P. R. Payne. A Solid State Upwelling Spectral Radiometer/Spectral Transmissometer. *SPIE* Ocean Optics VII Conference, Monterey, CA. June 27, 1984. Invited.
- Carder, K. L., R. G. Steward, and J. H. Paul. Picoplankton and Remote Sensing in the Eastern Gulf of Mexico. American Geophysical Union Fall Meeting, San Francisco, CA. December 3-7, 1984 (Abstract in *EOS*, 1984).
- Carder, K. L. Ocean color remote sensing. Imaging Spectrometer Science Advisory Group Meeting, Jet Propulsion Laboratory, Pasadena, CA. April 30, 1985.
- Carder, K. L., W. Gregg, D. Costello, K. Haddad, and J. Prospero. Quantification of Ocean Chlorophyll from CZCS Imagery Containing Sunlint, Sahara Dust, and Marine Aerosols. AGU Fall Meeting, San Francisco, CA. December 1985 (Abstract in *EOS* 66(46), November 12, 1985).
- Carder, K. L., M. J. Perry, and D. J. Collins. Methodologies for ascertaining the effects of nutrient and light stress on the optical properties of phytoplankton. Ocean Sciences Meeting, AGU/ASLO, New Orleans, LA. January 17, 1986 (Abstract in *EOS* 66(51), December 17, 1985).
- Carder, K. L., D. J. Collins, M. J. Perry, H. Clark, J. Mesias, J. Cleveland, and J. Greenier. The interaction of light with phytoplankton in the marine environment. Ocean Optics VIII Symposium, *SPIE*, Orlando, FL. 1986.
- Carder, K. L. High Spectral Resolution Chlorophyll Algorithms for Case II Waters, NASA's Ocean Color Science Working Group Workshop at Sterling Forest, NY. May 7, 1986. Invited.
- Carder, K. L. State-of-The Art Instrumentation for Measuring Ocean Aggregates. Aggregate Dynamics in the Sea Workshop, Office of Naval Research, Asilomar, September 1986. Invited.

- Carder, K. L. A Method for Quantifying Saharan Dust, Marine Aerosol, and Sunlight Radiances and Measuring Ocean Chlorophyll with CZCS Imagery, NASA's Ocean Color Science Working Group Workshop at Sterling Forest, NY. May 5, 1986. Invited.
- Betzer, P. R., R. E. Bernstein, K. L. Carder, J. A. Breland, II, R. A. Duce, and R. A. Feely. Particle Fluxes in the North Pacific Ocean: Responses to Major Atmospheric Dust Storms, American Geophysical Union Annual Meeting, San Francisco, CA. December 8-12, 1986 (Abstract in *EOS* 67(44), p. 899, 1986). Invited.
- Feely, R. A., P. R. Betzer, K. L. Carder, J. F. Gendron, and T. L. Geiselman. Time Series of Chemical, Hydrographic and Suspended Matter Data During ADIOS-I in the Central North Pacific: Preliminary Results, American Geophysical Union Annual Meeting, San Francisco, CA. December 8-12, 1986 (Abstract in *EOS* 67(44), p. 899, 1986). Invited.
- Betzer, P. R., R. E. Bernstein, K. L. Carder, and S. Tanner. Biological Interactions with Marine Aerosols in Oligotrophic Waters of the North Pacific Ocean, American Geophysical Union Annual Meeting, San Francisco, CA. December 8-12, 1986 (Abstract in *EOS* 67(44), p. 899, 1986).
- Costello, D. K., R. W. Young, K. L. Carder, and P. R. Betzer. Multiple- Sample Sediment Traps with In Situ Holographic Imaging of Settling Particles, American Geophysical Union Annual Meeting, San Francisco, CA. December 8-12, 1986 (Abstract in *EOS* 67(44), p. 899, 1986). Invited.
- Carder, K. L., D. K. Costello, R. W. Young, and P. R. Betzer. Dynamics and Composition of Holographic Recorded Particles from ADIOS I, American Geophysical Union Annual Meeting, San Francisco, CA. December 8-12, 1986 (Abstract in *EOS* 67(44), p. 899-900, 1986). Invited.
- Carder, K. L., R. G. Steward, G. R. Harvey, and P. R. Betzer. Absorption by Marine Fulvic and Humic: Its Effect on Remote Sensing of Ocean Chlorophyll, International Union of Geodesy and Geophysics (IUGG), XIX General Assembly, Vancouver, Canada, August 9-22, 1987 (Abstract in *IAPSO*, vol. 3, p. 1058, 1987).
- Carder, K. L. Workshop on Ocean Color in the Global Ocean Flux Study (GOPS) ERA, NASA, Annapolis, MD. September 29-October 1, 1987. Invited.
- Carder, K. L., R. G. Steward, T. G. Peacock, P. R. Payne, and W. V. Peck. Spectral Transmissometer and Radiometer (STAR): Preliminary Results, American Geophysical Union Meeting, New Orleans, LA. January 17-22, 1988 (Abstract in *EOS* 68(50), p. 1683, December 15, 1987). Invited.
- Betzer, P. R., K. L. Carder, D. K. Costello, R. H. Byrne, and R. W. Young. In Situ Laser Holography: Insights for Basic Processes/Applications for Global Ocean Flux, American Geophysical Union Meeting, New Orleans, LA. January 17-22, 1988 (Abstract in *EOS* 68(50), p. 1715, December 15, 1987). Invited.
- Betzer, P. R., R. H. Byrne, K. L. Carder, and D. K. Costello. 1988. In situ and shipboard approaches to physical/chemical transformation in the oceanic water column. *U. S. Global Ocean Flux Study, Upper Ocean Processes Planning Report #7* of U. S. GOFS Working Group, Woods Hole, MA.
- Carder, K. L., T. G. Peacock, R. G. Steward, P. R. Payne, and W. Peck. Spectral transmissometer and radiometer design and initial results, SPIE's Technical Symposium on Optics, Electro-optics and Sensors, Ocean Optics 9, April 5, 1988, Orlando, FL
- Costello, D. K., K. L. Carder, and R. G. Steward. Computer Enhancement of In Situ Holographic Images with Preliminary Algorithms for Marine Particle Pattern Recognition,

- AGU Annual Meeting, San Francisco, CA. December 8, 1988 (Abstract in *EOS* 67(44), p. 1124, November 1988).
- Peacock, T. G., K. L. Carder, and R. G. Steward. Components of Spectral Attenuation for an Offshore Jet in the California Coastal Transition Zone, AGU Annual Meeting, San Francisco, CA. December 8, 1988 (Abstract in *EOS* 67(44), p. 1125, November 1988).
- Young, R. W., K. L. Carder, P. R. Betzer, C. R. McClain, N. Tindale, and R. A. Duce. Effects of Asian Dust on Aerosol Albedo and Ocean Productivity in the North Central Pacific, AGU Annual Meeting, San Francisco, CA. December 8, 1988 (Abstract in *EOS* 69(44), p. 1125, November 1988).
- Tindale, N., R. A. Duce, R. W. Young, and K. L. Carder. Single Particle Analysis of Asian Dust Storm Aerosol Particles, AGU Annual Meeting, San Francisco, CA. December 8, 1988 (Abstract in *EOS* 69(44), p. 1076, November 1988).
- Roesler, C. S., K. L. Carder, and M. J. Perry. Modeling Phytoplankton Absorption from Total Absorption Spectra, AGU Annual Meeting, San Francisco, CA. December 9, 1988 (Abstract in *EOS* 69(44), p. 1140, November 1988).
- Carder, K. L., S. K. Hawes, R. G. Steward, K. A. Baker, and R. C. Smith. Remote Sensing Algorithm to Discriminate Marine Humus from Chlorophyll, AGU Annual Meeting, San Francisco, CA. December 9, 1988 (Abstract in *EOS* 69(44), p. 1141, November 1988).
- Carder, K. L. In Situ Imaging for Particle Classification, Marine Optics and Bio-Optics Conference, Friday Harbor, WA, 24 August 1989. Invited.
- Costello, D. K., K. Carder, and R. G. Steward. Strategies for Automatic Classification of Particles, Symposium on Underwater Optics, OSA, Orlando, FL, 17 October 1989 (Abstract in *OSA Technical Digest*, 1989, Annual Meeting, p. 79). Invited.
- Carder, K. L. Remote Sensing of Marine Humus, Workshop on Effects of Solar Ultraviolet Radiation on Biogeochemical Dynamics in Aquatic Environments, Woods Hole, MA, 23 October 1989. Invited.
- Hawes, S. A., and K. L. Carder. Fluorescence Quantum Yields of Marine Humic and Fulvic Acids: Application for In Situ Determination, AGU, New Orleans, LA, 14 February 1990. (Abstract in *EOS* 71(2): 136).
- Peacock, T. G., K. L. Carder, C. O. Davis, and R. G. Steward. Spectral Optical Properties of the California Coastal Transition Zone: Remote Sensing Reflectance and Total Absorption, New Orleans, LA. AGU, New Orleans, LA, 14 February 1990. (Abstract in *EOS* 71(2): 146).
- Peacock, T. G., K. L. Carder, C. Davis, and R. G. Steward. Contribution of degradation products of primary productivity to spectral signals in the California Coastal Transition Zone, *SPIE Ocean Optics X*, Orlando, FL April 17, 1990: p. 20.
- Reinersman, P., K. L. Carder, F. E. Müller-Karger, C. Davis, and D. English. Airborne Visible and Infrared Imaging Spectrometer (AVIRIS) pigment data for the West Florida Shelf. A.G.U. Fall Meeting, San Francisco, CA. *EOS* 71(43), December 5, 1990: p. 1395.
- Doyle, L., J. Bannon, and K. L. Carder. Toward quantifying color in descriptions of rocks and sediments. A.G.U. Fall Meeting, San Francisco, CA. *EOS* 71(43), December 6, 1990: p. 1697.
- Costello, D.K., K.L. Carder and R.G. Steward. 1991. Development of the Marine Aggregated Particle Profiling and Enumerating Rover (MAPPER). In: *Underwater Imaging Photography and Visibility*, SPIE, Vol. 1537, p. 161-172.
- Carder, K. L. Oceanography from Satellites
- Carder, K. L., Inherent optical properties of phytoplankton. ASLO Summer Meeting, Halifax, Nova Scotia, June 10-14, 1991. Invited.

- Steward, R. G., K. L. Carder, and D. K. Costello. Applications of video spectroscopy in the marine environment. Abstract In: *Underwater Imaging, Photography, and Visibility*, proceedings of the Society of Photo-Optical Instrumentation Engineers, Vol. 1537. San Diego, CA. July 23, 1991.
- Costello, D. K., K. L. Carder, and R. G. Steward. Development of the Marine Aggregated Particle Profiling and Enumerating Rover (MAPPER). In: *Underwater Imaging, Photography, and Visibility*, proceedings of the Society of Photo-Optical Instrumentation Engineers, Vol. 1537. San Diego, CA. July 23, 1991. p. 161-172.
- Carder, K. L., Case II MODIS-N Algorithms for Chlorophyll *a* and colored dissolved organic matter, MODIS Ocean Team Meeting, Miami, May 20, 1992.
- Carder, K.L., R. G. Steward, R. F. Chen, S. Hawes, Z. Lee, and C. O. Davis. AVIRIS Calibration and Application in Coastal Oceanic environments: Tracers of soluble and particulate constituents of the Tampa Bay coastal plume. First Thematic Conference on Remote Sensing for Marine and Coastal Environments, ERIM, New Orleans, LA. June 16, 1992.
- Hawes, S. K., K. L. Carder, and G. R. Harvey. Quantum fluorescence efficiencies of marine humic and fulvic acids. First Thematic Conference on Remote Sensing for Marine and Coastal Environments, ERIM, New Orleans, LA. June 16, 1992.
- Lee, Z., K. L. Carder, S. K. Hawes, R. G. Steward, T. G. Peacock, and C. O. Davis. An interpretation of high spectral resolution remote sensing reflectance. *Optics of the Air-Sea Interface: Theory and Measurement*. Leland Estep, ed. Proc. SPIE 1749, San Diego, CA. July 1992.
- Costello, D. K., K. L. Carder, and W. Hou. Structured visible diode laser illumination for quantitative underwater imaging. In: *Ocean Optics XI*. Gary D. Gilbert, ed. Proc. SPIE 1750, San Diego, CA. July 1992.
- Hawes, S.K., K. L. Carder, and G. R. Harvey. Quantum fluorescence efficiencies of fulvic and humic acids: effects on ocean color and fluorometric detection. In: *Ocean Optics XI*. Proc. SPIE 1750, San Diego, CA. July 1992.
- Carder, K. L. Observations of terrestrial aerosol transport to oceans. "Global Aerosols and Ocean Biogeochemistry," NASA's Earth Science and Applications Division. Orlando, FL. September 1, 1992.
- Carder, K. L., Z. Lee, T. G. Peacock, R. G. Steward, and C. O. Davis. Aircraft algorithms for water absorption coefficients: rain or shine. A.G.U. Fall Meeting, San Francisco, CA. December 8, 1992.
- Carder, K.L., P. Reinersman, and R.F. Chen. AVIRIS calibration using the cloud-shadow method. 4th JPL AVIRIS Workshop. Crystal City, VA. September 1993.
- Costello, D.K., K.L. Carder, R.G. Steward, and A. Alldredge. The Distribution and Optical Properties of Large Marine Particles: Data from a Culture Tank and Field Experiments. EOS AGU/ASLO, San Diego, CA. February 21-25, 1994.
- Hou, W., D.K. Costello, K.L. Carder, and R.G. Steward. High-resolution Marine Particle Data from MAPPER, a new in situ optical ocean instrument. EOS AGU/ASLO, San Diego, CA. February 21-25, 1994.
- Lee, Z.P., K.L. Carder, and T.G. Peacock. Hyperspectral modeling of remote sensing reflectance: from the Florida Shelf to the Mississippi River. EOS AGU/ASLO, San Diego, CA. February 21-25, 1994.
- Peacock, T.G., K.L. Carder, P.G. Coble, Z.P. Lee, and S.K. Hawes. Long-path Spectrometer for

- measuring gelbstoff absorption in clear waters. EOS AGU/ASLO, San Diego, CA. February 21-25, 1994.
- Reinersman, P., F-I Chen, and K.L. Carder. Monte Carlo Simulation of Atmospheric Point Spread Function with Application to Coastal Imaging Processing. EOS AGU/ASLO, San Diego, CA. February 21-25, 1994.
- Steward, R.G., K.L. Carder, and T.G. Peacock. High resolution in water optical spectrometry using the Submersible Upwelling and Downwelling Spectrometer (SUDS). EOS AGU/ASLO, San Diego, CA. February 21-25, 1994.
- Young, L.R., K.L. Carder, and P. Hallock. Hyperspectral remotely sensed colored dissolved organic matter as a photoprotective agent against bleaching in corals and foraminifera. EOS AGU/ASLO, San Diego, CA. February 21-25, 1994.
- Carder, K.L. and D.K. Costello. Optical properties of large marine aggregates. SIGMA meeting in San Diego, CA. February 19-20, 1994.
- Carder, K.L. Ocean color applications to circulation in the Gulf of Mexico. Northeastern Gulf of Mexico Physical Oceanography workshop, Tallahassee, FL. April 5-7, 1994.
- Carder, K.L. Algorithm theoretical basis for ocean chlorophyll, downwelling irradiance, and aerosol-angstrom exponents. Moderate Resolution Imaging Spectrometer (MODIS) Scientific Team Meeting. Baltimore, MD. May 3-6, 1994.
- Carder, K.L. SeaWiFS algorithm for chlorophyll. MODIS Scientific Team Meeting. Washington DC. May 12, 1994.
- Carder, K.L. Bottom classification and albedo. ONR Scientific Team Meeting, Bio-optical Properties of Coral Reefs. Boston, MA. May 16-19, 1994.
- Costello, D.K., K.L. Carder. Using Unmanned Vehicle Systems for Ground-Truthing Oceanographic Satellite Data. Association for Unmanned Vehicle Systems (AUVS) Proceedings Manual 21st Annual Technical Symposium and Exhibition, p 447-454. Detroit, MI, May 1994.
- Carder, K.L. Ocean chlorophyll algorithm. MODIS Scientific Team Meeting. College Park, MD. October 11-14, 1994.
- Carder, K.L. SeaWiFS Team Meeting with NASA/GSFC on "Latest Developments in Chlorophyll a Algorithms." Greenbelt, MD. November 8-9, 1994.
- Carder, K.L. "Hyperspectral measures of boundaries in the South Atlantic Bight." Invited speaker at South Carolina Sea Grant Consortium Meeting. Charleston, South Carolina. November 16-18, 1994.
- Costello, D.K., W. Hou and K.L. Carder. 1994. Some effects of the sensitivity threshold and spatial resolution of a particle imaging system on the shape of the measured particle size distribution. *Ocean Optics XII*, SPIE 2258. Jules S. Jaffe, ed., Bergen, Norway.
- Costello, D.K., K.L. Carder and R.G. Steward. 1994. New Instrumentation and platforms for subsurface optical measurements. *Ocean Optics XII*, SPIE 2258. Jules S. Jaffe, ed., Bergen, Norway.
- Carder, K.L. "Development and validation of chlorophyll a , OCTS algorithm for global waters." The first ADEOS (Advanced Earth Observing Satellite) Symposium to further OCTS (Ocean Color and Temperature Scanner) Developments. Osaka, Japan. December 4-25, 1994.
- Costello, D.K., K.L. Carder, R.F. Chen, T.G. Peacock, and N.S. Nettles. 1995. Multi-spectral imagery, hyper-spectral radiometry, and unmanned underwater vehicles: Tools for the assessment of natural resources in coastal waters. In: *Visual Communications and Image Processing '95*, SPIE. Taipei, Taiwan, Invited.

- Costello, D.K., I.I. Kaminer, K.L. Carder and R. Howard. 1995. The use of unmanned vehicle systems for coastal ocean surveys: Scenarios for joint underwater and air vehicle missions. Proc. *International Program Development in Undersea Robotics & Intelligent Control*. Lisbon, Portugal, Invited.
- Carder, K.L. 1995. Optical Model of Ocean Remote Sensing: Application to Ocean Color Algorithm Development. *Space Remote Sensing of Subtropical Oceans (SRSSO)*. COSPAR Colloquium, Taipei, Taiwan. Invited.
- Carder, K.L., R.F. Chen, Z. Lee. 9/12-9/16/95. COSPAR Colloquium. "Space Remote Sensing of Sub-Tropical Oceans (SRSSO)". Taipei, Taiwan.
- Chen, R.F., K.L. Carder, Z. Lee 9/12-9/16/95. COSPAR Colloquium. Bathymetric algorithm of water-leaving radiances in AVIRIS Imagery: Use of a Reflectance Model. Taipei, Taiwan.
- Chen, F.R., Z.P. Lee and K.L. Carder. 1995. A bathymetric algorithm of water-leaving radiances in AVIRIS imagery: use of a reflectance model, COSPAR Colloquium, Space Remote Sensing of Subtropical Oceans, National Science Council, Taiwan, 12-16 Sept.
- Carder, K.L. 1995. Presentation to NASA SeaWiFS Team.
- Carder, K.L. 1995. Presentation to NASA MODIS Ocean Team.
- Carder, K.L. 1995. Presentation to the Naval Research Laboratory on "Hyperspectral Remote Sensing in Coastal Environments." Washington, D.C. Invited.
- R.G. Steward, T.G. Peacock, C.O. Davis and J.L. Mueller. 1996. Remote-Sensing Reflectance and Inherent Optical properties of Oceanic Waters Derived from Above-Water Measurements. SPIE Vol. 2963, pp. 160-166.
- Lee, Z.P., K.L. Carder, T.G. Peacock and R.G. Steward. 1996. Remote sensing reflectance measured with and without a vertical polarizer. SPIE Vol. 2963, pp. 483-488.
- Bissett, W.P., J.S. Patch, K.L. Carder and Z.P. Lee. 1996. Pigment Packaging and Chlorophyll a-specific Absorption in Costello, D.K., K.L. Carder, R.F. Chen, T.G. Peacock and N.S. Nettles. 1995. Multi-spectral imagery, hyper-spectral radiometry, and unmanned underwater vehicles: Tools for the assessment of natural resources in coastal waters. In: *Visual Communications and Image Processing '95*. SPIE, Taipei, Taiwan
- Lee, Z.P., K.L. Carder, R.G. Steward, T.G. Peacock, C.O. Davis and J.L. Mueller, Protocols for measurement of remote-sensing reflectance from clear to turbid waters. Presented at SeaWiFS workshop, Halifax, Nova Scotia, 10/21/96.
- Lee, Z.P., K.L. Carder High-Light Oceanic Waters: a Method, an Algorithm, and Validation. SPIE Vol. 2963, pp. 358-374.
- Hou, W., K.L. Carder and D.K. Costello. 1996. Scattering phase function of very large particles in the ocean. SPIE Vol. 2963, pp. 579-584.
- Pratt, P., K.L. Carder, D.K. Costello and Z.P. Lee. 1996. Algorithms for path radiance and attenuation to provide color-corrections for underwater imagery, characterize optical properties and determine bottom albedo. SPIE Vol. 2963, pp. 753-759.
- Lee, Z.P., K.L. Carder, R.G. Steward, T.G. Peacock, C.O. Davis and J.L. Mueller, Remote-sensing reflectance and inherent optical properties of oceanic waters derived from above-water measurements. Presented in Ocean Optics XIII, Halifax, Nova Scotia, 10/96.
- Costello, D.K., K.L. Carder and S.M. Smith. 1996. Unmanned underwater vehicles as platforms for optical oceanography in coastal waters. *EOS AGU/ASLO*.
- Betzer, PR., S.E. Dunn, S.M. Smith, R.H. Byrne, K.L. Carder, P.G. Coble, D.K. Costello, K.A. Fanning and T.L. Hopkins. 1996. Sediment-water interactions. *EOS AGU/ASLO*.
- Hou, W., K.L. Carder and D.K. Costello. 1996. Scattering phase functions of very large

- particles in the ocean. In *Ocean Optics XIII*, Steven G. Ackleson, editor. Proc. SPIE, Halifax, Nova Scotia, Canada.
- Pratt, P., K.L. Carder, D.K. Costello and Z. Lee. 1996. Algorithms for path radiance and attenuation to provide color corrections for underwater imagery, characterize optical properties and determine bottom reflectance. In *Ocean Optics XIII*, Steven G. Ackleson, editor. Proc. SPIE, Halifax, Nova Scotia, Canada.
- Zhongping Lee, Kendall Carder, Robert Steward and Brad Weigle. Bottom Depth and Type for Shallow Waters: Hyperspectral Observations from a Blimp. Presented at the Fourth International Conference on Remote Sensing for Marine and Coastal Environments, Orlando, Florida, 17-19 March 1997. Published.
- C. Cattrall and K.L. Carder. Experimental Determination of Spectral Absorption by Iron-Bearing Aerosols: Applications to Remote Sensing Imagery. Presented at the Fourth International Conference on Remote Sensing for Marine and Coastal Environments, Orlando, Florida, 17-19 March 1997. Presentation.
- Patty Pratt, Kendall L. Carder, and David K. Costello. Remote Sensing Reflectance Algorithms Developed to Correct Underwater Coral Imagery for the Effects of Optical Thickness To Assist in Benthic Classification. Presented at the Fourth International Conference on Remote Sensing for Marine and Coastal Environments, Orlando, Florida, 17-19 March 1997. Published.
- Melissa Carder, Kendall L. Carder and B.L. Weigle. Skylight Correction of Video Images: An Airship Shadow Approach. Presented at the Fourth International Conference on Remote Sensing for Marine and Coastal Environments, Orlando, Florida, 17-19 March 1997. Published.
- Costello, D.K. and K.L. Carder. In situ optical data collected aboard unmanned underwater vehicles in coastal water. ASLO, Santa Fe, NM. 1997.
- Lee, Z.P., K.L. Carder, R.G. Steward, L.R. Young. Absorption coefficient and path elongation factor: influence on remote sensing of shallow-water bathymetry. ASLO, Santa Fe, NM. 1997.
- Peacock, T.G., K.L. Carder and R. Waterbury. A Dual-path, Long-path Absorption Spectrometer for Obtaining Absorption Coefficients of Dissolved Organic Matter (DOM). ASLO, Santa Fe, NM. 1997.
- Costello, D.K., K.L. Carder, and J.S. Patch. Methods for Utilizing Hyperspectral In-situ Light Profiles in the Presence of Wave Focusing and the Absence of Above-water Measurements. EOS AGU/ASLO, San Diego, February, 1998.
- Ivey, J.E., K.L. Carder, H.Hochman, J. Patch, and R.G. Steward. 1998. The modulation of optical properties of Sombrero Key, Florida. *Ocean Optics XIV*, S. Ackleson and J. Campbell (eds.) Proc. SPIE (CDROM).
- Lee, Zhongping Z.; Zhang, Mingrui M.; Carder, Kendall K.; Hall, Lawrence L. A Neural Network Approach To Deriving Optical Properties And Depths Of Shallow Waters, *s Ocean Optics XIV*, Kailua-Kona, HA, 10 November, 1998.
- Hu, C., Muller-Karger, F; Carder, K L.; Lee, Z. A Method To Derive Optical Properties Over Shallow Waters Using Seawifs, *Ocean Optics XIV*, Kailua-Kona, HA, 10 November, 1998.
- Ivey, James E.; Carder, Kendall L.; Hochman, Herschel; Patch, Jennifer S.; Steward, Robert G. The Modulation Of Optical Properties Of Sombrero Key, Florida, *Proceedings Ocean Optics XIV*, Kailua-Kona, HA, 10 November, 1998.
- Carder, K L.; Chen, F-I R.; Cattrall, C; Strub, A. Detecting Desert Saharan Dust Storms Using

- SEAWIFS Imagery, *Ocean Optics XIV*, Kailua-Kona, HA, 11 November, 1998.
- Renadette, Lisa A.; Carder, Kendall L.; Costello, David K.; Hou, Weilin; Zhang, Mingrui, An Evaluation of Bottom interpretation From Space Using Underwater Imagery, *Ocean Optics XIV*, Kailua-Kona, HA, 11 November, 1998.
- Costello, D K.; Carder, K L.; Hou, W; Peacock, T G.; Ivey, J E, Hyperspectral Measurements Of Upwelling Radiance During COBOP: THE Role Of Bottom Albedo And Solar-Stimulated Bottom Fluorescence, *Ocean Optics XIV*, Kailua-Kona, HA, 11 November, 1998.
- Cattrall, C; Carder, K L., In-Situ Radiometric Determination Of An Optical Model Of Long-Range Saharan Dust For Use In Ocean Colour Imagery, *Proceedings Ocean Optics XIV*, Kailua-Kona, HA, 11 November, 1998.
- Hou, Weilin; Carder, Kendall L.; Costello, David K.; English, David; Ivey, Jim; Mazel, Charles, Database Structure Of The COBOP Project With Visual Inspection Via WWW, *Ocean Optics XIV*, Kailua-Kona, HA, 13 November, 1998.
- Carder, K.L., D.K. Costello, Z. P. Lee. Invited. The Use of Unmanned Underwater Vehicles to Acquire Environmental Data in Support of Mine-Counter Measure Operations. 4th International Symposium on Technology and the Mine Problem. Naval Post-Graduate School, Monterey, CA 2000.
- Cattrall, C. and K.L. Carder, “Ground-based determination of Saharan dust single-scattering albedo and phase function during two dust events in summer 1998, Florida Keys”. Paper presented at AGU, San Francisco, December 14-19, 2000.
- Costello, D.K. and K.L. Carder. Bottoms Up! The Hemispherical-directional Reflectance of Sand, Corals, and Seagrass and the Effect on the Upwelling Light Field. AGU/ASLO Ocean Science Meeting, San Antonio, TX, 2000.
- Costello, D K.; Carder, K L. The contribution by internally reflected, upwelling radiance to the downwelling light field in shallow waters, *Ocean Optics XV*, Musee Oceanographique, Monaco, 18 October 2000.
- Lee, Z. and K.L. Carder. “Spectral channels and their influences on remote-sensing retrieval: 1. Shallow Waters”. AGU/ASLO Ocean Science Meeting, San Antonio, TX, 2000.
- Hou, W. L. Renadette, A. Farmer, K.L. Carder, D.K. Costello and T.G. Peacock. “Bottom reflectance of Various Benthic Types based on *in-situ* Multi-channel Imagery”. AGU/ASLO Ocean Science Meeting, San Antonio, TX, 2000.
- Lee, Z.P., K.L. Carder and F.R. Chen. “Bathymetry and Environmental Properties Observed from AVIRIS Data” submitted for presentation to Sixth International Conference on Remote Sensing for Marine and Coastal Environments to be held in Charleston, SC 1-3 May 2000.
- Lee, Z; Ivey, J E.; Carder, K L.; Steward, R G.; Patch, J S., Pure water absorption coefficient around 400 nm: Lab-measured versus field-observed, *Ocean Optics XV*, Musee Oceanographique, Monaco, 18 October 2000.
- Carder, K L.; Lee, Z; Chen, R F, Satellite pigment retrievals for optically shallow waters, *Ocean Optics XVI*, Musee Oceanographique, Monaco, 18 October 2000.
- Kaltenbacher, E., J. Patten, D. English, D. K. Costello, and K.L. Carder. 2001. Development of a Compact, Real-Time, Optical System for 3-D Mapping of the Ocean Floor. Proceedings, Autonomous Undersea Systems Institute AUV Sensors Workshop, Oceanology International 2001. Miami, Florida (Invited).
- Carder, K.L., and R.G. Steward. Autonomous Marine Optical Sensor Network on the West Florida Shelf. Ocean Color Science Working Group meeting sponsored by NASA HQ., San Diego, CA, May 2001.

- Carder, K.L. Light Absorption in the Sea: Remote Sensing Retrievals Needed for Light Distribution with Depth, Affecting Heat, Water, and Carbon Budgets. MODIS Science Team Meeting, Plenary Session, Baltimore, MD, Dec. 2001.
- Carder, K.L., H. Warrior, Z. Lee, F.R. Chen, and D. Otis, Shallow-Water Heat and Salt Models with Optical Parameters Derived from MODIS or SeaWiFS Imagery. Presented at the *AGU/ASLO Ocean Sciences Meeting*, Honolulu, HA, 11-15 February 2002.
- Costello, D. K., K. L. Carder, J. Ivey, and D. C. English, D. 2002. Interpretation of Observations of Trans-spectral Phenomena Acquired Using Hyperspectral Sensors Aboard a Remotely Operated Vehicle in Exuma Sound. *AGU/ASLO 2002 Ocean Science Meeting*, Kailua-Kona, Hawaii, February 2002.
- Farmer, A. S., D. K. Costello, K. L. Carder and W. Hou. 2002. Bottom Albedo Derivations from ROV Measured Remote Sensing Reflectance over a Sandy-Seagrass Area near Lee Stocking Island, Bahamas. *AGU/ASLO 2002 Ocean Science Meeting*, Kailua-Kona, Hawaii, February 2002.
- Lee, Z. and K.L. Carder, Using MODIS channels to derive inherent optical properties of coastal waters after correcting chlorophyll fluorescence. Presented at the *AGU/ASLO Ocean Sciences Meeting*, Honolulu, HA, 11-15 February 2002.
- Mazel, C. H. et al. 2002. Advances in Fluorescence Imaging of the Sea Floor. *AGU/ASLO 2002 Ocean Science Meeting*. Kailua-Kona, Hawaii, February 2002.
- McIntyre, M.L., D.F. Naar, K.L. Carder, and P.A. Howd, Hyperspectral Remote Sensing of Nearshore Bathymetry Offshore of Sarasota, Florida: Comparisons With High-Resolution Multibeam Bathymetry. Presented at the *AGU/ASLO Ocean Sciences Meeting*, Honolulu, HA, 11-15 February 2002.
- Carder, K.L, Performance of MODIS Semi-Analytic Ocean-Color Algorithms: Chlorophyll *a*, Total Absorption, and Absorbed Radiation by Phytoplankton (ARP). MODIS Science Team Meeting, Plenary Session, Greenbelt, MD, July 22, 2002.
- Carder, K.L, F. Chen, J. Cannizzaro, and J. Campbell, Performance of MODIS Semi-Analytic Ocean-Color Algorithms: Chlorophyll *a*, Total Absorption, and Absorbed Radiation by Phytoplankton (ARP), presented at *The World Space Congress*, COSPAR, Houston, 18 October, 2002 [invited].
- Cannizzaro, J.P., K.L. Carder, F.R. Chen, and C.A. Heil. Remote detection of red tide blooms on the West Florida Shelf: a novel classification technique, Presented at *Ocean Optics XVI*, Santa Fe, NM, November 18-22, 2002.
- Cannizzaro, J.P., K.L. Carder, F.R. Chen, J.J. Walsh, Z. Lee, C. Heil, and T. Villareal, A novel classification technique for detection of red tides in the Gulf of Mexico: Application to the 2001-2002 bloom event, Presented at the *Xth International Conference on Harmful Algae*, St.Pete Beach, FL, October 21-25, 2002.
- Carder, K.L., C.C. Liu, Z. Lee, D.C. English, J. Patten, F.R. Chen, J.E. Ivey, and C.O. Davis. Illumination and turbidity effects on observing faceted bottom elements with uniform lambertian albedos, Presented at *Ocean Optics XVI*, Santa Fe, NM, November 18-22, 2002.
- Costello, D. K., K. L. Carder, J. E. Ivey, D. C. English, T. G. Peacock and W. Hou. Measurement and interpretation of diffuse attenuation and reflectance in clear, deep-water environments: The Effects Of Trans-Spectral Phenomena, Presented at *Ocean Optics XVI*, Santa Fe, NM, November 18-22, 2002.
- English, D.C., K. L. Carder, W. Hou, and D. K. Costello. Use of unmanned underwater vehicles to determine the spatial distribution of reflectance and optical properties, Presented at *Ocean*

- Optics XVI*, Santa Fe, NM, November 18-22, 2002.
- Filippi, A. M., R. L. Miller, J. R. Jensen, R. A. Leathers, C. O. Davis, K. L. Carder, T. V. Downes. Cybernetic statistical learning for hyperspectral remote sensing inverse modeling in the coastal ocean, Presented at *Ocean Optics XVI*, Santa Fe, NM, November 18-22, 2002.
- Hou, W., K. L. Carder, D. K. Costello, D. C. English. Coastal bottom feature classification using 2-D and 3-D moment invariants, Presented at *Ocean Optics XVI*, Santa Fe, NM, November 18-22, 2002.
- Ivey, J.E., K.L. Carder, F.R. Chen, and Z. Lee. Absorption measurements in optically clear waters, Presented at *Ocean Optics XVI*, Santa Fe, NM, November 18-22, 2002.
- Lee, Z., K.L. Carder, and K. Du. Influence of particle phase function on the model parameter of remote-sensing reflectance, Presented at *Ocean Optics XVI*, Santa Fe, NM, November 18-22, 2002.
- Liu, C.C., R.L. Miller, K.L. Carder and Z. Lee. Estimating the underwater light field from remote sensing, Presented at *Ocean Optics XVI*, Santa Fe, NM, November 18-22, 2002.
- Otis, D.B., K.L. Carder, D.C. English, J.E. Ivey, J. Patch, F.R. Chen, and H. Warrior. Using SeaWiFS imagery and optical property measurements to investigate the Bahama Banks as a source of gelbstoff to the surrounding deep ocean, Presented at *Ocean Optics XVI*, Santa Fe, NM, November 18-22, 2002.
- Reinersman, P. N. and K. L. Carder. A modular, hybrid method for solving the radiative transfer equation with arbitrary geometry in 1, 2, or 3 dimensions, Presented at *Ocean Optics XVI*, Santa Fe, NM, November 18-22, 2002.
- Steward, R. G. and K. L. Carder. Compression of autonomous hyperspectral data, Presented at *Ocean Optics XVI*, Santa Fe, NM, November 18-22, 2002.
- Warrior, H., K. Carder, Z.P. Lee, D. Otis, R. Chen. An improved optical model for heat and salt budget estimation for general ocean circulation models, Presented at *Ocean Optics XVI*, Santa Fe, NM, November 18-22, 2002.
- Chen, F. R., K. L. Carder, P. Bissett, R. Steward, D. Costello, J. Ivey, and Z. P. Lee. 2004. Bathymetry Retrievals from PHILLS Flown Over Turbid Waters. ASLO/TOS Ocean Research Conference, Honolulu, Hawaii, p27.
- Hou, W., K. L. Carder, D. K. Costello, and D. C. English. 2004. Large-Scale, Multi-Channel Video Mosaics Of A Coral Reef Automatically Constructed From Imagery Acquired Using An Autonomous Underwater Vehicle. ASLO/TOS Ocean Research Conference, Honolulu, Hawaii.
- Carder, K.L., J. Cannizzaro, F.R. Chen, C. Heil, G.A. Vargo, 2004. *Karenia brevis* blooms on the west Florida shelf: A bridge between optics and physiology, ASLO/TOS Ocean Research Conference, Honolulu, Hawaii, p24.
- Malik, L.A., K.L. Carder, J. Cannizzaro, J. Ivey, 2004. Variation of pigment composition in response to light quality. ASLO/TOS Ocean Research Conference, Honolulu, Hawaii, p98.
- Otis, D.B. and K.L. Carder, 2004. CDOM effects on the underwater light field: Simulations of UV radiation incident upon coral reefs, ASLO/TOS Ocean Research Conference, Honolulu, Hawaii, p119.
- Warrior, H.V. and K.L. Carder, 2004. 3D simulation of thermohaline plumes in the Bahamas, ASLO/TOS Ocean Research Conference, Honolulu, Hawaii, p170.
- Ayoub, Lore M; Hallock-Muller, Pamela; Carder, Kendall; English, David; Ivey, Jim - "Calibrating a Bioindicator of Photooxidative Stress on Coral Reefs", for *Ocean Optics XVII*,

- Fremantle, Australia, October 28, 2004.
- Carder, Kendall L; Cannizzaro, Jennifer P; Chen, F. Robert; Bailey, Sean W; Werdell, P. Jeremy - "Toward a Climate-Quality Chlorophyll Dataset: Global Validation of a Semi-Analytical Chlorophyll a Algorithm", for Ocean Optics XVII, Fremantle, Australia, October 28, 2004.
- Chen, Feng-I R; Carder, Kendall L; Costello, David K - "Hyperspectral Retrievals of Bottom Depth and Albedo Using a Genetic Optimization Code", for Ocean Optics XVII, Fremantle, Australia, October 28, 2004.
- Lee, ZhongPing; Darecki, Mirosław; Carder, Kendall; Marra, John; Davis, Curtiss; Arnone, Robert - "Applications of Ocean-Color Remote Sensing: An IOP-Centered System", for Ocean Optics XVII, Fremantle, Australia, October 28, 2004.
- Carder, K.L., P. Reinersman, D.K. Costello, E. Kaltenbacher, J. Kloske, and M.Montes-Hugo, 2005. Optical Inspection of Ports and Harbors: Laser-Line Sensor Model Applications in 2 and 3 Dimensions, in SPIE Proceedings 5780(49), 11 pp, March, Orlando.
- Carder, K.L., Cannizzaro, J.P., Lee, Z. Ocean color algorithms in optically shallow waters: Limitations and improvements. [in: R. Frouin et al.], Remote Sensing of the Coastal Ocean Environment, SPIE Vol 5885, Bellingham, WA pp.06-1 to 06-11, August 2005, San Diego.
- Montes-Hugo, M.A. and K.L. Carder, 2005. Monte Carlo simulations as a tool to optimize target detection by AUV/ROV laser line scanners, SPIE Proceedings 5799(1), 12 pp March, Orlando.
- Carder, K.L., D. English, and C. Du. "An Autonomous Marine Optical System (AMOS) for monitoring the optical properties of port and harbor waters." SPIE Defense & Security Symposium, 17-21 April 2006, Gaylord Palms Resort and Convention Center in Orlando (Kissimmee), Florida USA.
- Carder, K.L, Reinersman, P.N.; Hallock, P., 2006. A 3-D model of light effects related to the bleaching of corals and foraminifera, Ocean Optics XVIII, October, Montreal (extended abstract on CDROM, ONR, Arlington, VA).
- K.L. Carder, J. Cannizzaro, and R. Chen, 2006. "Remote Detection of HABs in the Gulf of Mexico: Alerts for resource management, MODIS Science Team meeting, October, Lanham, Md.
- K.L. Carder, J. Cannizzaro, and R. Chen, 2006. "Remote Detection of HABs in the Gulf of Mexico in 2005," MODIS Science Team meeting, October, Baltimore, Md.
- K.L. Carder, J. Cannizzaro, and R. Chen, 2006. "Detection of *Karenia brevis* blooms on the West Florida Shelf in 2005", MODIS Science Team meeting, October, Lincicom, Md.
- K.L. Carder, J. Cannizzaro, and R. Chen, 2006. "Detection of *Karenia brevis* blooms on the West Florida Shelf in 2005 using remote-sensing reflectance data", Summer ASLO meeting, June, Victoria, BC.