

ANDREA J. VANDER WOUDE, PH.D.

andrea.vanderwoude@noaa.gov

CELL: 734-358-6920

CAREER SUMMARY

I am a satellite oceanographer, data scientist and geologist, interpreting ecological patterns and water quality parameters. I have been using remote sensing for over 20 years and specifically hyperspectral imagery for more than 3 years. My professional experiences have used remote sensing to understand climate change in the coastal and Southern Ocean in addition to harmful algal blooms in the Great Lakes.

EDUCATION

2001- 2006 Santa Cruz, CA Ph.D.	University of California, Santa Cruz Biological/ Physical Oceanography, Dr. Raphael Kudela Thesis topic: ' <i>Coastal Retentive Embayments North and South of Point Reyes, CA: Existence, Time scales and Carbon Significance</i> ' December 2006
1997-1999 Houghton, MI B.Sc.	Michigan Technological University Geology and Remote Sensing, Dr. Judith Budd June 1999
1995-1997 Traverse City, MI	Northwestern Michigan College

TECHNICAL SKILLS

Programming Languages: Python, Matlab, Interactive Data Language (IDL), html, Fortran and Unix shell scripting

Platform/Operating Systems: UNIX, Windows, Macintosh and Linux

GIS and Remote Sensing Software: QGIS, arcGIS, ERDAS IMAGINE, Definiens eCognition, and ENVI

Graphics Software: Adobe Photoshop and Illustrator

RESEARCH & PROFESSIONAL EXPERIENCE

Fall 2016 - Present **Global Science and Technology, Inc.** **Greenbelt, MD**
Remote Sensing Specialist

- Prepared flight plans, configured sensors and processed the imagery with proprietary software and developed code in Python, MATLAB or IDL. Added metadata to the database to document the database content.
- Automated processing tasks, mosaicking the images as well as verifying the accuracy of the data. This includes writing code to test the data against in situ optics and lab processed samples collected with coincident over flights.
- Developed new or evaluate existing detection and classification algorithms using second derivative or semi-analytical algorithms to detect features of interest such as harmful or nuisance algal blooms throughout the Great Lakes.
- Developed algorithms for phytoplankton functional type classification using laboratory-based absorption curves from known species. The end product will be geospatial maps of phytoplankton groups (including cyanobacteria) of interest to water intake managers under the SOAR project.

Winter 2014 - Present **University of Waterloo** **Waterloo, ON**
Adjunct Faculty

- Acted as a committee member for Alex Driedger's thesis on remote sensing of microplastics in the Great Lakes (M.Sc., Graduated June 2015)

Summer 2012 – Present CILER, University of Michigan, at NOAA GLERL

Ann Arbor, MI

Research Fellow

- Improved model inputs and developed an Atlantis biophysical ecosystem-based model for hypoxia in the Gulf of Mexico (Summer 2012 - Winter 2013)
- Initiated the input for the first GLERL HAB tracker in 2014 with a modified FLH-CI second-derivative algorithms
- Defined biophysical regions in Lake Erie from satellite chlorophyll and sea surface temperature data and modeled winds as input for self organizing maps (SOMs)
- Algorithm development for harmful algal bloom detection in the Great Lakes
- Launched an airborne hyperspectral sensor in spring of 2015 with over 15 flyovers and currently developing an optically-based phytoplankton functional type algorithm for Lake Erie in addition to other Great Lakes
- Managed the deployment, configuration, data retrieval, mosaicking of images and algorithm development for the 2016 airborne hyperspectral sensor imager (Resonon Pika II) over the Great Lakes (total of 2 years hyperspectral work date)
- Automated Python and shell scripts for products for the HAB Tracker and possible future bulletin showcase of hyperspectral data
- Used Python programs to compare in situ data to hyperspectral imagery collected
- Weekly map products for SOAR water intake managers and NASA collaborators of cyanobacteria index as well as future phytoplankton types in the Great Lakes
- Created GLERL database of hyperspectral data for dissemination to researchers
- Communicated the results at academic conferences and the laboratory review and multiple manuscripts are in preparation to address the new algorithm development

Fall 2011 – Spring 2012 Michigan Technological Research Institute

Ann Arbor, MI

Researcher

- As part of GLOS and the MTRI collaborative with the EPA, worked on GLRI defined AOC's within the Great Lakes and developed a satellite algorithm for suspended sediment in those regions.
- Mapped unpaved road types using aerial imagery and eCognition algorithms

Winter 2008 – Winter 2010 Oregon State University

Corvallis, OR

Postdoctoral Researcher

- As a joint position between Dr. Peter Strutton and Dr. Burke Hales, I used self-organized maps to define biophysical regions from satellite data to predict climate driven, Southern Ocean CO₂ fluxes

Winter 2007 – Spring 2008 University of Minnesota, Duluth

Duluth, MN

Postdoctoral Researcher

- Designed idealized three-dimensional estuary developed in ROMs to understand the response of estuaries to physical forcing conditions (upwelling versus downwelling) and various estuary sizes

Summer 2001 – Winter 2006 University of California, Santa Cruz

Santa Cruz, CA

Graduate Research Assistant

- As part of the NSF CoOP WEST project, identified retentive embayments around Point Reyes and their seasonality from mooring and shipboard data and satellite imagery
- Placed satellite data onto WOCE drifter trajectories from CoOP WEST, to act as an *in situ* sensor and to understand the spatial and temporal time scales of retentive embayments
- Developed a satellite algorithm for the partial pressure of CO₂ around Point Reyes to understand the contribution of retentive embayments to coastal carbon cycling
- Mosaicked AVIRIS hyperspectral imagery for Monterey Bay harmful algal bloom detection.

Summer 2004 USGS Coastal and Marine Geology

Santa Cruz, CA

USGS Summer Internship

- Mapped sediment transport in San Francisco Bay as part of historical tsunami research using arcGIS

Summer 2002 NASA Wallops Island Flight Facility **Wallops Island, VA**

NASA Goddard Graduate Coastal Research Fellow

- Advanced global spatial and temporal decorrelation scales from global WOCE drifters with satellite data overlaid on their trajectories

2000 – 2001 Earth Tech, Inc.

Grand Rapids, MI

Monitoring Specialist

- Reported water quality monitoring results for West Michigan superfund sites

TEACHING EXPERIENCE

Fall 2013 Washtenaw Community College

Ann Arbor, MI

Instructor - Undergraduate Course

- Led a course on Introduction to Earth Science with a laboratory section for non-science majors
- Developed curriculum and taught across multiple platforms (lab, field, lecture), preparing laboratory sections
- Performed all student assessments and recording
- Daily presentation of multiple current events to initiate discussion and engage students in the geosciences with real-world applications

Winter 2010 Oregon State University

Corvallis, OR

Guest Lecturer - Graduate Course

- Biological Oceanography: Two Lectures on phytoplankton dynamics and air-sea CO₂ fluxes

Fall 2007 University of Minnesota, Duluth

Duluth, MN

Guest Lecturer - Graduate Course

- Physical Limnology: Lecture on satellite oceanography. Instruction on how to acquire Lake Superior satellite imagery for graduate student research

Spring 2007 University of Minnesota, Duluth

Duluth, MN

Guest Lecturer - Undergraduate Course

- Geophysical Fluid Dynamics: Lecture on modern satellite oceanography and remote sensing techniques

Fall 2005 University of California, Davis, Bodega Marine Laboratory

Bodega Bay, CA

Guest Lecturer - Graduate Course

- Coastal Physical Oceanography: Lecture on coastal remote sensing and how to acquire coastal data products

Spring 2002/04 University of California, Santa Cruz

Santa Cruz, CA

Graduate Teaching Assistant - Undergraduate Course

- Led laboratory sections on “life in the sea” for mainly non-science majors
- Involved field and laboratory based exercises on the ecology of plants and animals in the oceans and coastal areas with consideration of life in various marine habitats, including the open ocean, rocky shores, estuaries and the sea

Summer 2001 University of California, Santa Cruz

Santa Cruz, CA

Graduate Teaching Assistant - K-12 Course

- Aided Dr. John Ryan on a summer course for exemplary high school students on satellite oceanography remote sensing techniques and field studies during the California state summer school for mathematics and science (COSMOS) program

Fall 2000 - Winter 2001 Alliance Redwoods Conference Grounds

Occidental, CA

Naturalist - K-12 Course

- Led outdoor education groups in northern California coastal redwoods
- Outdoor field courses in oceanography and the ecology of local wildlife, forests, and waterways

RESEARCH CRUISE EXPERIENCE

- CO₂ mooring deployment, western arm of Lake Superior: Spring 2007

- Wind-to-Whales Cruise, Monterey Bay, CA: Spring 2005
- NASA Optical Instrumentation Cruise on Monterey Bay, CA: Spring 2004
- CoOP "River Influences on Shelf Ecosystems" Cruise, Newport, OR: Summer 2004
- CoOP WEST Cruise, Gulf of the Farallones to Point Arena, CA: Winter 2002

PUBLICATIONS IN REFEREED JOURNALS

Lekki, J., Ortiz, J., Anderson, R., Ruberg, S., Avouris, D., R., Sawtell, Becker, R., Sayers, M., Churnside, J., Schiller, S., Cline, M., Shuchman, R., Demers, J., Simic, A., Leshkevich, G., Stuart, D., Liou, L., Tokars, R., Luvall, J., and **A. Vander Woude**, "Airborne Hyperspectral Remote Sensing of Harmful Algal Blooms in the Great Lakes Region: System Calibration and Validation." NASA technical memorandum NASA/TM—2017-219071. Washington, D.C.:National Aeronautics and Space Administration, 2017.

Powers, L., Werne, J., **Vander Woude, A.**, Sinninghe Damste, J., Hopmans, E. and S. Schouten. 2010 Applicability and calibration of the TEX-86 paleothermometer in lakes. *Organic Geochemistry* 41 (4), pp. 404-413.

Kudela, RM, NS Banas, JA Barth, ER Frame, D Jay, JL Largier, EJ Lessard, TD Peterson, and **A. Vander Woude**. 2008. New insights into the controls and mechanisms of plankton productivity along the US West Coast. *Oceanography*, 21(4): 46-59

Vander Woude, A., Largier, J., and R. Kudela, 2007. Nearshore retention of upwelled waters north and south of Point Reyes (northern California) - Patterns of surface chlorophyll and temperature observed in CoOP WEST. *Deep Sea Research II*, volume 53, issue 25-26, pp.2985-2998, doi:10.1016/j.dsr2.2006.07.003.

PUBLICATIONS IN NON-REFEREED JOURNALS

Vander Woude, A. and R. Kudela. pCO₂ concentrations in retentive embayments of northern California: Coastal Ocean Processes (CoOP) study on Wind Events and Shelf Transport (WEST). *Surface Ocean Lower Atmosphere Study (SOLAS) newsletter*, issue 6, Winter 2007.

Ryan, J., Chavez, F., Bellingham, J., Rienecker, E., Kudela, R., **Vander Woude, A.**, Maffione, R., and A. Fischer, Environmental process in the Monterey Bay sanctuary, a synoptic of AVIRIS. AVIRIS earth science and applications workshop 2002, jet propulsion laboratory, Pasadena, CA, Spring 2002.

THESIS

Vander Woude, A. 2006. Coastal Retentive Embayments North and South of Point Reyes, CA: Existence, Time scales and Carbon Significance. Ph.D. dissertation, University of California, Santa Cruz (USA). 119 pp.

AWARDS & HONORS

2017-2017	Panel member for the AMS summer meeting in Madison, WI
2005-2006	Awarded UCSC Center for Remote Sensing grant
2001-2005	Graduate Areas of Assistance and National Need (GAANN) fellow
2004-2005	Awarded Science, Technology, Engineering, Policy, and Society (STEPS) Institute grant
2004-2005	Awarded UCSC Center for Remote Sensing grant
2001-2002	NASA Goddard Graduate Coastal Research fellow
2001-2002	Awarded Ethyl & Earl Meyers Trust grant
1998-1999	NASA: Michigan Space Grant Consortium Undergraduate fellow

PROFESSIONAL PRESENTATIONS & INVITED TALKS

Vander Woude, A., Stuart, D., Ruberg, S., Johengen, T., McCarty, B., Churnside, J., Palladino, D., and A. Burtner. Chlorophyll a and Phycocyanin from Hyperspectral Airborne and Hand-held Sensors on Lake Erie. International Association for Great Lakes Research (IAGLR), Guleph, ON, June 2016.

Vander Woude, A., Mason, D., Zhang, H., Stow, C., Adamack, A., de Mutsert, K., Pierson, J., Roman, M., Brandt, S. Kolesar, S. and C. Sellinger. The effects of hypoxia on the food web of the Northern Gulf of Mexico: An Atlantis Ecosystem modeling approach. ASLO Aquatic Sciences Meeting. New Orleans, LA, February 2013.

Vander Woude, A., Mason, D. and E. Rutherford. Integrating ecosystem modeling and remote sensing to understand the effects of hypoxia on the food web in the Northern Gulf of Mexico. Earth, Planetary and Space Sciences Institute Seminar Series, Michigan Tech University, December 3, 2012. INVITED

Vander Woude, A., Strutton, P. and B. Hales. "Remote sensing of the Southern Ocean air-sea CO₂ fluxes." NOAA Cooperative Exchange, Cooperative Institute for Meteorological Satellite Studies, University of Wisconsin, Madison, Summer 2010.

Vander Woude, A., Strutton, P. and B. Hales. "Remote sensing of the Southern Ocean air-sea CO₂ fluxes." Oregon State University, College of Oceanic and Atmospheric Sciences, Spring 2010. INVITED

Vander Woude, A., Strutton, P. and B. Hales. "Remote sensing of the Southern Ocean air-sea CO₂ fluxes." AGU Ocean Sciences, Winter 2010.

Strutton, P., **Vander Woude, A.** and B. Hales. "SO GasEx results and long term changes in Southern Ocean CO₂ sources and sinks." Ocean Carbon and Biogeochemistry workshop, Summer, 2009.

Vander Woude, A., Strutton, P., Hales, B. and M. Kavanaugh. "Remote sensing of Southern Ocean air-sea CO₂ fluxes." Ocean Color Research Team Meeting, Spring 2009.

Alin, S., **Vander Woude, A.**, Hales, B. and P. Strutton. "Seasonal evolution of carbon sources and sinks along the western continental margin of North America." 2nd North American Carbon Program All-Investigators Meeting, San Diego, California, Winter, 2009.

Alin, S., J. Barth, A. Dickson, W. Evans, R. Feely, B. Hales, M. Hernandez-Ayon, D. Ianson, L. Juranek, K. Shearman, B. Law, C. Maloy, J. Newton, C. Sabine, P. Strutton, P. Tortell, V. Tunnicliffe, and **A. Vander Woude**. "Recent (and future) advances in carbon cycle synthesis along the North American Pacific Coast." 2nd North American Carbon Program All-Investigators Meeting, San Diego, California, Winter, 2009.

Vander Woude, A. and J. Austin. "The influences of upwelling winds on estuarine salt exchange." American Society for Limnology and Oceanography 2008 Ocean sciences meeting. Orlando, FL, Spring, 2008.

Vander Woude, A. and R. Kudela. "CO₂ variability within retentive embayments: The northern California region of CoOP WEST." American Society for Limnology and Oceanography 2008 Ocean sciences meeting. Orlando, FL, Spring, 2008.

Vander Woude, A. "Retentive embayments in northern California: A descriptive analysis." United States Geological Survey Coastal and Marine Geology, Santa Cruz, CA, March 2, 2006. INVITED

Vander Woude, A. "Retentive embayments in northern California: A descriptive analysis." Point Reyes Bird Observatory, Stinson Beach, CA, March 8, 2006. INVITED

Vander Woude, A., Largier, J. and R. Kudela. "Chlorophyll and sea surface temperature time scales for global oceans and nearshore retentive embayments off of California." Land-ocean Interactions in the Coastal Zone (LOICZ) Open science meeting. Egmond Aan Zee, Netherlands, Summer 2005.

Vander Woude, A., Largier, J. and R. Kudela. "Spatial and temporal patterns of phytoplankton and sea surface temperature during CoOP WEST (northern California)." American Geophysical Union 2004 Fall meeting. San Francisco, CA, Fall, 2004.

Vander Woude, A., Lucas, A., Kudela, R. and J. Largier. "Spatial and temporal variability of phytoplankton over the continental shelf of central California." American Geophysical Union 2004 Ocean Sciences meeting. Portland, OR, Winter, 2004.

Vander Woude, A., Moisan, J. and R. Kudela. "Physical dynamics that control global and local variability of phytoplankton." Surface Ocean Lower Atmosphere Study (SOLAS) Summer School. Corsica, France, Summer, 2003.

Vander Woude, A., Kudela, R., and J. Ryan. "A comparison of hyperspectral and multispectral imagery of Monterey bay." American Society for Limnology and Oceanography 2002 Ocean sciences meeting. Honolulu, HI, Spring, 2002.

SERVICE AND CONTINUED EDUCATION ACTIVITIES

2006-Present	Reviewer Journal of Marine Systems, Michigan Sea Grant and Great Lakes Research
2014-Present	Panel Proposal Reviewer Oregon Sea Grant
2009-2011	Reader Panel Reviewer Nature
Summer 2008	Preparing for an Academic Career in the Geosciences , Oklahoma City, OK Selected and funded to attend a professional development workshop for graduate students and postdoctoral fellows
Spring 2004	Land-ocean Interactions in the Coastal Zone (LOICZ) , Egmond Aan Zee, Netherlands Selected and funded to participate in the open science meeting
Summer 2002	Surface Ocean Lower Atmosphere (SOLAS) International Summer School , Corsica, France Selected to participate and funded in the first SOLAS summer school