Carlos A. Rueda-Velasquez, Ph.D.
Software Engineer

Contact Information
Address: 7700 Sandholdt Road - Moss Landing, CA 95039-USA - Tel: (831) 775-1700
Email address: carueda@mbari.org

Education
Doctor of Philosophy, Computer Science, December 2007. University of California, Davis.

Masters of Science, Computer Science. 2002. Instituto Tecnológico de Monterrey. México. Coursework completed.

Bachelor of Science, System Engineering; July 1994. Universidad Autónoma de Manizales, Colombia.

Affiliations/Honors

ACM, Association for Computing Machinery, since 2003.
OGC, Open Geospatial Consortium, since 2007.
AGU, American Geophysical Union, since 2008.
B.S. Honor and Outstanding B.S. Thesis Mention.

Professional Experience

07/21/2008–present
Software Engineer. Monterey Bay Aquarium Research Institute (MBARI).
- CANON Oceanographic Decision Support System (ODSS). Design and implementation of a Web application to access scientific datasets of diverse types and formats using international standards and protocols. Prototyping of scheduling and monitoring of marine assets to support decision-making.
- Co-Principal Investigator and Technical Lead of the National Science Foundation funded Marine Metadata Interoperability Project (MMI), http://marinemetadata.org. Organized international workshops on scientific data and metadata interoperability. Developed Web based services and applications to facilitate marine and Earth science data interoperability using Semantic Web technologies (http://mmisw.org/). Lead of an international group of engineers, scientists, and practitioners to develop an ontology for marine devices. The ontology provides an extensible conceptual model and controlled vocabulary for describing heterogeneous instrument types, with different data characteristics, and their attributes. Complemented with a visualization tool purposely targeted at facilitating the discussions, I established an innovative and practical community driven development process whereby concepts can be incorporated incrementally and iteratively. This ontology has been used and extended by other oceanographic organizations and initiatives (for example, the NSF-funded Rolling Deck to Repository program, http://www.rvdata.us), and served as a basis for a similar effort by the World Wide Web Consortium (W3C) to develop a more general sensor network ontology (http://www.w3.org/2005/Incubator/ssn/ssnx/ssn).
- Ocean Observatories Initiative (http://oceanobservatories.org) Cyber-Infrastructure component (OOI-CI). Main designer and implementer of the software framework that will support the several instrument platforms in the overall network, which includes a cabled underwater research facility being constructed off the Oregon and Washington coastlines, and a network of global buoys to be deployed in critical high latitude locations in the Northern and Southern hemispheres. Participant in data management designs. Participant in prototypes and demonstrations involving the use of a variety of technologies and protocols, including W3C Semantic Web technologies to enrich data discovery and management workflows, and MBARI products such as the OGC PUCK protocol and the SIAM software framework.
- Observatory Middleware Framework (OMF). Comprehensive performance evaluation and tuning of

the NSF funded OMF framework resulting in dramatic performance improvements.
- MBARI Technologies and Technology Transfer efforts. Contributions to the SIAM framework with improvements to facilitate its integration with external observatory systems (such as OOI-CI), more flexible configuration of ports for remote invocation, and a more efficient command-line interface. Prototyping of a web application prototype for real-time visualization of point data streams used in end-to-end demonstrations involving data generated from marine sensors.
- Acted as Software Engineering Group Leader at MBARI in several occasions.

10/2007–07/20/2008
Postdoctoral Scholar, Database and Information Systems Laboratory. Department of Computer Science. University of California at Davis. Designed and developed computational tools for visualization of sensor data streams in real-time founded on the utilization of open sensor Web standards and applied on critical disaster prevention and management applications such as wild fires in California. Main designer of the KEM execution monitoring module in the NSF funded Kepler Scientific Workflow Management System (http://kepler-project.org).

02/2006–12/2006
Software Developer, IBM Corporation. Silicon Valley Laboratory, San José, CA. Data Warehousing Edition Installation/Configuration: Responsible for use case specifications and main designer and developer of the overhauled DWE 9.1 Configuration Tool using IBM WebSphere and Java Management Extensions technologies. Manager: Hui Liao.

09/2003–01/2006 and 01/2007–09/2007
Graduate Student Researcher, Database and Information Systems Laboratory. Department of Computer Science. University of California at Davis. Developed data processing and numerical analysis algorithms for a variety of applications ranging from the spatial interpolation of meteorological parameters over extended geographical areas, to the efficient inversion of models for estimation of vegetation properties from remotely sensed data. Developed a framework for the processing of geospatial image streams for data integration and change analysis in remotely sensed data using the Kepler Scientific Workflow Management System. Developed real-time visualization tools for satellite image streams.

04/2001–09/2003
Postgraduate Researcher, Center for Spatial Technologies and Remote Sensing. Department of Land, Air, and Water Resources. University of California at Davis. Designed data processing protocols for estimating vegetation properties from satellite image data. Designed and implemented data integration algorithms for efficient merging of raster and vector massive datasets. Designed an extensible application for management and analysis of spectral data. Improved the implementation of standard Radiative Transfer Models for Remote Sensing research and applications. Designed and implemented linked canopy-leaf numerical vegetation models and made corresponding numerical inversions orders of magnitude more efficient than standard methods.

08/1994–03/2001
Department of Systems Engineering, Universidad Autónoma de Manizales (Colombia).
- **Coordinator of the Computer Science Area** in the 5-year Systems Engineering and Computer Science program. Review of curricular contents; evaluation of faculty and course materials; improvement of administrative and academic processes in particular through the introduction of Internet technologies for several purposes including web content for courses, interest groups, mailing lists, and online evaluation of courses, teachers, and instructors.
- **Assistant Instructor**. Taught several undergraduate courses including: Analysis and Design of Algorithms, Programming Languages, Artificial Intelligence, Digital Signal Processing, Dynamic Systems, Introduction to Computers, Introduction to Databases. Consistently got best evaluations in student polls.
- **Designer and implementer of a computer language for teaching purposes**, used in multiple courses at various levels and for several years.

- **Adviser for undergraduate theses** related to speech and speaker automatic recognition using a variety of machine learning techniques.
- **Co-Founder, Director, and Editor** of "Yupana," a scientific journal written to undergraduate students and aimed to communicate classical ideas and new developments in computer science, numerical analysis, or general science. Established the journal as an important part of the school.

02/1992–12/1999
Co-founder and Development Manager, AZEN Software Co. (Colombia). Coordinated, designed and implemented several business applications for private and public organizations across the country, some of which still in operation today. Founded on cutting-edge software development methodologies, these multi-user applications include: Payroll, Accounting, Billing, Inventory Control, Budgeting, and Accounts Payable.

International Program Committee Memberships and Collaborations

Program Committee Member, 22nd International Conference on Scientific and Statistical Database Management (SSDBM). Heidelberg, Germany, June 2010.

Journal Reviewer - SENSORS; MDPI Publishing. http://www.mdpi.com/journal/sensors

Program Committee Member, 6th Colombian Computing Conference (6CCC), May 4–6, 2011, Colombia.

Program Committee Member, 8th Colombian Computing Conference (8CCC), August 21–23, 2013, Colombia.

Program Committee Member, 9th Colombian Computing Conference (9CCC), September 3–5, 2014, Colombia.

Member of the Gulf of Mexico Research Initiative Information and Data Cooperative (GRIIDC) Vocabulary and Semantics Working Group. (2013–present).

Member of the DataONE (Data Observations Network for Earth, https://dataone.org) Integration and Semantic Working Group. (2011–2013).

Reviewing Activities – Funding Agencies

- US National Science Foundation. EarthCube Building Blocks. July 2013.

- US National Science Foundation. Major Research Instrumentation Program Panelist. May 2009.

Peer-reviewed publications

Graybeal, J., Isenor, A., **Rueda, C**. (2012): Semantic Mediation of Vocabularies for Ocean Observing Systems. Computers & Geosciences. Volume 40, March 2012, Pages 120-131, ISSN 0098-3004. doi:10.1016/j.cageo.2011.08.002.

Fredericks, J. and **Rueda, C**. (2011): Content-Infused OGC Web Services Enabling Dynamic Quality Assessment in Observing Systems. Workshop on Sensor Web Enablement 2011 (SWE 2011).

Greenberg, J.A., **C. Rueda**, E.L. Hestir, M.J. Santos and S.L. Ustin. (2009): *Least Cost Path Analysis for Spatial Interpolation*. Computers & Geosciences (Elsevier).

Gertz, M., **Rueda, C**., Zhang, J. (2009): *Interoperability and Data Integration in the Geosciences*. Book Chapter in A. Shoshani and D. Rotem (editors). Scientific Data Management: Challenges, Existing

Technology, and Deployment, Chapman and Hall/CRC. ISBN 9781420069808.

Zhang, J., Hart, Q., Gertz, M., **Rueda, C**., Bergamini, J. (2009): *Sensor data dissemination systems using Web-based standards: A case study of publishing data in support of evapotranspiration models in California*. Civil Engineering and Environmental Systems (Taylor and Francis, UK) Special Issue on Environmental Sensing, Informatics and Decision Making. 26(1), pp. 35-52.

Hart, Q., Brugnach, M., Temesgen, B., **Rueda, C**., Ustin, S.L., Frame, K. (2009): *Daily reference evapotranspiration for California using satellite imagery and weather station measurement interpolation*. Civil Engineering and Environmental Systems (Taylor and Francis, UK) Special Issue on Environmental Sensing, Informatics and Decision Making. 26(1), pp. 19-33.

Rueda, C., Gertz, M. (2008): *Real-time Integration of Geospatial Raster and Point Data Streams*. In 20th International Conference on Scientific and Statistical Data Management (SSDBM), LNCS 5069, 605-611.

Rueda, C., Gertz, M. (2007): *Modeling Satellite Image Streams for Change Analysis*. In 15th ACM International Symposium on Advances in Geographic Information Systems (ACM GIS 2007), ACM, 43–50.

Rueda, C., Gertz, M., Ludaescher, B., Hamann, B. (2006): *An Extensible Infrastructure for Processing Distributed Geospatial Data Streams*. In 18th International Conference on Scientific and Statistical Database Management (SSDBM), pp. 285–290.

Gertz, M., Hart, Q., **Rueda, C**., Singhal, S., Zhang, J. (2006): *A Data and Query Model for Streaming Geospatial Image Data*. In EDBT Workshops (11th International Workshop on Foundations of Models and Languages for Data and Objects), Revised Selected Papers. LNCS 4254, Springer, 687–699.

Zarco-Tejada, P.J., **Rueda, C.A.**, and Ustin, S.L. (2003): *Water Content Estimation in Vegetation with MODIS Reflectance Data and Model Inversion Methods*. Remote Sensing of Environment. 2003. Volume 85, Issue 1, 25 April 2003, Pages 109-124.

Doctoral Dissertation

Rueda-Velasquez, C.A. (2007): *Geospatial Image Stream Processing: Models, Techniques, and Applications in Remote Sensing Change Detection*. Department of Computer Science. University of California, Davis. ISBN: 9780549493525 (http://dbs.ifi.uni-heidelberg.de/fileadmin/publications/2007/CSE-2008-1.pdf)

Conferences – Workshops – Posters –Technical Reports

J. Graybeal, **C. Rueda**, F. Gayanilo, K. Stocks. "MMI's Metadata and Vocabulary Solutions: 10 Years and Growing." Poster. American Geophysical Union, Fall Meeting 2014. (IN33B-3772)

Matthew K. Howard, F. C. Gayanilo, **C. A. Rueda**, S. R. Smith, Todd A. Chavez, and J. C. Gibeaut. "What's in a name? Vocabularies for Search, Browse and Interoperability." 2014 Gulf of Mexico Oil Spill & Ecosystem Science Conference. Mobile, Alabama. January 2014.

Haines, S., V. Subramanian, E. Mayorga, D. Snowden, R. Ragsdale, **C. Rueda** and M. Howard. IOOS vocabulary and ontology strategy for observed properties. Proc. MTS/IEEE Oceans 2012, Hampton Roads, VA.

OGC Engineering Report 09-156r2: Ocean Science Interoperability Experiment Phase II Report. Bermudez, L., Coyle, D., **Rueda, C.**, Bridger, E., O'Reilly, T., Maskey, M., Delory, E. 2011.

Rueda, C., Bermudez, L., Graybeal, J. (2009): *The MMI Ontology Registry and Repository*. Open Geospatial

Consortium Technical and Planning Committee Meeting. Geosemantics Domain Working Group. Mountain View, CA. December 7, 2009.

O'Reilly, T., K. Headley, D.R. Edgington, **C. Rueda**, K. Lee, E. Song, C. Albrechts, J. del Rio, D. Toma, A. Manuel, E. Delory, C. Waldmann, S. Fairgrieve, L. Bermudez, E. Bridger, P. Bogden, and A. Amirault (2009). Instrument interface standards for interoperable ocean sensor networks. Proceedings of the IEEE/Oceans Engineering Society, Bremen, Germany.

Rueda, C., Bermudez, L., Graybeal, J., and Alexander, P. (2009): *The MMI Semantic Framework: Rosetta Stones for Earth Sciences*. American Geophysical Union Fall 2009 Meeting. San Francisco, CA. December 15, 2009.

del Rio, J., O'Reilly, T., Headley, K., Toma, D., Cater, N., **Rueda, C.**, Edgington, C., Ng, C., Bghiel, I., Bermudez, L., Zedlitz, J., Johnson, F., Johnson, G., Davis, E., Phillips, R., Tilak, S., Fountain, T., Delory, E., Manuel, A., Waldman, C. (2009): *Evaluation of MBARI PUCK Protocol for Interoperable Ocean Observatories*. 3rd International Workshop on Marine Technology. Barcelona, Spain. 2009.

Rueda, C., Bermudez, L., Fredericks, J. (2009): *The MMI Ontology Registry and Repository: A Portal for Marine Metadata Interoperability*. Oceans MTS/IEEE 2009. Biloxi, MS. October 2009.

Fredericks, J.; Botts, M.; Bermudez, L.; Bosch, J.; Bogden, P.; Bridger, E.; Cook, T.; Graybeal, J.; Haines, S.; **Rueda, C.;** Waldmann, C. (2009): *Integrating QA/QC into Open GeoSpatial Consortion Sensor Web Enablement*. Community White Paper. OceanObs'09. Venice, Italy. September 2009.

Rueda, C., Bermudez, L., Graybeal, J., Isenor, A., and Alexander, P. (2008): *Semantic Integration for Marine Science Interoperability Using Web Technologies*. American Geophysical Union Fall 2008 Meeting. San Francisco, CA. December 19, 2008.

Rueda, C. and Alexander, P. (2008): *The MMI Project: Communities Creating Marine Metadata Interoperability*. National Center for Biomedical Ontology (NCBO) BioPortal Developers Meeting. Stanford University. December 18, 2008.

Rueda, C. (2008): *The MMI Tools: Overview and Demonstration*. Ocean Observing Systems Semantic Interoperability Workshop. University Corporation for Atmospheric Research, Boulder, CO. November 17, 2008.

Rueda, C. (2008): *The Marine Metadata Interoperability Project*. Ocean Observing Systems Semantic Interoperability Planning Workshop. University of Alabama at Huntsville. August 26, 2008.

Rueda, C. (2008): *Vocabularies and Ontologies: Formats and Tools*. Ocean Observing Systems Semantic Interoperability Planning Workshop. University of Alabama at Huntsville. August 26, 2008.

Rueda, C., Zhang, J., Gertz, M. (2008): *The Coast-to-Mountain Environmental Transect Project (COMET)*. First Kepler Stakeholders Meeting, UC Davis, May 13-14, 2008.

D. Riaño, M.A. Patricio, P. Zarco-Tejada, **C. Rueda**, L. Usero, S.L. Ustin. (2005): *Estimation of equivalent water thickness using radial basis function neural networks*. First International Conference on Remote Sensing and Geoinformation Processing in the Assessment and Monitoring of Land Degradation and Desertification. Trier, Germany, September 2005. http://ubt.opus.hbz-nrw.de/volltexte/2006/362/

Rueda, C., Gertz, M. (2005): *Real-time visualization of streaming data from a GOES environmental satellite*. UC Davis Student Workshop on Computing 2005.

Rueda, C., Yang, H., Ludaescher, B., Gertz, M., Hart, Q., Zhang, J., Singhal, S. (2005): *Visualizing and Processing Real-time GOES Satellite Data Using Kepler*. Presented at the Sixth Biennial Ptolemy Miniconference. Berkeley, CA. May 2005.

Rueda, C. (2004): *SAMS: A Spectral Analysis and Management System*. IGERT Workshop: Invasive Weed Mapping with Remote Sensing Data. February 2004. University of California at Davis.

S. L. Ustin, E. Underwood, M. J. Mulitsch, J. A. Greenberg, S. C. Kefauver, M. L. Whiting, C. A. **Rueda,** C. M. Ramirez, G. J. Scheer, and L. F. Ross. (2004): *Mapping invasive plant species in the Sacramento-San Joaquin Delta region using hyperspectral imagery*. Report. Department of Boating and Waterways, Sacramento, CA. 2004.

Ustin, S., J. Greenberg, D. DiPietro, S. Dobrowski, J. Goodman, **C. Rueda**, J. Syder, A. Trabucco, Q. Xiao, and P. J. Zarco-Tejada. 2001. Monitoring the Earth using imaging spectrometers. In Digital Media Innovation Program (DiMI), J. Kuchera-Morin, S. Berman, T. Lynn, C. Nizibian, and D. Scott, editors. Microsoft, Inc., Mountain View, CA.

Other software
(open-source software actively used as of 05/2015 by several groups nationwide and abroad)

Rueda, C., Greenberg, J.A., and Ustin, S.L. *StarSpan: A Tool for Fast Selective Pixel Extraction from Remotely Sensed Data*. (2005). Center for Spatial Technologies and Remote Sensing (CSTARS), University of California at Davis, Davis, CA. http://carueda.info/projects/starspan/.

Rueda, C., Wrona, A.F., and Ustin, S.L. *SAMS: Spectral Analysis and Management System*. (2003). Center for Spatial Technologies and Remote Sensing (CSTARS), University of California at Davis, Davis, CA. http://code.google.com/p/cstars-sams/.

Rueda, C. *LORO: A Programming Language and Integrated Development Environment for Beginners*. (2000). Universidad Autónoma de Manizales (Colombia). Used in multiple courses at various levels and for several years in the BS program in Computer Science. The project registers more that 28,000 downloads to date. http://loro.sourceforge.net/z/?About.

Technical Expertise

Scientific Data Management – Web Applications and Services – Remote Sensing and Geospatial data processing, specifications, and libraries – Scientific workflows – Semantic Web technologies – Agile Software Development

Development Environments / Languages / Toolkits / Frameworks / Libraries / Databases / Tools:
ActiveMQ, Akka, AllegroGraph, AMQP, Angular.js, Apache Ant, BeanShell, BioPortal, Buildout, Buildbot, C, C++, Camel, CouchDB, DB2, Db4objects, Drupal, ENVI, Eclipse, Enterprise Architect, Express.js, ExtJS, GDAL, GEOS, GNU tools, GRASS GIS, GeoTools, Git, Google AppEngine, Google Maps, Google Web Toolkit, Grails, Heroku, IDEA, iRODS, Java, JavaCC, Javascript, jEdit, JMeter, JMX, jQuery, JUnit, Liferay, Matlab, Maven, MediaWiki, MongoDB, Mongoose, MySQL, Node.js, OSGi, OpenLayers, Play Framework, PostgreSQL, Protégé, PyCharm, Python, R, RabbitMQ, Restlet, SBT, Scala, Scalatra, ServiceMix, Spring, SVN, TestNG, Vaadin, ZeroMQ.

Volunteer work

Uepage.org Foundation: Helping communities in need in Colombia while promoting Colombian Music and Culture in California (http://uepage.org/). Contributing to the artistic and musical groups and providing technical support for the web site since 2001.