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ACT REQUEST FOR TECHNOLOGIES

Title: Performance Verification of In Situ pH Sensors
Date: December 6, 2011
Program: The Alliance for Coastal Technologies (ACT)
Application Deadline: Application (form with signed cover letter) must be received by 5:00 p.m. Eastern Time on January 6, 2011.

Summary:

The Alliance for Coastal Technologies (ACT; see www.act-us.info) will conduct a performance verification of in situ pH sensors. ACT is requesting preliminary applications - from developers or manufacturers of commercially available pH sensors - who would like to have their instruments tested. The ACT evaluation will focus on moored instruments that are designed for in situ measurements of pH in either freshwater or seawater. Testing will be conducted in diverse freshwater, brackish and marine coastal environments at ACT Partner Institution sites. The ACT sensor technology evaluation will be free of charge for qualifying applicants, contingent upon government funding. All results will be made available to the public via summary reports posted to the website (see www.act-us.info)

ACT is a NOAA-funded partnership of research institutions, state and regional resource managers, and private sector companies that are interested in developing, improving, and applying sensor technologies for studying and monitoring coastal environments. ACT was established on the premise that instrument validation of existing and emerging technologies is essential to support both coastal science and resource management, and the development of the Integrated Ocean Observing Systems (IOOS). The specific functions of ACT are to serve as: (1) an unbiased, third-party testbed for evaluating existing, new, and developing coastal sensors and sensor platforms, (2) a comprehensive data and information clearinghouse on coastal technologies, and (3) a forum for capacity building through workshops and seminars on specific technology topics.

Note: ACT does not certify technologies or guarantee that a technology will always operate at the certainty and reproducibility verified, especially under different environmental conditions. Furthermore, ACT does not: 1) seek to determine regulatory compliance; 2) rank technologies or compare their performance; 3) label or list technologies as acceptable or unacceptable; or 4) seek to determine "best available technology" in any form. Thus, although testing protocols will apply to all instruments evaluated, no direct comparisons will be made between instruments from different manufacturers. Verification results for each instrument will be stated in individual final reports, which will be released to the public via the ACT website.

Please visit our web site at www.act-us.info for information on ACT and to download application forms. More information can also be obtained by contacting Dr. Tom Johengen (johengen@umich.edu) or Dr. Mario Tamburri (tamburri@umces.edu).

Benefits of Technology Verification:

ACT will provide technology developers an independent, scientifically objective process for testing their instruments in a range of coastal environments and under actual conditions for which their products were designed. Test protocols for the verification will be designed to address realistic data quality objectives under varying environmental conditions, as determined from prior Customer Needs and Use Assessment surveys, and with input from the Technical Advisory Committee (TAC) and company participants. Moreover, ACT will provide potential investors and users of innovative approaches with information on how technologies perform in comparison to conventional methods. Through this process of verification, ACT will ultimately aid in the implementation of accurate and reliable technologies that will enable the effective monitoring and increased understanding of coastal resources and processes.

Focus of Performance Verification:

ACT initiated a Performance Verification of commercially available in situ pH sensors for three reasons: 1) the need for accurate monitoring of pH has become increasingly critical in the characterization of ocean acidification and changes in the carbon cycle in coastal and estuarine ecosystems; 2) pH sensors and sensor packages are already available but vary in performance (see ACT Report February 2005, In situ measurement of dissolved inorganic carbon speciation in natural water: pH, pCO_2, TA and TCO_2); and 3) performance verification testing of these instruments is feasible within a reasonable timeframe with existing ACT capabilities and funding.

A specific Test Plan will be developed in collaboration with accepted applicants, TAC, and ACT staff. The members of the TAC are:

Dr. Robert Byrne, University of South Florida
Dr. Andrew Dickson (Chair), Scripps Institution of Oceanography, University of California, San Diego
Dr. Burke Hales, Oregon State University
Mr. Scott McLean, Oceans Networks Canada, University of Victoria
Dr. Kenneth Pratt, NIST
Dr. Chris Sabine, NOAA Pacific Marine Environmental Laboratory
Dr. Rik Wanninkhof, NOAA Atlantic Oceanographic and Meteorological Laboratory

Eligible Technologies and Requirements

Eligible technologies for participation include instruments that are commercially available at present, or are close to commercial release and already have data available to support performance claims. All instruments must be appropriate for long-term (weeks to months) field deployments in coastal environments. Participants may need to be able to deliver two or three complete instrument packages for the verification, depending on the specific protocols developed. ACT will take responsibility for the instruments during the verification testing and will return all units when the evaluation is complete. Participants will also be involved in the design of evaluation protocols. The results and summaries from this verification will be made public after evaluations are complete. Because of limited resources, ACT may select to evaluate only one sensor model or type per individual developer, manufacturer, or distributor, depending on the numbers of qualifying applicants. ACT will consult with individual applicants if this selection process is necessary.

Application Process and Acceptance for Evaluation:

The application and acceptance process for company participation consists of completing the following four steps: (1) submitting a preliminary application, (2) receiving conditional acceptance, (3) submitting a full application, and (4) developing and signing an agreement on a final test plan. Details of each step are as follows:

Step 1. Preliminary Application - Applicants (developers, manufacturers, and distributors) are requested to provide summary information about the technology proposed for testing and about their organization by submitting a signed cover letter (no longer than two pages) and by completing the ACT Application for Evaluation form (available at www.act-us.info/evaluation/rft.php). The purpose of the preliminary application is to assess whether: 1) the technology meets the criteria/requirements set forth in this Request for Technology; 2) whether ACT facilities are capable of conducting an appropriate and safe evaluation; and 3) to ensure that no conflict of interest exists between the applicant and ACT or the TAC. Preliminary applications are screened and categorized by ACT Headquarters staff based on at least the following criteria:

- Does the technology fit within the scope of this Performance Verification?
- Does the technology address the stated priorities?
- Is the technology applicable to in situ monitoring/studying of aquatic systems?
- Is the technology based on sound scientific and technical principles?
- Is the technology sufficiently commercial-ready for verification testing?
- Can the applicant demonstrate ownership of the technology?

Step 2. Conditional Acceptance - All applicants that meet the requirements for an ACT Technology Evaluation will be identified and accepted contingent upon the successful completion of Steps 3 and 4.

Step 3. Full Applications - The Full Application for testing requests additional information about the technology to ensure a clear understanding of the proposed technology, including the scientific and engineering principles of operation, previous performance data, and potential users/customers. The application should include appropriate peer review literature, technical articles, reports, process flow diagrams, equipment specification sheets, operating instructions, and other related materials to enable the reviewer to fully understand the technology and any data and information that is available to support the application. However, disclosure of patentable ideas, trade secrets, and privileged or confidential commercial or financial information that may harm an applicant's chances to secure future patents, trademarks, or copyrights is not expected as part of the application materials and should be avoided. Applicants are encouraged to protect the intellectual property of ideas as appropriate. If applicable, please consult your institution's technology transfer or intellectual property office to determine the best way to protect your intellectual property.

Full applications must also include proposed protocols for conducting the evaluation. The draft protocols should be based on standard scientific testing practices and must include:

- Requirements for qualifications of test personnel.
- Requirements for health and safety of test personnel, the public, and the environment.
- Proposed methods and procedures for verification including: a) set-up, b) period of operation, c) required calibration intervals and criteria, d)operation parameters, e) experimental design with number of replicates and controls, and f) demobilization.
- A standard measure or existing, accepted technology for the new technology to be calibrated by or tested against.
- Proposed methods and procedures for storing, retrieving, analyzing, and reporting data.

Step 4. Agreement on Test Plan - ACT Headquarters staff, TAC members, Technical Coordinators for each Partner Institution, the Quality Assurance/Quality Control (QA/QC) Coordinator, and representatives for each qualifying applicant will gather for a workshop tentatively scheduled for late March 2011, at the University of Michigan in Ann Arbor, MI, to discuss and draft a Verification Plan,

based on the recommendations for each qualifying applicant and an appropriate QA/QC strategy. The draft will be externally reviewed for appropriateness of experimental design and statistical analyses before a Final Verification Plan is submitted to the qualifying applicants. Although ACT does not conduct direct comparisons of instruments being evaluated, the standardization of methods in Verification Plans will allow the simultaneous assessment of the various instruments, and will permit end-users to draw their own conclusions regarding the in situ pH sensor that best meets their needs.

Deadlines and Dates:

- Initial Application (form with signed cover letter) must be received by 5:00 p.m. Eastern Time – January 6, 2011
- Notification of Conditional Acceptance – January 13, 2012
- Full Application packages due – February 17, 2012
- Tentative Date of Verification Protocol Workshop – March 22-24, 2012
- Final verification protocols and Test Plan – April 30, 2012

Verification or Demonstration Agreement:

A legal agreement between ACT and individual qualifying applicants will be drafted to state that all parties agree to conduct the evaluation in accordance with the final Verification Plan and that the results will be released to the public. The agreement will also state that there will be no modifications to the final Verification Plan, regardless of unforeseen circumstance encountered during testing, without written consent from all parties. Furthermore, the agreement will clearly state that: each participant will be allowed to view the Verification Statement for its own instrument before the Report is released to the public and allowed to include (in the form of a one-page letter) a written response to be included as an appendix to the Verification Statements, and that company representatives will not be allowed to make changes to the final report. Finally, it is noted that all data collected during verifications by the instruments tested are the property of the participant and cannot be used by any other party without consent. The agreement will be signed by the ACT Director and the appropriate representative from the qualifying applicant organization.

Additional Information and Forms:

Please visit our web site at www.act-us.info for additional information on the ACT program, details on the ACT Evaluation Process, and to download required application forms. More information can also be obtained by contacting Dr. Tom Johengen (johengen@umich.edu) or Dr. Mario Tamburri (tamburri@cbl.umces.edu).