



SBIR



Small Business Innovation Research Program

ABSTRACTS OF PHASE II AWARDS FOR FISCAL YEAR 2013

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration

INTRODUCTION

The Department of Commerce (DOC), National Oceanic and Atmospheric Administration (NOAA), through the Small Business Innovation Research (SBIR) program, awarded 10 Phase I contracts for FY 2013. These awards are up to \$95,000 each, and totaling approximately \$950,000. The awards are for a six-month effort to demonstrate the feasibility of innovative approaches to the research topics identified in the "DOC/NOAA SBIR Program Solicitation for FY 2013 (NOAA 2013-1)." Abstracts of the successful Phase I proposals submitted under this solicitation, and brief comments on their anticipated results are provided in this publication.

In Phase II, funding is provided for projects that are most promising after Phase I is completed. These awards can be for up to \$400,000 each and for two years. The DOC/NOAA awarded a total of 6 Phase II contracts in FY 2013 for a total of approximately \$2.4 million. Abstracts of successful Phase II proposals and comments on their anticipated results are also provided in this publication.

The SBIR program is highly competitive. A total of 112 proposals were received by DOC/NOAA in response to its FY 2013 solicitation. Internal and external scientists and/or engineers independently reviewed the proposals. With the funds available, only 10 were selected for an award. Final selection was based upon the results of the reviews, relative importance to DOC/NOAA needs, relationship to on-going research, and potential for commercialization.

FY 2013 PHASE II AWARD WINNER

FIRM: Sunburst Sensors, LLC
1226 West Broadway
Missoula, MT 59802-3915

AWARD: \$399,993

PHONE: 406-532-3246
FAX:
E-MAIL: jim@sunburstsensors.com

PRINCIPAL INVESTIGATOR: James C. Beck

TITLE OF PROJECT: Development of a Long Term pH and pCO₂
Lagrangian Drifter

SUBTOPIC NUMBER: 8.3.1C

TECHNICAL ABSTRACT:

Quantifying oceanic CO₂ uptake and ocean acidification and understanding their impact on global climate and ocean ecology are key goals of NOAA's climate change research programs. NOAA's request for Development of a long-term Lagrangian pH and pCO₂ drifter (SBIR Subtopic 8.3.1C) aims to address these goals by developing technology that measures both pCO₂ and pH that can be widely deployed in the world's oceans.

Sunburst Sensors proposes to develop an innovative, reasonably priced pH and pCO₂ measurement system for oceanic surface drifters. Indicatorbased opto-fluidic sensors have been designed and fabricated using microfluidic manufacturing techniques. Success in Phase I led to a prototype sensor that will be evaluated and refined. Alternative optical components will be tested and a final opto-fluidic cell will be designed. A modified circuit board, firmware and client software will be developed to control the system and interact with the drifter's satellite modem and strain gauge. The system will then be packaged to fit into a Global Drifter Program style drifter.

The total system will be pier tested for two weeks to evaluate performance and ultimately deployed in the ocean from a research vessel, with data collected for the sensor lifetime (~1 year) or until it ceases operation.

SUMMARY OF ANTICIPATED RESULTS:

This research will result in a new cost-effective sensor that can measure both pH and pCO₂ with the required accuracy and precision for oceanographic carbon cycle research. The combined sensor will meet Global Drifter Program specifications to allow researchers to pursue integration of the sensor in the GDP. The product will lead to a significant market for Sunburst Sensors, with sales expected of 50-100 per year. Widespread surface measurements of pH and pCO₂ will help fulfill several of NOAA's core objectives outlined in the U.S. Carbon Cycle science plan, i.e.

- "Provide clear and timely explanation of past and current variations observed in atmospheric CO₂ and CH₄ and the uncertainties surrounding them;

- Determine and evaluate the vulnerability of carbon stocks and flows to future climate change and human activities, emphasizing potential positive feedbacks to sources or sinks that make climate stabilization more critical or more difficult;
- Predict how ecosystems, biodiversity, and natural resources will change under different CO₂ and climate change scenarios.”

FY 2013 PHASE II AWARD WINNER

FIRM: Zeigler Bros., Inc.
P.O. Box 95
Gardners, PA 17324-0095

AWARD: \$397,510.08

PHONE: 717-677-6181
FAX: 717-677-6826
E-MAIL: info@zeiglerfeed.com

PRINCIPAL INVESTIGATOR: Matt Zeigler, Vice President of Operations

TITLE OF PROJECT: Development of manufacturing technology for the practical application of specialized and environmentally sensitive nutrients, enzymes, immune-stimulating compounds and biologics to aquafeeds

SUBTOPIC NUMBER: 8.2.3F

TECHNICAL ABSTRACT:

In an effort to support the development of a domestic marine aquaculture industry, Zeigler Bros. Inc., (ZBI) proposes to continue its Phase I research by demonstrating the ability to scale up inclusion particle (IP) manufacturing. During Phase II ZBI will also demonstrate the efficacy of IOs for orally delivering phytase and probiotics to marine finfish. These efforts will directly address the primary limiting factors of the development of a domestic marine aquaculture industry; nutrient utilization, pollution, and disease management.

During Phase I ZBI did demonstrate the efficacy of a feed-based anti-viral delivery platform, significantly improving survivability of pacific white legged shrimp (*Panaeus vannamei*) when challenged with White Spot Syndrome Virus with lab-scale production. The next logical step is to transition into a manufacturing project, adapting the laboratory techniques and equipment into a R&D prototype inclusion particle production line (IPPL) capable of manufacturing larger batches of IPs and flexible enough to allow for multiple test molecules, such as phytase, probiotics or anti-virals.

ZBI proposes to develop the prototype manufacturing line, train employees to operate the line, manufacture multiple IP formulations containing anti-virals, phytase and probiotics separately, and manufacture complete feeds to be used in validation studies with marine aquaculture animals.

SUMMARY OF ANTICIPATED RESULTS:

- Validation of feed-based delivery platform for environmentally sensitive feed additives

- Prototype manufacturing line for inclusion particles
- Technological advancement of de-watering and drying techniques and equipment for micron-sized particles.

FY 2013 PHASE II AWARD WINNER

FIRM: Mercury Science Inc.
4802 Glendarion Dr.
Durham, NC 27713-8025

AWARD: \$400,000

PHONE: 866-861-5836
FAX: 407-982-7502
E-MAIL: tom@mercuryscience.com

PRINCIPAL INVESTIGATOR: Thomas N. Stewart, President

TITLE OF PROJECT: Porous Membrane Electrode for Quantitative
Detection of Toxins

SUBTOPIC NUMBER: 8.1.6N

TECHNICAL ABSTRACT:

In Phase I, a novel porous electrode was designed to demonstrate a rapid, simple assay for the detection of domoic acid in marine samples. During Phase II, methods to manufacture porous electrodes will be improved to enable high volume production of low-cost biosensors that can be connected to a potentiostat. These biosensors will be incorporated into a portable test kit for the quantitation of domoic acid. Based on performance evaluations, the assay protocol will be adjusted to provide the optimal response at appropriate detection levels. Reagent formulations will be optimized to increase signal, reduce background noise, improve reproducibility, and lengthen test kit shelf life. Following optimization, a complete prototype test kit will be assembled. Field trials using the prototype kit will be performed by potential users. Standard operating procedures for the manufacture and quality control of reagents will be established. The successful completion of Phase II will lead to the market launch of a commercially useful onsite domoic acid test kit in Phase II

SUMMARY OF ANTICIPATED RESULTS:

Low-Cost, Rapid Analytical Biosensors- Novel porous electrodes will be produced at a low cost and high reproducibility. These electrodes will be incorporated into single use disposable biosensors and used to design new products for the onsite, quantitative detection of domoic acid. Introduction of this technology will enable detection and monitoring of other toxins to be performed quickly and simply. Similar to current point-of-care blood glucose test methods, new toxin detecting test kits will contain all components and reagents needed to perform an analysis without the need for advanced training. The first product will measure domoic acid in shellfish tissue samples at an important domoic acid regulatory level (20 ppm in shellfish). The test will be performed in the field with the aid of a portable potentiostat and laptop computer at a cost per analysis of less than \$12. **This test kit for quantitative domoic acid analysis will be**

available for research use at the end of Phase II. The technology will be further applied to commercialization of products to detect a wide range of other analytes, including tests for saxitoxin, brevetoxin, and melamine.

FY 2013 PHASE II AWARD WINNER

FIRM: Polestar Technologies Inc.
220-3, Reservoir Street
Needham Heights, MA 02494

AWARD: \$399,777

PHONE: 781-449-2284
FAX: 781-449-1072
E-MAIL: kcarpenter@polestartech.com

PRINCIPAL INVESTIGATOR: Dr. R. Shashidhar, Senior Vice President

TITLE OF PROJECT: Dip and Read Nanosensor for Calcium Ion Measurements in Sea Water

SUBTOPIC NUMBER: 8.2.2R

TECHNICAL ABSTRACT:

This topic requires the capability for enabling high sensitivity/high precision measurements of calcium concentrates in seawater. This proposal aims to demonstrate the feasibility of a novel high sensitive nanosensor that can be used to determine very low concentrations of calcium in seawater in the presence of a large background calcium concentration. The sensor approach uses the benefits of nanotechnology combined with molecular recognition to achieve high sensor sensitivity and high specificity so that the measurements are not affected by other ions like magnesium. Phase I results have indeed demonstrated a calcium detection sensitivity of a 5 μM in the presence of 100 mM concentrations of calcium in seawater. It is impervious to the presence of large concentrations of interfering magnesium ions and it can work well within the time scale of a Diel cycle. These results have been obtained using seawater at laboratory conditions. The goal of Phase II is to demonstrate that the sensor will function with the same features in conditions that are relevant to the needs of NOAA – the diver should be able to take the sensor to sea depths and temperatures needed to measure, in situ, the calcium concentration close to the coral itself.

SUMMARY OF ANTICIPATED RESULTS:

The sensor package is envisaged as a simple dip and read unit. The sensor part can be plugged into the electronic read out part which will be a hand held unit. The ability to detect very small amounts of calcium concentrates in the presence of a large background concentration of calcium in the sea water will be very useful for monitoring the calcification rate in reef-building corals and in other calcifying marine organism like crustose coralline algae.

FY 2013 PHASE II AWARD WINNER

FIRM: Propagation Research Associates, Inc.
1275 Kennestone Circle, Suite 100
Marietta, GA 30066-6032

AWARD: \$400,000

PHONE: 678-384-3401
FAX: 770-795-8134
E-MAIL: contracts@pra-corp.com

PRINCIPAL INVESTIGATOR: Bonnie Valant-Spaight, Head of Atmospheric
Physics Division

TITLE OF PROJECT: Reducing Impact of Severe Space Weather on
Global Positioning System (GPS) Satellite Users

SUBTOPIC NUMBER: 8.4.4W

TECHNICAL ABSTRACT:

In Phase II, Propagation Research Associates, Inc., (PRA) proposes to complete the development of a real-time nowcast of ionospheric scintillation impacts on GPS users. Continuing its partnership with NASA's Jet Propulsion Laboratory, PRA will implement real-time production of a map of ionospheric scintillation parameters over the United States using real-time data streamed from the National Geodetic Survey's CORS network. PRA will mature the user experience model of scintillation impacts developed in Phase I and produce it in real time. PRA will then implement a web-based specification product to communicate the scintillation impacts in a format that is both easily understood and allows the user to access as much or as little detail about the impacts as he or she desires. PRA will also study the feasibility of 1) using an expanded set of real-time GPS data to enlarge the nowcast to areas outside the United States and 2) forecasting scintillation effects using existing NOAA SWPC nowcast and forecast products

SUMMARY OF ANTICIPATED RESULTS:

The PRA GPS scintillation effects nowcast will allow members of the general public to learn in real-time when space weather conditions are affecting the accuracy and availability of GPS position, navigation, and timing services. At the conclusion of this Phase II effort, PRA will deliver prototype code for producing products designed to communicate a United States (including Alaska) nowcast to the general public and various interest groups. This work will also investigate the possibility of expanding the nowcast outside the United States and forecasting ionospheric scintillation effects in the North America region.