SBIR

Small Business Innovation Research Program

ABSTRACTS OF Phase II AWARDS FOR FISCAL YEAR 2016

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

FY 2016 PHASE I AWARD WINNER

FIRM: USML LLC (dba US Microwave Laboratories)
                                   150 Fox Trail,
                                   Summerfield NC 27358-8280

AWARD: $119,921

PHONE: (336) 582-0603

E-MAIL: cfajardo@usmicrolabs.com

PRINCIPAL INVESTIGATOR: Claudia P. Fajardo

TITLE OF PROJECT: Satellite ground station network for real-time space
                                   weather data

SUBTOPIC NUMBER: 8.4.3W

TECHNICAL ABSTRACT:

The goal of this project is to determine the feasibility of developing a ground station network capable of delivering real time space weather data to end users. Specifically, the proposed works seek to assess existing and future communications requirements for providing better than 15 minute latency (threshold objective) for transfer of data from NOAA space weather assets to the ground for distribution to end users. This study will include space weather assets in LEO, MEO, HEO, GEO and at the L1 and L5 Lagrange points. The range of orbits for this study is extreme, from LEO to Lagrange points (hundreds of km to millions of km). Therefore, it is likely that no single system will satisfy the requirements. Basically, a potential solution for LEO may not work for Lagrange points and vice versa. A detailed list of the various requirements for the different mission profiles (LEO to L5) will be delivered as part of this study.

SUMMARY OF ANTICIPATED RESULTS:

We anticipate an exhaustive analysis of existing NOAA satellite capabilities, both in space and on the ground, followed by a recommendation on how to optimize the current resources and acquire new ones to achieve the goal of better than 15 minute latency for transfer of data from NOAA space weather assets to the ground for distribution to end users.

FY 2016 PHASE II AWARD WINNER

FIRM: Almeria Analytics
                                   75 Spring Rd NE
                                   Rio Rancho, NM 87124-2561

AWARD: $380,239

PHONE: (505) 603-4959

E-MAIL: Fernandezsj01@aol.com

PRINCIPAL INVESTIGATOR: Steven Fernandez

TITLE OF PROJECT: Commercial VERDE – Phase 2

SUBTOPIC NUMBER: 8.5.1X

TECHNICAL ABSTRACT:

The wide spread use of NOAA developed products including future climate scenarios, weather products, and infrastructure impacts are not used as widely by public decision makers or the public as possible because it is difficult to explore the data without expensive help manipulating the data or expressing their queries. The technical objective is to establish a prototype service and platform for web standards and 1) deliver products to workstations, mobile applications and tablets, 2) receive queries from users and 3) permit decision-makers to structure new future scenarios inexpensively viewed on workstations, mobile applications, and tablets by the hazard community. A prototype portal will be the first open web streaming services testbed to allow the users to structure their look ahead models and apply local knowledge; 2) a common spatial climate models. Integration of the models provides a framework for existing high-resolution climate modeling output, infrastructure model data and population movements in a common reference grid.

SUMMARY OF ANTICIPATED RESULTS:

A portal will provide open, shareable and actionable information on current hazards as a complement to the existing NOAA products and data feeds. This requires the real-time feeds are reliable even in the face of cyber, weather, and physical hazards during emergency operations and open, shareable, and actionable Datasets in a inexpensive delivery system for NOAA and University researchers. Prototype systems will be able to accommodate incorporating those models identified in this task through commercial demand from researchers and planners. New modeling runs and data sets based on prioritized scenarios will be developed and these data sets will be placed within the prototype testbed.

FIRM: Amethyst Research Incorporated
                                    123 Case Circle
                                    Ardmore, OK 73401-0643

AWARD: $399,999.28

PHONE: (580) 657-2575

E-MAIL: admin@amethystresearch.com

PRINCIPAL INVESTIGATOR: Rob Kuester

TITLE OF PROJECT: Ultra High Sensitivity SWIR Methane Imaging Camera

SUBTOPIC NUMBER: 8.6.1X

TECHNICAL ABSTRACT:

Methane is the third most prevalent greenhouse gas, whose atmospheric concentration is currently over 1.7 ppm and is about 21 times more potent when compared to CO2. Thus, while the quantitative monitoring of methane levels is necessary, it is also critically important to directly identify the sources of the methane emissions, for example, in ice floes, leaks in pipelines, and also from drilling/fracking and other anthropogenic activities. The Phase I effort has indicated that a new class of detector – resonant cavity enhanced photo detector – can be successfully manufactured with excellent resonance at the absorption band for methane. This is a significant result, and provides for the first time narrow band infrared detector that has significantly improved performance over any existing infrared detector. For the Phase II effort we will develop an inexpensive methane gas imaging camera, that can be used for direct observation of methane gas/emission. The imaging array uses the advanced resonant cavity enhanced photo-detector (RCE-PD) design that can be tuned to the absorption spectrum of the gas (i.e. methane). This camera will be high sensitivity, low power, and lightweight so it can be readily integrated onto UAV's platforms and hand held systems.

SUMMARY OF ANTICIPATED RESULTS:

The anticipated benefits of the proposed methane gas imaging camera are sensitivity, low cost, and low weight making this imaging system technology ideal for sensing and imaging a wide variety of trace gases, in both land-based and airborne measurements. These advantages will allow the technology to serve the dual markets of industrial and environmental detection and analysis. Examples of trace gases that can be measured include greenhouse gases, emissions from burning of fossil fuels. The important areas of public application include environmental, homeland security, industrial process control, and emission monitoring.

FY 2016 PHASE II AWARD WINNER

FIRM: Arete Associates
                                9301 Corbin Avenue Suite 2000
                                Northridge, CA 91324

AWARD: $399,900

PHONE: (703) 413-0290

E-MAIL: cchinn@arete.com

PRINCIPAL INVESTIGATOR: Clayton Chinn

TITLE OF PROJECT: Coastal Eyes, a Multi-Mission Topographic, Current
                                Retrieval and Debris Mapping Sensor System

SUBTOPIC NUMBER: 8.3.2D

TECHNICAL ABSTRACT:

NOAA seeks to characterize the impact of severe weather on coastal areas with a cost-effective, responsive multi-mission sensor system. In response Areté Associates proposes a conceptual design for an affordable, responsive, compact airborne sensor system called "Coastal Eyes" which will rapidly provide land and surface water topography, surface current, debris and storm surge mapping over wide swaths of the coastal zone. CoastalEyes is cost-effective, able to be deployed on many aircraft and can be tasked quickly to support emergency management needs. .

Benefits include:
• Low-risk approach exploits existing COTS sensors and established processing techniques
• Wide-area monitoring of topographic and ocean variability using compact commercial radar
• Able to operate at high altitudes in day/night and a variety of weather conditions
• High-resolution land and ocean topography; near-shore bathymetry, and currents using compact LIDAR and time-series imaging systems
• Flexible and adaptive solution useable with a range of small manned aircraft and adaptable to unmanned platforms
• Commercial transition path embraces partnership with an established leader in airborne surveys.

In Phase 1, Areté developed the Coastal Eyes system design and quantified the achievable performance for the core missions.

Phase 2 will produce a CoastalEyes prototype and perform a demonstration of the five core missions.
SUMMARY OF ANTICIPATED RESULTS:

n Phase 2, the prototype demonstration will illustrate the ability of CoastalEyes to perform all five core missions in support of emergency management efforts in coastal regions with a focus

on storm damage assessment. The demonstration will mimic real-world scenarios with 24 hour, day and night time surveillance and data collection.

FY 2016 PHASE II AWARD WINNER

FIRM: Catalina Sea Ranch
                               820 S Seaside Ave;
                               San Pedro, CA 90731-

AWARD: $399,635

PHONE: (316) 993-1486

E-MAIL: kelly@catalinasearanch.com

PRINCIPAL INVESTIGATOR: Kelly Stromberg

TITLE OF PROJECT: Development of Genetics-Based Selective Breeding
                               Protocols for Improvement of the Mediterranean Mussel,
                               Mytilus Galloprovincialis, and Advancement of Aquaculture

SUBTOPIC NUMBER: 8.6.1X

TECHNICAL ABSTRACT:

The aquaculture industry lags in genetically based selective breeding programs when compared to terrestrial commercial crops. This aggravates the United States' (U.S.) $11 billion dollar seafood deficit, puts U.S. aquaculture entrepreneurs at an early disadvantage for success, and increases risk of bivalve crop degradation from climate change. Heterosis in bivalve crops, the phenomenon in which hybrid offspring exhibit enhanced traits compared to parental trait values, has been documented in scientific literature, but studies still remain scant and rarely address the genetic components of selection from breeding. To address this gap, Catalina Sea Ranch, LLC (CSR) will develop a novel family line system within the emerging model organism Mytilus galloprovincialis, which will be used to generate the framework for a genetics based selective breeding protocol.

Within this framework, there are 2 main goals for Phase II of SBIR funding: 1) to further develop family line resources in order to have the statistical power to identify specific genes responsible for commercial traits from Phase I; 2) to develop selective breeding protocols based on emerging techniques such as RNA interference and gene counting techniques in order to assess crop value at the earliest possible stages.

SUMMARY OF ANTICIPATED RESULTS:

Through Phase II, CSR will develop invaluable genetic phenotypes of Mga for the aquaculture industry which will indicate how the mutation rate will effect domestication of Mga as well as what inbreeding effects might occur within the selective breeding program. A conditioning tank set up and a holding tank system has the potential to make CSR the first shellfish hatchery that has the capability to store gravid shellfish year around. This would mean a steady, year round supply of seed for the company and for the West coast industry. CSR plans to place two patents in Phase II, the baseline genetic phenotypes as well as a kit–based methodology to access

broodstock genetic potential. If successful, this study will lend immediate benefits to the U.S. economy and have a long term global impact on sustainable protein production from the sea.

FY 2016 PHASE II AWARD WINNER

FIRM: Climate Forecast Applications Network, LLC
                               845 Spring Street; NW #129
                               Atlanta, GA 30308-

AWARD: $399,987

PHONE: (404) 919-2673

E-MAIL: mjelinek@cfanclimate.com

PRINCIPAL INVESTIGATOR: Mark Jelinek

TITLE OF PROJECT: Probablistic seasonal weather forecasts for the energy &
                               agriculture sectors

SUBTOPIC NUMBER: 8.3.1C

TECHNICAL ABSTRACT:

This proposal from Climate Forecast Applications Network addresses the challenge of providing business-relevant subseasonal forecasts for the energy and agricultural sectors, including applications to renewable energy. An innovative multi-model prediction system using the CFSv2 and ECMWF forecasts will be developed to exploit the advantages of each model. An interactive web-based dashboard system is designed to display and deliver the forecast information in a flexible and dynamic manner to aid decision support integration. A comprehensive assessment of predictability of businessrelevant variables by region, initial and target month, and atmospheric flow regimes provides the basis for assessing the confidence of individual forecasts and for identifying forecast 'windows of opportunity'. An ensemble calibration scheme uses predictability assessment, reforecasts and recent forecast errors to correct for model bias error and to improve the shape of the ensemble distribution. Advanced ensemble interpretation techniques support scenario predictions of extreme events. A strategy for assessing confidence of each forecast is based on a comprehensive forecast evaluation, predictability assessment, and ensemble characteristics.

SUMMARY OF ANTICIPATED RESULTS:

The expected outcomes are innovations in ensemble interpretation and calibration suitable for subseasonal time scales that provide the basis for web-based decision support tools for the energy and agricultural sectors. The improved forecast skill and comprehensive assessment of forecast uncertainty and confidence level will build user confidence in the forecast products. These solutions will find commercial markets with existing providers of weather/climate services looking to enhance their product offerings, as well as directly with key end user segments in the energy and agricultural sector.

FIRM:	Giner, Inc. 89 Rumford Avenue; Newton, MA 02466-1311
AWARD:	$399,584
PHONE:	(781) 529-0581
E-MAIL:	aargun@ginerinc.com
PRINCIPAL INVESTIGATOR:	Dr. Avni Argun
TITLE OF PROJECT:	Rapid and Low-Cost Field Toxin Analysis to Monitor Harmful Algal Blooms
SUBTOPIC NUMBER:	8.3.1C

TECHNICAL ABSTRACT:

Brevetoxins are a group of marine algal toxic compounds that are produced by microscopic dinoflagellate algae such as Karenia brevis. During harmful algal blooms (HAB), brevetoxins reach concentrations high enough to cause human neurological and gastrointestinal illnesses through inhalation of the airborne toxins or consumption of contaminated shellfish. The timely recognition of this toxin in marine environment is of great importance for public safety, human health, human recreation, marine ecology, and the marine economy. Therefore, it would be extremely valuable to provide coastal managers and fisheries with a practical field device that would accurately assess brevetoxin toxicity levels. The overall objective of this program is to develop a low-cost and easy-to-use electrochemical test for rapid and quantitative detection of brevetoxin species in seawater. This versatile field device will allow near real-time monitoring of brevetoxin levels in seawater and aerosols throughout the progression of a red tide bloom. The developed platform technology has the potential to go beyond detection of brevetoxin as indicator of HABs and could find applications in areas where rapid, accurate, and selective detection of marine (and other) toxins are needed.

SUMMARY OF ANTICIPATED RESULTS:

The proposed program will develop a portable electrochemical sensor device that would enable highly sensitive and selective field measurement of brevetoxin in ocean water. Successful demonstration of this device will allow for on-site, near real-time monitoring of toxic conditions at low cost. Rapid and accurate toxicity information, provided by the final handheld product, could be used by coastal managers and fisheries to make public safety related decisions.

FY 2016 PHASE II AWARD WINNER

FIRM: Innovative Imaging and Research Corp.
                                   Building 1103; Suite 140C
                                   Stennis Space Center, MS 39529-0001

AWARD: $400,000

PHONE: (228) 688-2276

E-MAIL: rryan@i2rcorp.com

PRINCIPAL INVESTIGATOR: Dr. Robert Ryan

TITLE OF PROJECT: VIIRS HGS DNB Radiometric Calibration Source

SUBTOPIC NUMBER: 8.1.1F

TECHNICAL ABSTRACT:

This project's aim is to develop an Accurate Active Light Source (AALS) that can be fielded at selected calibration sites to address NOAA's unmet needs and improve the calibration of the Suomi NPP VIIRS Day Night Band (DNB) operating in the high gain stage (HGS) under low light level conditions. The DNB HGS has extreme low-light sensitivity that enables a new generation of nighttime imaging. Many of these emerging applications' utility however depend on absolute radiometric accuracy and sensor stability. Currently the DNB HGS calibration hinges on transferring calibration from the low and medium gain stages to the HGS using a solar diffuser, which is more than seven orders of magnitude brighter than many of the faintly lit targets imaged using the HGS. As a result, the HGS absolute calibration accuracy under extreme low light may be too low to provide quantifiable information and detect change. Our new AALS will improve our small target radiometry/point source understanding. Combining our national standards-traceable AALS with a sensitive VIIRS nighttime imaging capability has the potential to create game changing new commercial and military applications. Key to commercialization and economic viability is the ability to design and field a cost-effective AALS.

SUMMARY OF ANTICIPATED RESULTS:

This project will result in a ruggedized field tested AALS active source prototype along with LED laboratory characterization data, a validated VIIRS calibration technique, a list of potential AALS deployment sites and expected suitability, early AALS stability data, an updated calibration error budget and AALS market research data.

FY 2016 PHASE II AWARD WINNER

FIRM:	Intelligent Optical Systems, Inc. 2520 W. 237th Street; Torrance, CA 90505-
AWARD:	$399,955.92
PHONE:	(424) 363-6360
E-MAIL:	sbirproposals@intopsys.com
PRINCIPAL INVESTIGATOR:	Manal Beshay
TITLE OF PROJECT:	Rapid Lateral Flow Assay for Field Detection of Brevetoxins
SUBTOPIC NUMBER:	8.1.1F

TECHNICAL ABSTRACT:

The bloom-forming algae *Karenia brevis* produces neurotoxins known as brevetoxins (PbTx) that can cause illness in humans and marine wildlife. During *K. brevis* blooms, also known as red tides, elevated levels of brevetoxins have been linked to massive bird, fish, and marine mammal kills. In addition, human consumption of brevetoxin contaminated shellfish leads to neurotoxic shellfish poisoning. The economic impact of *K. brevis* blooms in Florida alone has been estimated to be upwards of $30M/year.[1] In collaboration with Dr. Leanne Flewelling of the Florida Fish and Wildlife Conservation Commission's Fish and Wildlife Research Institute, NeoClone, Catalina Sea Ranch, and VICAM, Intelligent Optical Systems, Inc. (IOS) proposes to continue its development of a fast and portable shoreside lateral flow assay (LFA) for cost-effective immunoassay detection of PbTx. Coupling of detector antibodies to highly fluorescent labels technology has proved in Phase I to enhance assay sensitivity. As a result, with this beach-side assay, unlike the current laboratory assays, NOAA can implement routine coastal monitoring. In Phase II, IOS will validate assay sensitivity and develop a cost-effective sampling and testing kit for the rapid detection of brevetoxins in seawater, and ultimately in shellfish meat.

SUMMARY OF ANTICIPATED RESULTS:

In Phase II, IOS will continue its development of a rapid lateral flow assay that will report brevetoxin levels as low as ~0.3 ppb in seawater. The assay will yield results in 10-15 min. in a broad range of representative environmental conditions. Upon successful completion of Phase II, this low-cost (per-sample cost of $10 or less) beachside assay will immediately identify brevetoxins, making routine coastal monitoring practical. Applying this assay to shellfish matrices will greatly increase the effectiveness of state and federal agencies' routine testing for brevetoxin in shellfish to protect human health. Shellfish testing under laboratory conditions requires a homogenization and extraction step, but the proposed assay will increase speed and reduce cost compared to those existing testing methods.

FIRM:	Mano Nanotechnologies Inc. 151 Willow Street; Guilderland, NY 12180-
AWARD:	$399,999.96
PHONE:	(518) 542-2395
E-MAIL:	jmanobianco@verizon.net
PRINCIPAL INVESTIGATOR:	John Manobianco
TITLE OF PROJECT:	GlobalSense: A New Atmospheric Observing System Featuring Innovative Airborne Probes
SUBTOPIC NUMBER:	8.2.1F

TECHNICAL ABSTRACT:

The underlying framework for modern-day weather forecasting is numerical weather prediction (NWP). Even the current and planned weather observing platforms leave gaps that are insufficient to meet the requirements of NWP. Mano Nanotechnologies, Inc. proposes to commercialize a new environmental sensing system, known as "GlobalSense", which will enable transformational forecast improvements by filling these critical data gaps and benefit a broad range of applications with sensitivity to atmospheric conditions.

The GlobalSense system features an ensemble of completely disposable airborne probes, mechanisms to deploy probes, and receiver platforms to gather data from probes. The ultra-compact probes, called environmental Motes or eMotes, will function as passive drifters in the atmosphere using no active propulsion or flight. The novel eMote design exploits component miniaturization as well as integration of micro- and nanotechnology-based components in a bio-inspired form factor to minimize complexity, cost, size, mass, terminal velocity, and power consumption.

The Phase II project objective is to develop, test, and demonstrate a complete prototype GlobalSense system in the atmosphere. This objective will be met using mainly commercial off-the-shelf components with parallel and overlapping fabrication efforts on each system component following the specifications, component lists, and other design documentation resulting from the Phase I effort.

SUMMARY OF ANTICIPATED RESULTS:

At the conclusion of Phase I, the GlobalSense system was at technology readiness level (TRL) 3, consistent with completion of analytic critical function and characteristic proof-of-concept. A successful prototype demonstration in the relevant environment of the atmosphere by the end of Phase II will increase the TRL from 3 to 6 and represents a critical milestone that must be met

on the path to commercialization. The GlobalSense value proposition for weather applications is improved forecasting that translates directly to economic and social benefits for a multitude of weather-sensitive sectors worldwide. A GlobalSense system can have much broader commercial potential beyond traditional weather forecasting by measuring parameters of interest for air quality, greenhouse gas (climate change), surveillance, reconnaissance, and related applications.

FIRM: Northwest Research Associates, Inc.
                                       3380 Mitchell Lane;
                                       Boulder, CO 80301-

AWARD: $399,953

PHONE: (303) 415-9701

E-MAIL: clindsey@nwra.com

PRINCIPAL INVESTIGATOR: Dr. Charles Lindsey

TITLE OF PROJECT: Monitoring Active Region Development on the Far-Side of
                                       the Sun

SUBTOPIC NUMBER: 8.1.1F

TECHNICAL ABSTRACT:

Magnetic regions in the Sun's outer atmosphere exert major impacts on space weather in the near-Earth environment. Near-term impacts at Earth are predominantly due to magnetic regions in the Sun's near hemisphere; however, because the Sun rotates, mag- netic regions in the far hemisphere cross into the near hemisphere with little warning—except for our ability to monitor the Sun's far hemisphere from vantages in the helio- sphere other than that of Earth. For the past several years NASA's twin STEREO spacecraft have been in positions to view the entirety of the far hemisphere from the far side of the solar system. We are now approaching a period of most of a decade in length during which STEREO coverage of the Sun's far hemisphere will be greatly diminished or nil. We have developed algorithms capable of analyzing seismic observations of the Sun's near hemisphere to map large active regions with full coverage of the Sun's far hemisphere. We propose to use these algorithms to produce a data product of synoptic seismic maps of the Sun's far hemisphere that can take over the role of STEREO in the service of our nation's space-weather forecasting needs.

SUMMARY OF ANTICIPATED RESULTS:

The Phase-II project will result in a reliable seismic monitor of large active regions in the Sun's far hemisphere whose signatures are realistically calibrated for expectation magnetic fluxes, areas and EUV irradiances of said active regions in EUV spectral bands observed by NASA's STEREO spacecraft and the Solar Dynamics Observatory's Atmospheric Imaging Assembly. The seismic monitor will be operable for an indefinite period in which NASA's STEREO spacecraft can no longer fully cover the Sun's far hemisphere. The regions recognized by this facility will include those with the highest potentiality for the production of flares, CMEs and excess EUV irradiance.

FY 2016 PHASE II AWARD WINNER

FIRM: Precient Weather LTD
                                       200 Innovation Blvd; Suite 229
                                       State College, PA 16803-

AWARD: $399,909

PHONE: (814) 466-2231

E-MAIL: john.dutton@prescientweather.com

PRINCIPAL INVESTIGATOR: John A Dutton

TITLE OF PROJECT: Probabilities of Business Inpact Variables from CFS2
                                       Ensembles

SUBTOPIC NUMBER: 8.4.3D

TECHNICAL ABSTRACT:

The value of the subseasonal and seasonal probability (S2S) forecasts of the NWS Climate
Forecast System Version 2 (CFS2) will increase substantially when they are converted into
forecasts about business impact variables such as degree days, wind and solar power potential,
end-of-season crop yield, water resource variables, and extremes of both weather and impacts
themselves. In Phase II, our Phase I developmental forecasts of impact variables created from
CFS2 forecasts will become operational and available to customers. Computing the forecasts
and verification over a historical period will demonstrate the remarkable skill and reliability
achieved as a result of new and novel calibration techniques developed in Phase I.

The impact variable forecasts from operational CFS2 forecasts can then be combined with that
forecast skill to show decision makers the expected consequences of acting at various predicted
probabilities to seize opportunity or mitigate adverse events. Phase II will provide web-based
interactive decision advisory systems tailored to industries such as energy, agriculture,
transportation, insurance, and finance so that decision makers can assess alternative action,
reduce climate variability risk, and increase profit, thus demonstrating that the value of our
forecasts lies in the action they motivate and the favorable consequences that follow.

SUMMARY OF ANTICIPATED RESULTS:

This project will produce subseasonal and seasonal probability forecasts about the key business
variables of major national industries that will assist decision-makers to meet the challenge of
managing climate variability risk and opportunity on the scale of weeks to seasons, thereby
contributing to economic vitality and increasing the return on the national investment in
atmospheric observations, research, and supercomputer forecasts.

FIRM: Proteus Technologies LLC
                                                1040 Old Spanish Trail; Suite 7
                                                Slidell, LA 70458-

AWARD: $400,000

PHONE: (985) 231-2222

E-MAIL: sean@proteustechnology.com

PRINCIPAL INVESTIGATOR: Sean Griffin

TITLE OF PROJECT: The Trident Array: A Stable, Towed, Tetrahedral
                                                Hydrophone Array

SUBTOPIC NUMBER: 8.6.1X

TECHNICAL ABSTRACT:

Detecting the presence of marine mammals in paramount in lessening man's impact on the environment as we search the oceans for natural resources. Many human ocean activities use high powered acoustic sources that can disturb, disrupt, maim or kill marine animals. The ability to detect, identify and locate marine mammals is critical during these operations to mitigate harm. Passive acoustics is a reliable method to detect and localize marine mammals but the necessary volumetric acoustic methods generally require expensive systems that are also expensive to deploy. During Proteus' Phase I effort, we demonstrated real-time detection and localization at high tow speeds with a small, low cost volumetric array. The design proved to be highly stable at 10 knots tow speeds. During the Phase II effort, our plans are to improve our basic Phase I prototype design into a fully operational pre-production design that improves on the localization performance of the Phase I prototype that is low cost, reliable, modular and rugged. There is significant worldwide commercial potential for such as system in marine mammal population studies and mitigation efforts.

SUMMARY OF ANTICIPATED RESULTS:

Proteus anticipates at the completion of the Phase II that we will have a fully functioning pre-production volumetric array that is stable when towed at 10 knots and is capable of real-time localization of marine mammals. The array will have a more modular design than the Phase I prototype, will be more cost effective and more rugged while still meeting the performance objectives. The planned pre-production design will maintain the basic shape and architecture but will be made of different materials and easily replaceable components. The acoustic array performance will also be optimized and characterized. Additionally, the electronics will be improved with wet side digitization. Electronics design changes will improve the noise performance, reduce ship-to-ship noise variations, reduce dry side electronics footprint, reduce the tow cable wire count requirements and reduce the overall system cost. The significant commercial potential in marine mammal research, population study surveys and mitigation work

due to laws protecting marine mammals nationally and internationally. Proteus will be ready upon completion of the Phase II effort to fill this market need.

FY 2016 PHASE II AWARD WINNER

FIRM: Southwest Sciences, Inc.
                                          1570 Pacheco Street; Suite E-11
                                          Santa Fe, NM 87505-

AWARD: $400,000

PHONE: (505) 984-1322

E-MAIL: jsilver@swsciences.com

PRINCIPAL INVESTIGATOR: Dr. Joel A. Silver

TITLE OF PROJECT: Portable High Precision Nitrogen Gas Analyzer for Eddy
                                          Covariance Flux Measurements

SUBTOPIC NUMBER: 8.3.2D

TECHNICAL ABSTRACT:

Recent research has suggested that the commonly used assumption of dry air having no net flux is erroneous and can lead to significant errors in reported observations for eddy correlation flux measurements. If the density of nitrogen was measured directly, the accuracy of these measurements would be improved greatly. Southwest Sciences, Inc. proposes to develop a portable analyzer that would be used in conjunction with sonic anemometers to improve the performance of eddy covariance flux measurements. This instrument would use a new optical method to detect ambient nitrogen gas density with good precision and fast time response. The Phase I research demonstrated that required performance specifications could be achieved. The Phase II research would result in the construction, characterization and field testing of a prototype instrument.

SUMMARY OF ANTICIPATED RESULTS:

The Phase II prototype instrument will demonstrate the feasibility of this approach and provide a solid basis for further development of a commercial product. This portable, autonomous device would be relatively inexpensive and would be of use in the many locations where greenhouse gas fluxes are measured, both at academic and governmental sites.

FY 2016 PHASE II AWARD WINNER

FIRM: The Cultured Abalone Farm
                                   9580 Dos Pueblos Canyon Road;
                                   Goleta, CA 93117-

AWARD: $400,000

PHONE: (805) 685-1956

E-MAIL: dswezey@culturedabalone.com

PRINCIPAL INVESTIGATOR: Daniel Swezey

TITLE OF PROJECT: Developing Ocean Acidification Resistance in Commercial
                                   Red Abalone Aquaculture

SUBTOPIC NUMBER: 8.5.1X

TECHNICAL ABSTRACT:

The pH of the global ocean is becoming more acidic as a consequence of oceanic absorption of increasing atmospheric CO_2 concentrations. This process, termed "ocean acidification" (OA), will likely affect the aquaculture of marine shellfish. Maintaining current levels of commercial mollusc production will require the identification and commercialization of resilient seedstock. Through Phase I research efforts, we have discovered genotypes within the red abalone (*Haliotis rufescens*) metapopulation that exhibit resilience to future OA. In collaboration with university partners, our firm will identify the genetic signatures associated with tolerance to low pH, which will enable us to develop an OA-resilient strain of red abalone. We will verify their enhanced performance using advanced dissolved CO_2 testing infrastructure, developed by our project PI in collaboration with university colleagues. We will also work to develop a robust commercial coralline algae feedstock, which our Phase I research indicates conveys additional resilience to OA. These products hold significant commercial promise, and could serve as an example for adaptation efforts in other shellfish sectors.

SUMMARY OF ANTICIPATED RESULTS:

Our work will identify abalone strains and their genomic signatures that confer resilience to OA stress. These efforts will include an assessment of the genetic heritability of this resilience as the foundation for selective breeding efforts. We will also work to develop coralline algae as a viable food source for commercial abalone aquaculture applications, with the goal of exploiting this feedstock's capacity to convey enhanced resilience to OA in post-settlement abalone culture**.**