CIMEC

Cooperative Institute for Marine Ecosystems and Climate
UCSD, UCSB, UC Davis, UCLA, UCSC, HSU, CSU-LA

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The attached competitive proposal is being submitted to you for your consideration by the Cooperative Institute for Marine Ecosystems and Climate (CIMEC), a NOAA Cooperative Institute. Should you recommend funding for this proposal, the project will incorporate the terms of our Memorandum of Agreement (MOA). The NOAA contact (described below) for this cooperative agreement should be contacted immediately if this proposal is accepted for funding. The CIMEC Cooperative Agreement number is NA10OAR4320156.

Title of Proposal**: Real-Time In-Situ TC Observations from Targeted Ocean Drifter Deployments**

Principal Investigator(s): **Luca Centurioni**
CIMEC Partner Institution: **SIO**

Proposal # **2013-2041**

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Theme: **B – Climate Research Impacts**

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(1) Is there a former DOC employee working for the applicant who represented or will represent the applicant before DOC or another Federal agency regarding this application and/or subsequent award? **No**

(2) Does this award include any subaward to a Minority Serving Institution? **No**

(3) Does the proposed award require any recipient, subawardee, and/or contractor personnel to have physical access to Federal premises for more than 180 days or to access a Federal information system? **No**

(4) Is PROGRAM INCOME anticipated being earned during performance of this project? **No**

(5) Will a VIDEO be created for public viewing as part of this project? **No**

(6) Will DOC/NOAA owned equipment be provided to the recipient to use for this award? **No**

(7) Are any permits required to conduct this project? (If yes, please provide the name of the issuing agency and the permit number.) When possible, it is best to include the response. **No**

Real-Time In-Situ TC Observations from Targeted Ocean Drifter Deployments

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Submitted to:

Funding Opportunity Title: FY 2013 Joint Hurricane Testbed

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Real-Time In-Situ TC Observations from Targeted Ocean Drifter Deployments

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Real-Time In-Situ Hurricane Observations from Targeted Ocean Drifter Deployments

Luca Centurioni (SIO/UCSD) and Shuyi S. Chen (RSMAS/UM)

Project Summary

This project aims to support operational hurricane forecasters with real-time, in-situ observations from ocean drifters. The drifters are air-deployed by the USAFR 53rd Weather Reconnaissance Squadron "Hurricane Hunters" who are regularly tasked for surveillance missions into tropical cyclones (TC). The drifter deployments are targeted at hurricanes that threaten US landfall. The instruments are unique in being able to measure continually in time variables in both the atmosphere and ocean, such as surface wind speed and direction, atmospheric air pressure, sea surface temperature (SST) and, in some cases, upper ocean temperature (0-150m). Measurements are taken every 15 minutes and are transmitted via Argos/Iridium satellites in near real-time (~2 hours latency)/real-time (~2 min. latency). The drifters provide a comprehensive and complementary set of measurements not available from any other remote or in-situ observing system. Air-deployments of drifters have been conducted during the past ten years, with seven missions in the Atlantic Ocean-Fabian (2003), Frances (2004), Rita (2005), Dean (2007), Gustav (2008), Ike (2008) and Isaac (2012); and four in the Western Pacific Ocean- Hagupit (2008), Jangmi (2008), Fanapi (2010) and Malakas (2010). In total, 207 drifters have been deployed with a success rate of 92% providing data in one of the most challenging ocean environments, ranging from Cat-1 to Cat-5 TC intensities. The instrument design, deployment method, processing of real-time data and calibration with other surface measurements have reached sufficient maturity to transition these observations from research into operations. The proposed work consists of six tasks: (1) Review and analysis of drifter instrumentation and sampling strategy (to familiarize forecasters with novel data); (2) Implementation of real-time/near real-time transmission of drifter data to operational forecast and modeling centers alternative to the GTS (to provide forecasters and modelers with quality-controlled data in desired format); (3) Design and implementation of data visualization (so that forecasters can readily visualize and check the and in the most informative manner); (4) Deployment strategy and practice with staff at 53rd Air Force Reserve so that forecasters can call for deploying drifters as needed; (5) Expansion of existing fleet of drifters so that forecasters can target two to three hurricanes per year; and (6) Post-season performance review (with emphasis on high-wind speed comparison from all available in-situ and remote measurements). The proposed tasks are to be accomplished in close collaboration with forecasters at the National Hurricane Center (NHC) over a time period of two years. This project addresses many of the critical improvement needs identified by NHC and Joint Typhoon Warning Center (JTWC): to improve the capability to observe the TC and its environment; to support forecasters in their analysis and operational model initialization; to provide real-time/near real-time guidance for intensity changes, especially during times when the TC encounters gradients in the ocean's SST or OHC; to improve the accuracy of operational storm surge forecasts with better surface wind observations; and to provide essential data for post-season assessments of operational coupled atmosphere-ocean model forecasts with drifter observations. The proposed project is built on the PIs' experience working with CARCAH (Chief, Aerial Reconnaissance Coordination, All Hurricanes) and the USAFR 53rd in deployments of drifters in Atlantic hurricanes including Isaac (2012) and real-time data processing and reporting. Both the instrumentation and data processing are mature technology and ready for real-time operations.

Statement of Work

I. Project Duration

The project spans over two years, so that drifters can be deployed in several hurricanes, encompassing a variety of storm intensities, and possibly in multiple deployments into the same storm when needed by forecasters.

II. Project Description

1) Need for real-time in-situ observations of hurricane intensity

One of the most challenging issues of Tropical Cyclone's (TC) intensity forecasting is the lack of in-situ, high temporal resolution observations at the ocean surface including winds, sea-level pressure (SLP), and sea surface temperature (SST). They are extremely valuable for both operational forecasters and numerical prediction model data assimilation and coupled model verification (e.g., Chen et al. 2007, 2012). The goal of this project is to provide real-time in-situ hurricane observations from drifters to forecasters for improved storm assessment and forecast guidance. In addition the data will be available to the operational modeling centers such as NCEP/EMC, for initialization and assimilation in the operational models in order to improve model guidance to forecasters.

2) Ocean drifters

Ocean drifters have been designed as compact, autonomous and self-contained observing systems. They have proven to be robust and low-cost instruments that are able to measure quantities in the atmosphere and ocean, which are of critical importance for the assessment of tropical cyclones (TC). They provide in-situ observations from the interface of the atmospheric and oceanic boundary layers at a space and time resolution and in a complementary manner not available from any other current observing system. Drifter observations consist of surface wind speed and direction, atmospheric pressure, sea surface temperature (SST) and, in some cases, subsurface temperature, which are transmitted to satellites in near real-time/real-time every 15 minutes and available for direct ftp download from SIO and through the GTS of the WWW.

Drifters are typically air-deployed 18-24 hours ahead of an approaching hurricane, in a line perpendicular to the storm path at a spacing of 30 to 50 km. The resulting observational swath is 270 – 450 km wide, about three to four times a typical radius of maximum winds (RMW) on both the left and right side of the hurricane. During operational reconnaissance flights conducted in the common "figure-4" and "butterfly" patterns, typically 30-40 dropwindsondes are released at a spacing of 35-55 km. Only when followed by a second aircraft during the same day can the number of direct surface observations be increased during a 24-hour period of the storm's development. During RI (rapid intensification) events a hurricane may increase in strength by two or more hurricane categories on the Saffir-Simpson wind scale. In the same time period ten drifters can provide up to 960 atmosphere/ocean observations in a continuous data stream every 15 minutes.

The main components of a drifter are shown in Fig. 1. The drifters consist of a spherical surface float (40cm diameter) that contains the main electronic processor, satellite antenna and battery pack. Attached to the float are four sensors: a weather vane for wind direction, a wind speed

anemometer, an air pressure sensor and a thermistor to measure SST. Below the float there is a wire tether that carries either a cylindrical cloth drogue centered at 15m depth (Minimets), or it is extended to a depth of 150m with sensors to measure subsurface temperatures (ADOS, Centurioni 2008).

The sensor accuracy has been extensively studied and investigated with measurements from other sources, incl. moored NDBC buoys, scatterometers (NSCAT and QSCAT), and surface measurements from co-located dropwindsondes.

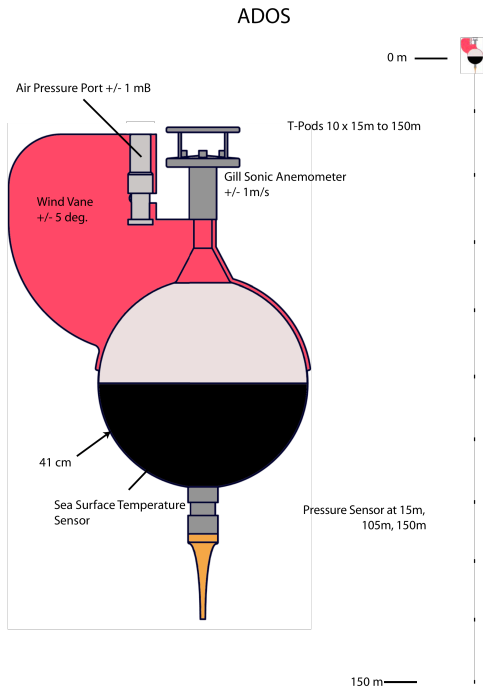

Figure 1. Schematic of ADOS drifter (Autonomous Drifting Observing System) with surface float and 150m-long thermistor cable.

Over the past ten years drifters have successfully been deployed by the US Air Force 53rd Weather Reconnaissance Squadron in eleven tropical cyclones, with seven missions in the Atlantic Ocean and Gulf of Mexico, and four missions in the Western Pacific Ocean (Fig. 2).

Figure 2. Drifter deployments: (left) drifters packaged and loaded on airplane, and (right) loadmaster preparing drifter deployment from open loading deck on C-130.

A total of 207 drifters were air-deployed with a success rate of over 92%. During these deployments the drifters transmitted data in all storm intensities: in Hurricane Fabian (2003, Cat-3), Frances (2004, Cat-4), Rita (2005, Cat-4), Dean (2007, Cat-5), Gustav (2008, Cat-2), Ike (2008, Cat-2) and Isaac (2012, Cat-2); and Typhoons Hagupit (2008, Cat-1), Jangmi (2008, Cat-5), Fanapi (2010, Cat-2) and Malakas (2010, Cat-2).

3) In-situ observations in typhoons

An example of ADOS and Minimet drifter data is presented in Fig.3 for Typhoon Fanapi, which was targeted with eight drifters deployed in September 2010 during an international field program to study the "Impact of Typhoons on the Ocean in the Pacific" (ITOP) (D'Asaro et al. 2011). The drifter observed SST cooling and wind directions are shown, in a storm-relative coordinate system. The typhoon was moving in a northwesterly direction, leaving a cold wake to the right of its track. The -1°C contour line is shown to emphasize the magnitude of cooling within the inner-storm region. The cooling and subsequent warming of the cold wake of a hurricane have been observed and analyzed with drifter observations (D'Asaro 2007, Price 2008).

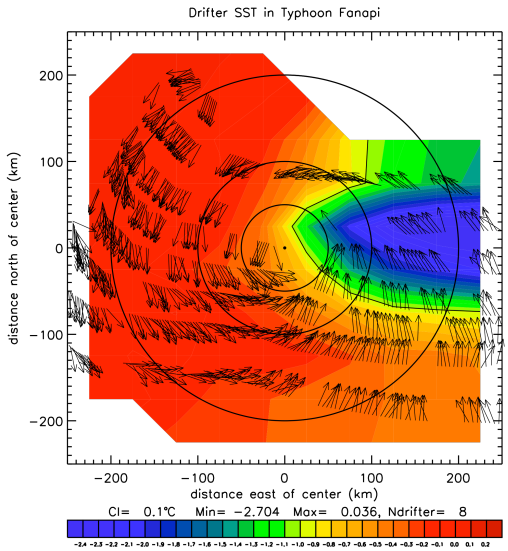

Figure 3. Drifter observations in Typhoon Fanapi (September 2010), shown in storm-relative coordinates. The storm is moving in a northwesterly direction. SST cooling is contoured. The -1°C contour line is shown. Vectors represent drifter observed surface wind directions. Circles are plotted at 50, 100 and 200 km distance from storm center.

An example of continuous subsurface temperature measurements from ADOS drifters is shown in Fig. 4. This drifter was deployed ahead of Typhoon Fanapi in September 2010 in the Northwest Pacific. During the 24 hours depicted, the subsurface temperature variability immediately before the arrival of the storm is very large (Fig. 4b). The cloud cover ahead of the storm center is preventing solar heating at the surface of the ocean, so SST remains fairly constant. Fig. 4a shows the resulting time series of (T100-SST), where T100 is the depth-averaged temperature from 0-100m. T100 has been identified as a robust metric of the upper ocean thermal field (Price 2009). The 100m depth is the typical depth of vertical mixing by a

Cat-3 storm. The (T100-SST) temperature difference represents, very roughly, the ocean's potential cooling due to the passing of the TC. This estimate of the ocean's surface cooling neglects other factors that can change the upper ocean heat content, like the air-sea heat fluxes (which account for only a few percent of the change in heat content), and also effects due to vertical and horizontal advection from internal waves and currents. Numerous studies have found that the primary cause for the SST cooling is the vertical mixing (e.g. D'Asaro 2007). In Fig. 4a, the (T100-SST) values range from -1°C to -2.5°C as calculated from individual 15-min profiles. For example, a cooling of the SST on the order of 1°C in the inner-core region of the TC will reduce the enthalpy flux by 40% (Cione and Uhlhorn 2003). It is therefore important to measure the variability of the temperature of the first 100 m below the ocean surface, which cannot be done with instruments from the XBT family.

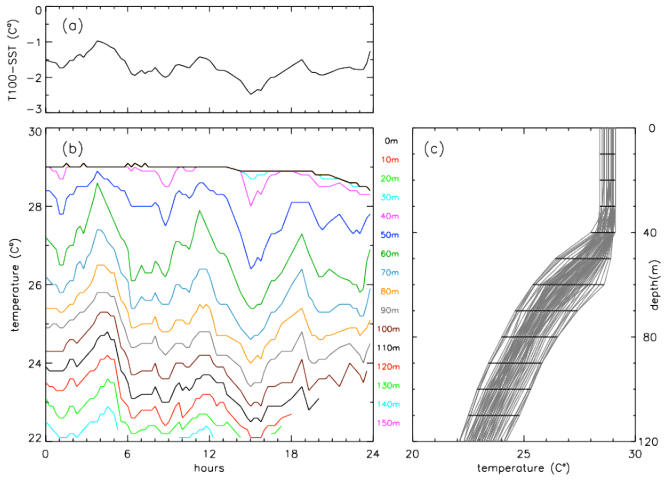

Figure 4. Subsurface temperature profiles from ADOS drifter on September 17, 2010. **(a)** 24-hour time series of (T100-SST) computed from profiles in (b); T100 is the average temperature from 0-100m. **(b)** 24-hour time series of subsurface temperatures, at 10m depth intervals, measured at 15-min intervals. **(c)** Corresponding temperature profiles (N=81).

4) Hurricane Isaac (2012)

The PIs worked closely with CARCAH to plan and deploy ten ocean drifters ahead of Hurricane Isaac sucessfully on August 26, 2012. The drifter data were reported in real-time on the GTS data system. Figure 5 shows drifter observations of sea-level pressure, surface wind speed, and SST from August 26-September 11, 2012. The center of Hurricane Isaac passed through the drifter array. The in-situ observations from the drifters provided a unique, detailed description of the storm evaluation, including the pre-, during, and post-storm stages. The high temporal resolution of the drifter data (every 15 min) proves to be invaluable in capturing the SLP at about 982 hPa and wind speed >45 kts near the center of the storm. The continued observations in time provided a rare opportunity to document not only the pressure and wind structure in Isaac, but also the storm-included ocean cooling as well as post-storm recovery of the SST in the Gulf.

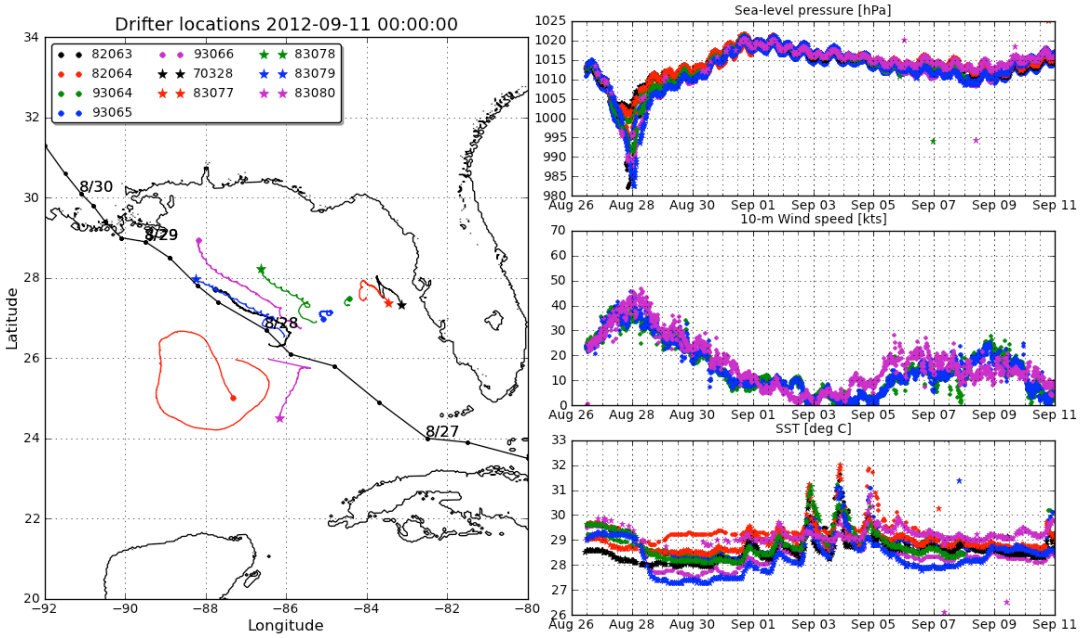

Figure 5. Ten ocean drifters deployed during Hurricane Isaac on August 26, 2012. The drifter positions/tracks (left) and continuous observations of sea-level pressure (hPa, top-right), surface wind speed (kts, mid-right), and SST (C, bottom-right) are shown from August 26-September 11, 2012.

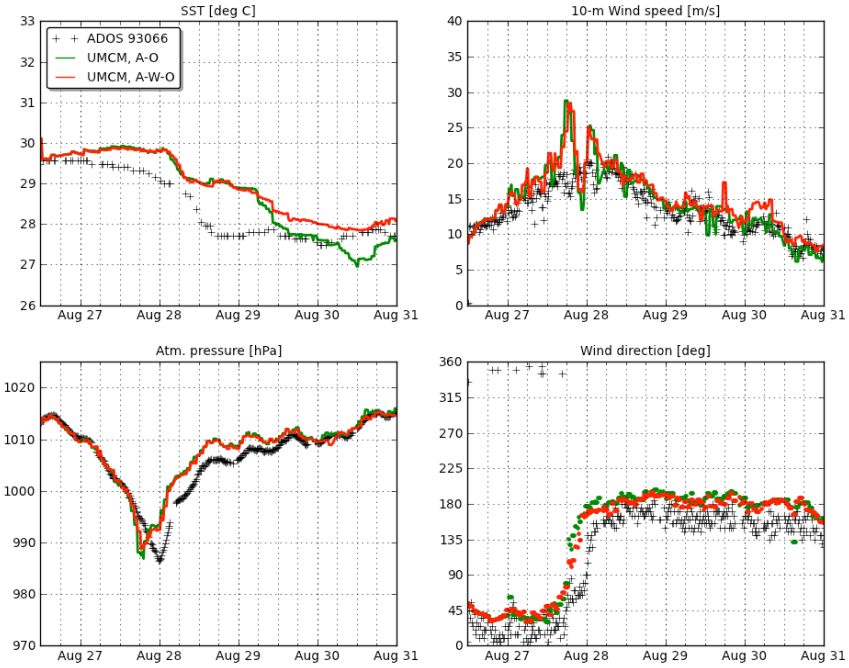

Figure 6. ADOS drifter observations (black) and UMCM model forecasts (coupled Atmosphere-Ocean model in green, Atmosphere-Wave-Ocean model in red) of SST (top-left), SLP (hPa, bottom-left), surface wind speed (m/s, top-right) and direction (bottom-right).

Observations from drifters have contributed to major advances in understanding air-sea interaction processes during TCs: e.g., the determination of heat and momentum fluxes at the sea surface (Black et al. 2007); the formation and recovery of the cold wake in the ocean (D'Asaro et al. 2011); the warming of the SST in the cold wake after passing of the hurricane (Price et al. 2008); and evaluation for wind stress in high-wind regimes (Zedler et al. 2009). These drifter data are also invaluable for evaluation and verification of coupled atmosphere-ocean prediction models for hurricane forecasting. Presented here are examples of drifter observations from Hurricane Isaac compared with the fully coupled atmosphere-wave-ocean model developed at the University of Miami (UMCM) (Chen et al. 2012). The UMCM was used for a real-time forecast experiment during the Grand Lagrangian Deployment (GLAD) field campaign. The model was configured to test the effects of the atmosphere-ocean coupling (WRF-HYCOM) and fully coupled atmosphere-wave-ocean (WRF-UMWM-HYCOM) on storm intensity forecasts (Fig. 6). The ocean model HYCOM seems to be warmer than the drifter observations, which led to a slightly over intensification of the coupled model prediction of surface wind speed. The PIs will assist the effort of similar model verification at the Environmental Modeling Center (EMC/NCEP) using the operational models (e.g., HWRF and GFS). The drifter data will be invaluable for data assimilation at EMC.

III. Proposed Work Plan

The proposed work consists of six tasks, and is intended to be accomplished in collaboration with forecasters at the National Hurricane Center (NHC) in Miami.

1. Review and Analysis of Drifter Data

During an initial visit at NHC the PI(s) will present data from past deployments of drifters into hurricanes and typhoons in order to familiarize NHC forecasters and specialists with the available data, the quality-control processing and currently implemented real-time transmission. The PI(s) will become familiar with the operational forecast environment, and receive feedback and guidance from NHC staff for the planned project tasks.

Project Deliverables: Document describing all necessary steps necessary to accomplish the planned tasks. This document and all other project deliverables will be made available on a designated website, together with progress reports and available drifter data.

2. Real-Time Drifter Data Transmission to NHC

Currently most of the drifter data are posted to the GTS, but not all data are sufficiently quality-controlled. The goal of this task is to design and implement the most efficient and automated flow of near real-time/real-time, quality-controlled drifter data to the forecasters at NHC, as well as to the modelers at numerical weather prediction centers, including EMC/NCEP and NOAA/AOML's Hurricane Research Division (HRD) where the current suite of operational and experimental forecast models are run. The specific requirements of forecasters and modelers may differ and require customized data format and files.

Project Deliverables: Software to receive, quality-control and transmit drifter data to point of use at NHC and EMC/NCEP.

3. Drifter Data Visualization at NHC

This task will require close collaboration with NHC staff in order to ensure that the drifter data are easily accessible to forecasters in their operational computing and display environment (e.g.,

ATCF. AWIPS-II, and other display capability that NHC uses). Close attention will be paid so that the new data will be available in a practical and forecaster-friendly manner. The data volume from the drifters is relatively small, and is currently stored in ASCII files that are easy to read and compatible with various computational and graphical software packages. As the drifter data are transmitted continuous in time and from several drifters deployed into the same TC, it will be possible to enhance the data visualization with time series of single or multiple variables, as well as various data compilations into 2-D maps and storm-relative maps. Additional important storm parameters can be derived and displayed, including, for example, radius of maximum wind, maximum sustained wind, radii of 34-, 50- and 64-kt winds, minimum sea-level pressure, pressure-gradient, gradient wind, SST cooling within the inner-core, etc. The PI(s) will work in collaboration with other funded JHT projects involving surface data analysis.

Project Deliverables: Drifter data display capability implemented at NHC.

4. Drifter Deployments

The crews of the USAFR 53rd Weather Squadron have conducted a total of eleven air-deployments of drifters over the past ten years. Their expertise and experience gained from these missions represents a great asset. In order for the drifters to become a valuable quick-response observational tool for the forecasters at NHC, it is essential to implement a mutually agreed communication protocol and deployment strategy that allows NHC forecasters maximum flexibility and access to air-deployed drifters while at the same time ensuring the safety of the deployment crew. It is also of great benefit to the accurate assessment of a hurricane when the measurements from deployed drifters in the ocean are combined with dropwindsonde profiles of the atmosphere in the location of the drifters and provided at several times after the initial deployment of the drifters. In this way the continuous sea-surface data from the drifters can be supplemented with atmospheric data profiling the entire vertical column of the hurricane.

Project Deliverables: Drifter deployment strategy developed and practiced.

5. Post-Season Review

After the end of the hurricane season and when there were drifter deployments conducted, it will be most valuable to assemble all available in-situ and remote observations made during the time period when the TC passed over the drifter array. Inter-comparison of data from the various observation systems will allow to verify/calibrate the different instruments currently employed. The main emphasis of this task will be on the surface winds. The continuous measurements from the drifter wind speed sensors might allow the team to clarify the relationship between 1-min and 10-min estimates of surface winds. The sea-surface measurements from drifters might enable a more accurate conversion of the flight-level winds to the nominal 10-m height. Collocation of dropwindsonde measurements with drifter wind speeds in high winds will allow the verification of measurements from drifter wind speed sensor.

Project Deliverables: Assembly and inter-comparison of all hurricane observations collected during the time of the drifter TC data.

6. Expansion of Drifter Fleet

The existing inventory of SIO's 25 drifters (ADOS and Minimets, primarily Argos) will be used at no cost for this project, thus making the proposed effort cost-efficient. The funds for these instruments come from non-Joint Hurricane Testbed (JHT) sources, i.e. from the Global Drifter Program of NOAA. They may be sufficient for three hurricane deployments. To demonstrate the

full capability for operations at NHC, additional drifters are needed. It is proposed to build one array of six nodes (i.e. six Minimet drifters reporting in real-time through Iridium satellites) per year with JHT funds (ca. $4K per Minimet), in order to allow additional deployments and to increase the resolution of the measured pressure-gradient and ageostrophic winds near the center of the TC. Depending on the number of hurricanes threatening US landfall in a particular year, i.e. if sufficient drifting assets are available, it could also be beneficial to the forecaster to develop a strategy to monitor the same TC with two drifter arrays deployed 24-hour apart.

Project Deliverables: Six additional new drifters built per year.

IV. Proposed Time Line

Year 1:

August 2013: Project starts with collaboration of NHC staff to define details of work (Task 1).

August 2013-February 2014: Design data transmission and visualization tool for NHC (Tasks 2 & 3).

August-November 2013: Monitor hurricane season in Atlantic, and, when possible, deploy drifters in collaboration with NHC forecasters (Task 4).

December 2013-February 2014: Post-season review and assembly of inter-comparison data sets (Task 5).

March 2014: Present progress report at Interdepartmental Hurricane Conference (IHC).

April-June 2014: Build and prepare additional six drifters (Task 6); and implement data transmission and visualization tool at NHC (Tasks 2 & 3) in preparation of the 2014 hurricane season.

July 2014: Meet with JHT committee to review progress and to initiate modifications, if approved for second-year funding.

Year 2: June-November 2014: Monitor hurricane season, and, when possible, deploy drifters in one or several hurricanes (Task 4), so that drifter data transmission and visualization software can be used with real-time hurricane observations (Tasks 2 & 3).

December 2014-February 2015: Post-season review of implemented data transmission and visualization software; and assembly of inter-comparison data sets (Task 5).

March 2015: Present progress report at Interdepartmental Hurricane Conference (IHC).

April-June 2015: Build and prepare second batch of drifters (Task 6); and further refine data transmission and visualization software at NHC (Tasks 2 & 3) in preparation of the 2015 hurricane season.

V. Proposed Travel Schedule for Collaboration and Coordination

It is planned for most of the proposed work tasks to be conducted by PIs off-site from NHC and using teleconferencing tools and email exchanges. Several on-site visits, however, will be necessary to coordinate and collaborate with NHC forecasters. The time of visits will be determined with the NHC staff.

August 2013: (2) PI Luca Centurioni and PI Shuyi Chen (at no cost since she is based in Miami) and Contractor Jan Morzel to NHC and RSMAS for initial consultation (Task 1).

September-December 2013: (1) PI Shuyi Chen (at no cost) to NHC (Tasks 2 & 3).

March 2014: (2) PI Chen and Contractor (Jan Morzel) to IHC for progress report

May 2014: (1) Contractor (Jan Morzel) to NHC for implementation of data transmission and visualization (Tasks 2 & 3)

The travel schedule for the proposed second year is similar to the first year, during appropriate times as needed.

VI. Estimated JHT Requirements

The computational requirements for the volume of drifter data are very small, and will not require any special preparations or additional hardware at NHC. During visits to NHC the PI(s) would like to be able to collaborate with forecasters and staff, without impacting their operational responsibilities.

References

Black, P., E. D'Asaro, W. Drennan, J. French, P.P. Niiler, T. Sanford, E. Terrill, E. Walsh, and J. Zhang, 2007: Air-sea exchange in hurricanes: Synthesis of observations from the Coupled Boundary Layer Air-Sea Transfer experiment (CBLAST). *Bull. Amer. Meteor. Soc., 88, 357-374.*

Centurioni, L. R., 2010: Observations of large-amplitude nonlinear internal waves from a drifting array: Instruments and methods. *J. Atmos. Ocean. Tech.* **27**(10), 1711-1731.

Chen, S. S., J. F. Price, W. Zhao, M. A. Donelan, and E. J. Walsh, 2007: The CBLAST-Hurricane Program and the next-generation fully coupled atmosphere-wave-ocean models for hurricane research and prediction. *Bull. Amer. Meteor. Soc.*, **88**, 311-317.

Chen, S. S., W. Zhao, M. A. Donelan, and H. L. Tolman, 2012: Directional wind-wave coupling in fully coupled atmosphere-wave-ocean models: Results from CBLAST-Hurricane, *J. Atmos. Sci.*, in review.

Cione, J.J., and E.W. Uhlhorn, 2003: Sea surface temperature variability in hurricanes: Implications with respect to intensity change. *Mon. Wea.* Rev**. 131**, 1783-1796.

D'Asaro, E., T. B. Sanford, P. P. Niiler, and E. J. Terrill, 2007: Cold wake of Hurricane Frances. *Geophys. Res. Lett.* **34**, L15609, doi:10.1029/2007GL030160.

D'Asaro, E., P. Black, L. Centurioni, P. Harr, S. Jayne, I.-I. Lin, C. Lee, J. Morzel, R. Mrvaljevic, P. P. Niiler, L. Rainville, T. Sanford, and T.Y. Tang, 2011: Typhoon-ocean interaction in the western North Pacific: Part 1. *Oceanography 24*(4), 24–31, doi:10.5670/oceanog.2011.91.

Price, J. F., J. Morzel, and P. P. Niiler, 2008: Warming of SST in the cool wake of a moving hurricane, *J. Geophys. Res., 113*, C07010, doi: 10.1029/2007JC004393.

Price, J. F., 2009: Metrics of hurricane-ocean interaction: vertically-integrated or vertically-averaged ocean temperature? *Ocean Sci.* **5**, 351-368, www.ocean-sci.net/5/351/2009.

Zedler, S.E., P.P. Niiler, D. Stammer, E. Terrill, and J. Morzel, 2009: Ocean's response to Hurricane Frances and its implications for drag coefficient parameterization at high wind speeds. *J. Geophys. Res., 114, C04016, doi:10.1029/2008JC005205.*

Biographical sketch: Luca Centurioni

(i) Professional preparation:
Undergraduate Institution: Istit. Univ. Navale, Naples and, Univ. of Genoa, Italy, Physical Oceanography/Physics, Laurea (B.Sc. + M.Sc.), 1993.
Graduate Institution: University of Southampton, Southampton UK, Physical Oceanography, Ph.D., 2000.
Postgraduate Institution: Southampton Oceanog. Centre, UK, and Scripps Inst. of Oceanog., USA.

(ii) Recent Appointments:
2011-present Assoc. Researcher, CASPO/CIMEC, Scripps Institution of Oceanography, La Jolla, CA, USA.
2009-2011 Associate Project Scientist, PORD, Scripps Institution of Oceanography, La Jolla, CA, USA.
2005-2009 Assistant Project Scientist, PORD, Scripps Institution of Oceanography, La Jolla, CA, USA.
2002-2005 Postgrad. Res. Oceanographer, PORD, Scripps Inst. of Oceanography, La Jolla, CA, USA.
1999-2002 Postdoctoral Research Assistant, JRD, Southampton Oceanography Centre (UK).

(iii) Recent Publications
Centurioni, L. R. (2010), Observations of Large-Amplitude Nonlinear Internal Waves from a Drifting Array: Instruments and Methods, *J Atmos Ocean Tech*, *27*(10), 1711-1731.

Chang, Y.C., R.S. Tseng and L.R. Centurioni, 2010: Typhoon-Induced Strong Surface Flows in the Taiwan Strait and Pacific, Journal of Oceanography 66(2): 175-182.

Dohan, K., F. Bonjean, L. Centurioni, M. Cronin, G. Lagerloef, D.-K. Lee, R. Lumpkin, N.A Maximenko, P.P Niiler, H. Uchida, 2010: "Measuring the global ocean surface circulation with satellite and in situ observations" in Proceedings of OceanObs'09: Sustained Ocean Observations and Information for Society (Vol. 2), Venice, Italy, 21-25 September 2009, Hall, J., Harrison D.E. & Stammer, D., Eds., ESA Publication WPP-306.

D'Asaro, E., P. Black, L. Centurioni, P. Harr, S. Jayne, I.I. Lin, C. Lee, J. Morzel, R. Mrvaljevic, P.P. Niiler, P.P., L. Rainville, S. Sanford, and T.Y. Tang, 2011. Typhoon-Ocean Interaction in the Western North Pacific: Part 1. Oceanography, 24, 24-31.

Gawarkiewicz, G., S. Jan, P.F.J. Lermusiaux, J.L. McClean, L. Centurioni, K. Taylor, B. Cornuelle, T.F. Duda, J. Wang, Y.J. Yang, T. Sanford, R.C. Lien, C. Lee, M.A. Lee, W. Leslie, P.J. Haley, P.P. Niiler, G. Gopalakrishnan, P. Velez-Belchi, D.K. Lee, and Y.Y. Kim, 2011. Circulation and Intrusions Northeast of Taiwan: Chasing and Predicting Uncertainty in the Cold Dome. Oceanography, 24, 110-121.

Jan, S., C.-C. Chen, Y.-L. Tsai, Y.J. Yang, J. Wang, C.-S. Chern, G. Gawarkiewicz, R.-C. Lien, L. Centurioni, and J.-Y. Kuo, 2011. Mean Structure and Variability of the Cold Dome Northeast of Taiwan. Oceanography, 24, 100-109.

Rudnick, D.L., S. Jan, L. Centurioni, C.M. Lee, R.-C. Lien, J. Wang, D.-K. Lee, R.-S. Tseng, Y.Y. Kim, and C.-S. Chern, 2011. Seasonal and Mesoscale Variability of the Kuroshio Near Its Origin. Oceanography, 24, 52-63.

Lumpkin, R., S. A. Grodsky, L. Centurioni, M.-H. Rio, J. A. Carton, and D. Lee, 2012, Removing spurious low-frequency variability in drifter velocities, J Atmos Ocean Tech. In press

Recent Professional Services: DBCP (WMO-IOC), chairman of ARGOS III pilot project 2008-2011; International Scientific Committee, the 42nd International Liege Colloquium on Ocean Dynamics, 2010; Reviewer for AMS and AGU Journals, J. Mar. Systems, J. Oceanogr, etc, Reviewer for NSF and NOAA proposals, Reviewer for the Millennium Science Initiative (World Bank and Science Initiative Group).

Recent Cruises

2009,08/13-08/21, East China Sea, R/V Roger Revelle, Chief Scientist, deployment of R-ADOS-A array.
2008, 09/1-09/12, East China Sea, R/V OR1 deployment of restrained ADOS-A.
2008, 07,01, San Diego, local cruise to test deployment of restrained ADOS-A, PI
2008,05/07, San Diego, local cruise to test deployment of restrained ADOS-A, PI

Biographical Sketch:

Shuyi S. Chen
Rosenstiel School of Marine and Atmospheric Sciences, University of Miami
4600 Rickenbacker Causeway, Miami, FL 33149
Phone: (305) 421-4048, FAX: (305) 421-4696, E-mail: schen@rsmas.miami.edu

Education:

1990	Ph.D.	Meteorology	The Pennsylvania State University
1985	M.S.	Meteorology	University of Oklahoma
1982	B.S.	Geophysics	Peking University

Professional Employment:

2007 - Present	Professor, University of Miami
2006 - Present	Affiliate Scientist, National Center for Atmospheric Research
1998 - Present	Affiliate Professor, University of Washington
2000 - 2006	Associate Professor, University of Miami
1997 - 1999	Associate Research Professor, University of Miami
1995 - 1997	Assistant Research Professor, University of Washington
1991 - 1995	Research Associate, University of Washington
1990 - 1991	Research Associate, Pennsylvania State University

Synergistic Activities:

a) Honors and Awards:

2012 Fellow, the American Meteorological Society

2007 A.P. Sloan Foundation Leadership Award for Advancing Underrepresented Minority Students in Mathematics, Science and Engineering

2006 NASA Group Achievement Award for TCSP

2002 First Place Award, the National Collegiate Weather Forecasting Contest, the Faculty and Staff Division (2001-2002).

b) Witness Testimony at the Joint Hearing on: *The State of Hurricane Research and the National Hurricane Research Initiative Act of 2007*, before the Subcommittee on Energy and Environment and the Subcommittee on Research and Science Education, Committee on Science and Technology of United States House of Representatives, 26 June 2008.

c) Field Program Experience:

2011	Principle Investigator/Mission Scientist of Aircraft Observation, Dynamics of Madden-Julian Oscillation (DYNAMO), Diego Garcia
2010	Principle Investigator, Impact of Typhoons on Ocean over Pacific (ITOP), Guam
2005	Principle Investigator/Chief Scientist, Hurricane Rainbands and Intensity Change Experiment (RAINEX), Miami, Florida
2003 - 2004	Principle Investigator, Coupled Boundary Layers Air-Sea Transfers (CBLAST)-Hurricane, Miami, Florida
1992 - 1993	Satellite Scientist, providing guidance and directing aircraft missions, Tropical Ocean and Global Atmosphere Coupled Ocean and Atmosphere Response Experiment (TOGA COARE), Honiara, Solomon Islands

d) Editorial Responsibilities:

2004 – 2006 Editor, *Weather and Forecasting*, AMS

2000 - 2003 Associate Editor, *Weather and Forecasting*, AMS

e) Panel and Science Committee:

- The National Academies Board on Atmospheric Sciences and Climate
- NAS Comm. on Progress and Priorities of US Weather Research and Research-to-Operations Activities
- American Geophysical Union – Committee on Cloud and Precipitation
- Science Steering Committee for the NSF Coastal Ocean Processes (CoOP)
- Science Advisory Board for Weather Research and Forecasting (WRF) Model
- Developmental Testbed Center (DTC) Science Advisory Board

Selected Publications:

Recent Relevant Publications:

Lee, C.-Y., and S. S. Chen, 2012: Symmetric and asymmetric structures of hurricane boundary layer in coupled atmosphere-wave-ocean models and observations, *J. Atmos. Sci.*, **69**, 3576-3594.
Kerns, B. W., and S. S. Chen, 2012: Cloud clusters and tropical cyclogenesis: Morphology and large-scale environment of developing and non-developing Systems, *Mon. Wea. Rev.*, **140**, in press.
Chen, S. S., W. Zhao, M. A. Donelan, and H. L. Tolman, 2012a: Directional wind-wave coupling in fully coupled atmosphere-wave-ocean models: Results from CBLAST-Hurricane, *J. Atmos. Sci.*, in review.
Chen, S. S., W. Zhao, J. F. Price, M. A. Donelan, E. Walsh, H. Tolman, and C.-Y. Lee, 2012b: Fully coupled atmosphere-wave-ocean model simulations of three Atlantic hurricanes, *J. Atmos. Sci.*, submitted.
Judt, F., and S. S. Chen, 2010: Convectively Generated Potential Vorticity in Rainbands and Formation of Secondary Eyewall in Hurricane Rita of 2005, *J. Atmos. Sci.*, **67**, 3581–3599.
Tao, W.-K., J. J. Shi, S. S. Chen, S. Lang, S.-Y. Hong, G. Thompson, C. Peters-Lidard, A. Hou, S. Braun, and J. Simpson, 2011: The impacts of microphysical schemes on hurricane intensity and Track, Asia-Pacific, *J. Atmos. Sci.,* **47**, 1-16.
Davis, C., W. Wang, S. S. Chen, Y. Chen, K. Corbosiero, M. DeMaria, J. Dudhia, G. Holland, J. Klemp, J. Michalakes, H. Reeves, R. Rotunno[1], and Q. Xiao, 2008: Prediction of landfalling hurricanes with the Advanced Hurricane WRF Model, *Mon. Wea. Rev.*, **136,** 1990-2005.
Chen, S. S., J. F. Price, W. Zhao, M. A. Donelan, and E. J. Walsh, 2007: The CBLAST-Hurricane Program and the next-generation fully coupled atmosphere-wave-ocean models for hurricane research and prediction. *Bull. Amer. Meteor. Soc.*, **88**, 311-317.
Houze, R. A., S. S. Chen, B. Smull, W.-C. Lee, M. Bell, 2007: Hurricane intensity and eyewall replacement. ***Science***, **315**, 1235-1239.
Chen, S. S., J. Knaff, and F. D. Marks, 2006: Effect of vertical wind shear and storm motion on tropical cyclone rainfall asymmetry deduced from TRMM. *Mon. Wea. Rev.,* **134**, 3190-3208.
Houze, R. A., S. S. Chen, and co-authors, 2006: The Hurricane Rainband and Intensity Change Experiment (RAINEX): Observations and modeling of Hurricanes Katrina, Ophelia, and Rita (2005). *Bull. Amer. Meteor. Soc.*, **87**, 1503-1521.

Other Significant Publications:

Chen, S. S., W. Zhao, J. E. Tenerelli, R. H. Evans, V. Halliwell, 2001: Impact of the Pathfinder sea surface temperature on atmospheric forcing in the Japan/East Sea, *Geophys. Res. Lett.*, **28**, No. 24, 4539-4542.
Chen, S. S., and R. A. Houze, Jr., 1997a: Diurnal variation and lifecycle of deep convective systems over the tropical Pacific warm pool. *Quat. J. Roy. Meteor. Soc*., **123**, 357-388.
Chen, S. S., and R. A. Houze, Jr., 1997b: Interannual variability of deep convection over the tropical warm pool. *J. Geophys. Res.*, **102**, 25,783-25,795.
Chen, S. S., R. A. Houze, Jr. and B. E. Mapes, 1996: Multiscale variability of deep convection in relation to large-scale circulation in TOGA COARE. *J. Atmos. Sci.*, **53**, 1380-1409.
Chen, S. S., and W. M. Frank, 1993: A numerical study of the genesis of extratropical convective mesovortices. Part I: Evolution and Dynamics. J. Atmos. Sci., **50**, 2401 - 2426.

Graduate and Postgraduate Advisors:

Dr. Y. Sasaki and Dr. R. Doviak, M.S. Thesis advisors, University of Oklahoma (1983-1985)
Dr. William M. Frank, Ph.D. Thesis advisor, Penn State University (1985-1990)
Dr. Robert A. Houze, Jr., Postdoctoral advisor, University of Washington (1991-1993)

Thesis advisor in the past five years to:

Manuel Lonfat, Derek Ortt, John Cangilosi, Melicie DesFlost, Joel Cline, Peter Kozich, Chiaying Lee, Falko Judt, Rebecca Waddington, Milan Curcic, Ronald Gordon, Patricia Sanchez, Jenna King, University of Miami; Wei Zhao, Qingdao Ocean University; David Mechem, University of Washington.

Postdoctoral-scholar sponsor in the past five years to:

Dr. Wei Zhao, RSMAS/University of Miami; Dr. Olivier Nuissiur, RSMAS/University of Miami; Dr. Brandon Kerns, RSMAS/University of Miami

Recent Collaborators (past 48 months):

Qing Wang, NPS; Chris Davis, John Michalakes, Wei Wang, Jimy Dudhia, X.-Y. Huang, Greg Holland, NCAR/MMM; Wen-Chau Lee, NCAR/EOL; Bob Houze, University of Washington; Ralph Foster, Tom Sanford, APL/University of Washington; Tim Liu, JPL/Cal Tech; Jim Price, WHOI; Rob Rogers, Frank Marks, Bob Atlas, NOAA/HRD; Hendrik Tolman, NOAA/NCEP; Jim Doyle, Sue Chen, Shouping Wang, NRL-Monterey; Rick Allard, NRL-Stennis; Ed Walsh, NASA; W.-K. Tao, R. Shin, NASA/GFSC; C.C. Wu, I.I. Lin, National Taiwan University; Isaac Ginis, T. Hara, URI.

CURRICULUM VITAE

Jan Morzel
Research Scientist
Rosetta Consulting, 2075 Upland Ave, Boulder, CO 80304, 303 413-1711
jan@rosettaconsult.com

Education
1980, B.S. ("Vordiplom"), University of Kiel, Germany, Physics and Mathematics.
1984, M.S., University of Hawaii, Physical Oceanography.

Research Positions
2008 – present: Research Scientist, founder of Rosetta Consulting, Boulder, Colorado.
2001 – 2008: Support Scientist, Colorado Research Associates, Boulder, Colorado, a division of Northwest Research Associates.
1991 – 2001: Software Engineer, National Center for Atmospheric Research, Climate and Global Dynamics Division, Boulder, Colorado.

Publications (last three years only)
Mrvaljevic, R.K., P.G. Black, L.R. Centurioni, E.A. D'Asaro, S.R. Jayne, C. Lee, R.-C. Lien, J. Morzel, P.P. Niiler, L. Rainville, T.B. Sanford, and T.Y. Tang, 2012: Evolution of the cold wake of typhoon Fanapi, submitted.
D'Asaro, E., P. Black, L. Centurioni, P. Harr, S. Jayne, I.-I. Lin, C. Lee, J. Morzel, R. Mrvaljevic, P.P. Niiler, L. Rainville, T. Sanford, and T.Y. Tang, 2011: Typhoon-ocean interaction in the western North Pacific, Part 1. *Oceanography 24*(4), 24–31, doi:10.5670/oceanog. 2011.91.
Zedler, S.E., P.P. Niiler, D. Stammer, E. Terrill, and J. Morzel, 2009: Ocean's response to Hurricane Frances and its implications for drag coefficient parameterization at high wind speeds, *J. Geophys. Res*., 114, C04016, doi:10.1029/2008JC005205.
Mapes, B.E., R.F. Milliff, and J. Morzel, 2009: Composite life cycle of maritime tropical mesoscale convective systems in scatterometer and microwave satellite observations, *J. Atmos. Sci*., 66, 199-208.
Price, J.F., J. Morzel, and P.P. Niiler, 2008: Warming of SST in the cool wake of a moving hurricane, *J. Geophys. Res.*, 113, C07010, doi:10.1029/2007JC004393.

Current Support

Investigator: **Centurioni, Luca**

Project/Proposal Title: Sea Surface Salinity and Ocean Current Observations in the Tropical Atlantic Surface Salinity Maximum with Lagrangian Drifters
Source of Support: NASA - NNX12A167G
Total Award Amount: $ 204,631
Location of Project: UCSD/SIO
Total Award Period Covered: 4/24/12 - 4/23/14
Person-Months Per Year Committed to the Project. Cal: 1.0, 1.0 Acad: Sumr:

Project/Proposal Title: Integrated Boundary Current Observations in the Global Climate System (CORC)
Source of Support: NOAA - NA10OAR4320156
Lead PI: Uwe Send
Total Award Amount: $ 199,999
Co-PI's: Bruce Cornuelle, Russ Davis, Dean Roemmich Daniel Rudnick
Location of Project: UCSD/SIO
Total Award Period Covered: 7/1/11 - 6/30/13
Person-Months Per Year Committed to the Project. Cal: 1.0, 1.0 Acad: Sumr:

Project/Proposal Title: Planning Joint Vietnam Ocean Circulation Studies
Source of Support: ONR N00014-11-1-0347
Co-PI's: Bruce Cornuelle, Julie McClean
Total Award Amount: $ 360,000
Location of Project: UCSD/SIO
Total Award Period Covered: 1/15/11 - 9/30/13
Person-Months Per Year Committed to the Project. Cal: 2.0, 2.0 Acad: Sumr:

Project/Proposal Title: CIMEC: The Global Drifter Program
Source of Support: NOAA-NA10OAR4320156
Co-PI: Bruce Cornuelle
Total Award Amount: $ 5,732,099
Location of Project: UCSD/SIO
Total Award Period Covered: 7/1/11 - 6/30/13
Person-Months Per Year Committed to the Project. Cal: 3.0, 3.0 Acad: Sumr:

Project/Proposal Title: Drifter Response of Upper Ocean Response to Typhoons
Source of Support: ONR-N00014-08-1-0656
Co-PI: Bruce Cornuelle
Total Award Amount: $ 1,393,074
Location of Project: UCSD/SIO
Total Award Period Covered: 4/1/08-2/28/13
Person-Months Per Year Committed to the Project. Cal: 1.0, 1.0, 1.0 Acad: Sumr:

Project/Proposal Title: Origins of the Kuroshio and Mindanao Currents
Source of Support: ONR-N00014-10-0273
Lead PI: Daniel Rudnick
Co-PI: Julie McClean
Co-PI: Bruce Cornuelle
Total Award Amount: $ 311,154
Location of Project: UCSD/SIO
Total Award Period Covered: 12/1/09-12/31/13
Person-Months Per Year Committed to the Project. Cal: Acad: Sumr:

Project/Proposal Title: Real Time Vertical Temperature and Velocity Profiles from a Wave Glider
Source of Support: ONR-N00014-12-1-0295
Co-PI: Bruce Cornuelle
Total Award Amount: $ 399,993
Location of Project: UCSD/SIO
Total Award Period Covered: 4/1/12-3/31/14
Person-Months Per Year Committed to the Project. Cal: 0.51, 1.0 Acad: Sumr:

Pending Support

Investigator: **Centurioni, Luca**

Project/Proposal Title: Real-time, high vertical resolution profiling drifters for upper ocean salinity studies
Source of Support: ONR DURIP - UCSD 20131009
Total Award Amount: $ 318,162
Location of Project: UCSD/SIO
Total Award Period Covered: 6/15/13 - 6/14/14
Person-Months Per Year Committed to the Project. Cal: 0.0 Acad: Sumr:

Project/Proposal Title: Real-Time In-Situ TC Observations from Targeted Ocean Drifter Deployments (THIS PROPOSAL)
Source of Support: NOAA - UCSD 20132041
Collaborative PI: Shuyi Chen, RSMAS/UM
Total Award Amount: $ 213,661
Location of Project: UCSD/SIO
Total Award Period Covered: 08/01/13 - 07/31/15
Person-Months Per Year Committed to the Project. Cal: 0.3 Acad: Sumr:

Current and Pending Support

INVESTIGATOR: **Shuyi S. Chen**

CURRENT SUPPORT:

- Project / Proposal Title: A Unified Air-Sea Interface for Fully Coupled Atmospheric-Wave-Ocean models for Improving Intensity Prediction of Tropical Cyclones
  Role: PI
  Source of Support: ONR N000141010162
  Total Award Amount: $781,398
  Location of Project: Miami, FL.
  Start & End Date: 12/01/2009 – 09/30/2013
  Person-Month per Year Committed to the Project: Cal: 1.0

- Project / Proposal Title: Aircraft Measurements for Understanding Air-Sea Coupling and Improving Coupled Model Predictions Over the Indian Ocean
  Role: PI
  Source of Support: ONR N000141110562
  Total Award Amount: $100,000
  Location of Project: Miami, FL.
  Start & End Date: 02/01/2011 – 09/30/2013
  Person-Month per Year Committed to the Project: Cal: 0.5

- Project / Proposal Title: Convection Structure and Environmental Conditions in the MJO Initiation Over the Indian Ocean
  Role: PI
  Source of Support: NOAA NA11OAR4310077
  Total Award Amount: $307,600
  Location of Project: Miami, FL.
  Start & End Date: 01/01/11-12/31/13
  Person-Month per Year Committed to the Project: Cal: 1.0

- Project / Proposal Title: Dropsonde Measurements for Characterizing Lower Troposphere Moisture Variability and Air-Sea Interaction Over the Tropical Indian Ocean
  Role: PI
  Source of Support: NSF AGS1062242
  Total Award Amount: $247,801
  Location of Project: Miami, FL.
  Start & End Date: 08/15/11-07/31/14
  Person-Month per Year Committed to the Project: Cal: 0.6

- Project / Proposal Title: Consortium for Advanced Research on Hydrocarbon Transport in the Environment (CARHTE)
  Role: Co-PI
  Source of Support: Consortium of Ocean Leadership SA1207GOMRI005
  Total Award Amount: $380,045

Location of Project: Miami, FL.
Start & End Date: 10/01/11-9/30/14
Person-Month per Year Committed to the Project: Cal: 1.0

- Project / Proposal Title: Coupled Wind/Wave Simulation models to Characterize Hurricane Load Cases
  Role: PI
  Source of Support: NREL
  Total Award Amount: $120,000
  Location of Project: Miami, FL.
  Start & End Date: 10/01/11 – 09/30/13
  Person-Month per Year Committed to the Project: Cal: 0.5

PENDING SUPPORT:

- Project / Proposal Title: Investigation of the Influence of Water Vapor and Air-Sea Flux on Tropical Rainfall Using TRMM, AIRS and Aircraft Data
  Role: PI
  Source of Support: NASA
  Total Award Amount: $287,657
  Location of Project: Miami, FL.
  Start & End Date: 01/01/13 – 12/31/15
  Person-Month per Year Committed to the Project: Cal: 0.5

Proposed Budget

The proposed duration of the project is two years, with a total funding of $125K in year 1 and $126K in year 2. During the first year a collaborative effort with forecasters and staff at NHC is proposed to implement the seamless and automatic inclusion of drifter data into the operational display and analysis system. During the following two hurricane seasons (end of year 1 and 2), the PIs will work closely with NHC forecasters to coordinate drifter deployments in storms that threaten US landfall, and to further refine and adjust the data stream and quality-control for optimal analysis.

The proposed year 1 budget for each institution is as follows:

- SIO - $11,004 salary, $1,582 travel, $2,625 supplies and other expenses, $23,700 equipment (new Minimet drifters) and $29,261 indirect charges.
- RSMAS - $4,363 salary, $1,500 travel and $3,225 indirect charges.
- Rosetta (as a contractor for SIO – costs included in the SIO budget total) - $33,490 salary and $4,500 travel.

Budget Justification

SIO/UCSD:

The SIO portion will be led by Dr. Luca Centurioni. He will be assisted by a Jr. Development Engineer who will fabricate the Minimet drifter system. One week of salary is required for Centurioni for supervising the project. One month of salary is required for Mr. Lance Braasch (Jr. Dev. Engineer at SIO) to fabricate the Minimets and adapt the real-time data distribution server of SIO to the needs of this project.

SIO Salaries used are based on annualized recharge rates. Salary recharge rates are calculated for actual productive time only. The rates include components for employee benefits, provisions for applicable merit increases and range adjustments in accordance with University policy. This method of proposing is consistent with method of charging as required by the Cost Accounting Standards.

The SIO budget also includes funds for supplies and other expenses. These project specific costs that include telephone network use charges, tolls, voice and data communication charges, computer and networking services, photocopying, faxing, postage, and other research related supplies are requested. Supply and expense items categorized as project specific are for expenses that specifically benefit this project and are reasonable and necessary for the performance of this project. Funds for shipping the drifters from San Diego to Keesler AFB will be shared between this project and the Global Drifter Program (Centurioni PI).

The current inventory of 25 drifters is sufficient for three hurricane deployments. The funds for these instruments are leveraged from non-JHT sources (i.e. NOAA's Global Drifter Program). It is proposed to build an array of six new Minimets each year with JHT funds ($3,950/Minimet), in order to increase the resolution of the measured pressure-gradient and ageostrophic winds near the center of the TC, and to allow additional deployments. This strategy would make it possible

to monitor a TC over two successive 24-hour periods. The Minimets cannot be leased because these instruments deployed as they are designed to collect observations of atmospheric and oceanic variables under hurricane conditions (time span of 3-4 days). The cost of leasing a ship to recover the Minimets does not justify the economic benefit of recovery operations. Thus the Minimets need to be fabricated.

In addition, funds are also requested for the support for a subcontract to Mr. Jan Morzel of Rosetta Consulting is sought to perform the tasks outlined in this proposal. The details of Mr. Morzel's contract are included in the budget narrative section of this proposal.

RSMAS/University of Miami:

Personnel

Dr. Shuyi Chen – The principal investigator requests salary support of 0.3 month each year. She will work with Dr. Luca and Mr. Morzel on planning for aircraft missions in hurricane deployment and using the drifter data for experiments of data assimilation in fully coupled atmosphere-wave-ocean model for hurricane prediction. The coupled modeling and data assimilation efforts are leveraged and supported by other research grants funded by NOPP and GoMRI. She will also work with scientists at NHC and EMC/NCEP on operational model verification.

Fringe Benefits

Fringe benefit rates are:

Faculty 21.8 % Current FY12

Travel

One domestic travel per year is budgeted for the PI to attend the NOAA Interdepartmental Hurricane Conference. Each trip will last for five days.

Airfare	$350
Ground transportation	$150
Hotel	$750 ($150 per day for 5 days)
Per diem	$250 ($50 per day for 5 days)
Total per trip	$1500
Total per year	$1500

F&A Rates

The F & A are charged as 55% of modified total direct costs in year 1 and 57% in year 2.

Rosetta Consulting
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Tel: 303 413-1711, Fax: 303 413-1711

December 4, 2012

Dr. Luca Centurioni
Scripps Institution of Oceanography
University of California, San Diego
La Jolla, CA 92093

Re: Proposal for Consulting Services, August 2013 – July 2015

Dear Dr. Centurioni,

Our collaboration over the past several years has resulted in progress being made in several areas of ocean research, in particular in advancing our understanding of the deployment and analysis of data from ocean drifting buoys in hurricanes. It has been a great pleasure to work with you in the recent ITOP project under ONR sponsorship, for observing typhoon-ocean interaction in the Western Pacific Ocean.

The major contributions of Rosetta Consulting were as follows:

- Participation in the ITOP field program in fall of 2010;
- Development of quality-control methods to analyze drifter observations to produce scientific quality data on: SST, air pressure, and wind direction and speed;
- In-depth analysis of sub-surface temperature data from ADOS drifters;
- Participation in research summaries and manuscripts that related wind speed observations to sea surface pressure, consistent with theoretical models of the atmospheric boundary layer;
- Attending NCAR's "Hurricane Weather Research and Forecasting (HWRF)" workshop in Boulder, Colorado (April 2011);
- Participation in conferences and workshops to present results from drifter research, including NOAA's Interdepartmental Hurricane Conference in Miami (February 2011), the ITOP conference in Santa Fe, New Mexico (May 2011) and the AGU meeting in San Francisco (December 2012) with a presentation on ITOP observations from drifters.

As a result of our joint work and based on feedback from other researchers in the field, it has become clear that there is a need to transition the drifter deployments from research to operations. A project for this purpose is the subject of a proposal to the Joint Hurricane Testbed (JHT) program at NOAA: "Real-time In-situ TC Observations from Targeted Ocean Drifter Deployments".

In order to support this effort to make drifter deployments available to forecasters at the National

Hurricane Center (NHC), a continuing collaboration is proposed. Jan Morzel will collaborate with the PI, Dr. Luca Centurioni (SIO/UCSD), in all aspects of this project. Specifically, Jan Morzel will perform various tasks for Dr. Centurioni:

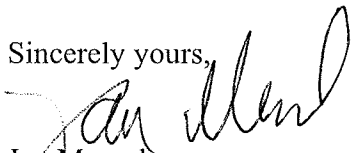
1. Review and analysis of Drifter Data with staff at NHC.
2. Develop, implement and test real-time drifter data transmissions to NHC.
3. Develop, implement and test drifter data visualization tools at NHC.
4. Coordinate with Dr. Centurioni and forecasters at NHC the deployment of drifters.
5. Post-season analysis of drifter data, including the assembly of collocated TC surface data from other observing systems to facilitate further quality-control and calibration of drifter sensor data: including in-situ dropwindsondes, and remotely sensed data from SWFMR (Stepped-Frequency Microwave radiometer) mission, when available.
6. Assist in the design and building of additional drifters for use in operational deployments by NHC.

To facilitate the collaboration with forecasters at NHC it is proposed to conduct two site visits to the National Hurricane Center in Miami, Florida, and one trip to the annual NOAA Interdepartmental Hurricane Conference (place to be determined). For each trip (five days) the anticipated cost for one domestic travel are as follows: airfare $350, ground transportation $150, hotel $750 ($150/day for 5 days) and per diem $250 ($50/day for 5 days). The total cost per trip is $1,500, and the total cost per year is $4,500.

For this collaborating effort, Jan Morzel, the principal investigator of Rosetta Consulting, proposes to spend approximately 394 hours each during the two years of the proposed project, with a period of performance from August 1, 2013 to July 31, 2015. The hourly charge will be $85/hr. The cost for the three trips will be $4,500. The anticipated subcontract cost will be $37,990 in each of the two years.

SIO will be billed monthly. The number of hours spent on each task will be listed.
The federal tax ID/EIN for Rosetta Consulting is 26-3044025.

Sincerely yours,



Jan Morzel
President
Rosetta Consulting

Minimet Drifter System Cost Estimate

DESCRIPTION	Quantity per Drifter	Price per Item	Price per SVP
Parachute and Rigging	0.5	1,200	600
SVP Platform	1	1,148	1,148
WindSonic Wind Sensor	1	1,037	1,037
Barometer Upgrade	1	850	850
Deployment Packaging	0.5	400	200
Parachute Pallet	0.5	131	65
Sensor Mounting Hardware	1	50	50
Total Hardware Cost:			**3,950.00**

2 drifters will be deployed together therefore only 1/2 of the rigging costs is alotted per drifter.

COLLEGES AND UNIVERSITIES RATE AGREEMENT

EIN:

DATE:05/12/2010

ORGANIZATION:
University of California San Diego Campus

San Diego, CA

FILING REF.: The preceding agreement was dated 05/28/2004

The rates approved in this agreement are for use on grants, contracts and other agreements with the Federal Government, subject to the conditions in Section III.

SECTION I: INDIRECT COST RATES

RATE TYPES: FIXED FINAL PROV. (PROVISIONAL) PRED. (PREDETERMINED)

EFFECTIVE PERIOD

TYPE	FROM	TO	RATE(%)	LOCATION	APPLICABLE TO
PRED.	07/01/2008	06/30/2012	54.50	On-Campus	Organized Res.
PRED.	07/01/2012	06/30/2014	55.00	On-Campus	Organized Res.
PRED.	07/01/2008	06/30/2014	26.00	Off-Campus	Organized Res.
PRED.	07/01/2008	06/30/2014	53.00	On-Campus	Instruction
PRED.	07/01/2008	06/30/2014	26.00	Off-Campus	Instruction
PRED.	07/01/2008	06/30/2010	45.00	On-Campus	Other Spon Act.
PRED.	07/01/2010	06/30/2014	43.00	On-Campus	Other Spon Act.
PRED.	07/01/2008	06/30/2014	26.00	Off-Campus	Other Spon Act.
PRED.	07/01/2008	06/30/2010	16.00 (1)		Organized Res.
PRED.	07/01/2010	06/30/2014	18.00 (1)		Organized Res.
PRED.	07/01/2008	06/30/2014	10.30	Off-Campus	(2) IPA

TYPE	FROM	TO	RATE(%)	LOCATION	APPLICABLE TO
PROV.	07/01/2014	Until Amended		(3)	Organized Res.

*BASE

Modified total direct costs, consisting of all salaries and wages, fringe benefits, materials, supplies, services, travel, and subgrants and subcontracts up to the first $25,000 of each subgrant or subcontract (regardless of the period covered by the subgrant or subcontract). Modified total direct costs shall exclude equipment, capital expenditures, charges for patient care, student tuition remission, rental costs of off-site facilities, scholarships, and fellowships as well as a portion of each subgrant and subcontract in excess of $25,000.

(1) Nimitz Marine Facility & Marine Physical Laboratories.

(2) Intergovernmental/Personnel Act Agreements.

(3) Use same rates and conditions as those cited for fiscal year ending June 30, 2014.

SECTION II: SPECIAL REMARKS

TREATMENT OF FRINGE BENEFITS:

Fringe benefits are specifically identified to each employee and are charged individually as direct costs. The directly claimed fringe benefits are listed below.

TREATMENT OF PAID ABSENCES
Vacation, holiday, sick leave pay and other paid absences are included in salaries and wages and are claimed on grants, contracts and other agreements as part of the normal cost for salaries and wages. Separate claims for the costs of these paid absences are not made. A separate charge is made to Federal projects for vacation benefit leave accruals.

DEFINITION OF EQUIPMENT
Effective July 1, 2006, equipment is defined as tangible nonexpendable personal property having a useful life of more than one year and an acquisition cost of $5,000 or more per unit.

DEFINITION OF ON-CAMPUS, OFF-CAMPUS AND SPECIAL RATES

DEFINITION OF OFF-CAMPUS RATE
The off-campus rate is applicable to those projects conducted at facilities not owned or leased by the University. However, if the project is conducted in leased space and lease costs are directly charged to the project, then the off-campus rate must be used.

PROJECTS CONDUCTED ENTIRELY ON-CAMPUS OR ENTIRELY OFF-CAMPUS:
Projects conducted entirely on-campus or entirely off-campus will be applied the on-campus or off-campus rate respectively.

PROJECTS CONDUCTED PARTIALLY OFF-CAMPUS AND PARTIALLY ON-CAMPUS:
If the project involves work at both on-campus and off-campus sites, either the on-campus or off-campus rate generally should be applied, consistent with where the majority of the work is to be performed. Salary cost is generally accepted as a measure of work performed in terms of the total project.

USE OF BOTH ON-CAMPUS AND OFF-CAMPUS RATES
The use of both on-campus and off-campus rates for a given project may be justified if both of the respective rates can clearly be identified with a significant portion of salaries and wages of the project. For purposes of this provision, significant is defined as approximately 25% or more of the total costs and a project's total salary and wage costs exceed $250,000.

OTHER SPECIAL RATES
These rates apply only to the facility or program to which they are identified. If any additional special rates become necessary the establishment of such rates should be coordinated through the cognizant negotiation agency.

The following fringe benefits are treated as direct costs:
OASDI, MEDICARE, RETIREMENT PLAN, WORKERS COMPENSATION, UNEMPLOYMENT, HEALTH/DENTAL/OPTICAL/LIFE INSURANCE, NON-INDUSTRIAL DISABILITY INSURANCE, ANNUITANT HEALTH/DENTAL INSURANCE, INCENTIVE AWARD PROGRAM, EMPLOYEE SUPPORT PROGRAM, SEVERANCE PAY AND TUITION/FEE REMISSION OF CERTAIN STUDENT EMPLOYEES.

ORGANIZATION: University of California San Diego Campus

AGREEMENT DATE: 05/12/2010

SECTION III: GENERAL

A. LIMITATIONS:

The rates in this Agreement are subject to any statutory or administrative limitations and apply to a given grant, contract or other agreement only to the extent that funds are available. Acceptance of the rates is subject to the following conditions: (1) Only costs incurred by the organization were included in its facilities and administrative cost pools as finally accepted: such costs are legal obligations of the organization and are allowable under the governing cost principles; (2) The same costs that have been treated as facilities and administrative costs are not claimed as direct costs; (3) Similar types of costs have been accorded consistent accounting treatment; and (4) The information provided by the organization which was used to establish the rates is not later found to be materially incomplete or inaccurate by the Federal Government. In such situations the rate(s) would be subject to renegotiation at the discretion of the Federal Government.

B. ACCOUNTING CHANGES:

This Agreement is based on the accounting system purported by the organization to be in effect during the Agreement period. Changes to the method of accounting for costs which affect the amount of reimbursement resulting from the use of this Agreement require prior approval of the authorized representative of the cognizant agency. Such changes include, but are not limited to, changes in the charging of a particular type of cost from facilities and administrative to direct. Failure to obtain approval may result in cost disallowances.

C. FIXED RATES:

If a fixed rate is in this Agreement, it is based on an estimate of the costs for the period covered by the rate. When the actual costs for this period are determined, an adjustment will be made to a rate of a future year(s) to compensate for the difference between the costs used to establish the fixed rate and actual costs.

D. USE BY OTHER FEDERAL AGENCIES:

The rates in this Agreement were approved in accordance with the authority in Office of Management and Budget Circular A-21 Circular, and should be applied to grants, contracts and other agreements covered by this Circular, subject to any limitations in A above. The organization may provide copies of the Agreement to other Federal Agencies to give them early notification of the Agreement.

E. OTHER:

If any Federal contract, grant or other agreement is reimbursing facilities and administrative costs by a means other than the approved rate(s) in this Agreement, the organization should (1) credit such costs to the affected programs, and (2) apply the approved rate(s) to the appropriate base to identify the proper amount of facilities and administrative costs allocable to these programs.

BY THE INSTITUTION:

University of California San Diego Campus

(INSTITUTION)

(SIGNATURE)

Peter J. Taylor

(NAME)

Chief Financial Officer

(TITLE)

6-2-2010

(DATE)

ON BEHALF OF THE FEDERAL GOVERNMENT:

DEPARTMENT OF HEALTH AND HUMAN SERVICES

(AGENCY)

Wallace Chan

(SIGNATURE)

Wallace Chan

(NAME)

Director, Western Field Office

(TITLE)

5/12/2010

(DATE) 0236

HHS REPRESENTATIVE: Janet Turner

Telephone: (415) 437-7820

OMB Number: 4040-0004
Expiration Date: 03/31/2012

Application for Federal Assistance SF-424

* 1. Type of Submission:
- [ ] Preapplication
- [x] Application
- [ ] Changed/Corrected Application

* 2. Type of Application:
- [x] New
- [ ] Continuation
- [ ] Revision

* If Revision, select appropriate letter(s):

* Other (Specify):

* 3. Date Received: 12/06/2012

4. Applicant Identifier: UCSD 20132041 Centurioni

5a. Federal Entity Identifier:

5b. Federal Award Identifier:

State Use Only:

6. Date Received by State:

7. State Application Identifier:

8. APPLICANT INFORMATION:

* a. Legal Name: The Regents of the University of California

* b. Employer/Taxpayer Identification Number (EIN/TIN): 956006144

* c. Organizational DUNS: 1751045950000

d. Address:

* Street1: 9500 Gilman Drive
Street2: Mail Code 0210
* City: La Jolla
County/Parish:
* State: CA: California
Province:
* Country: USA: UNITED STATES
* Zip / Postal Code: 92093-0210

e. Organizational Unit:

Department Name: UCSD/SIO

Division Name: CIMEC

f. Name and contact information of person to be contacted on matters involving this application:

Prefix: Mr.
* First Name: William
Middle Name:
* Last Name: Park
Suffix: III

Title: Contract and Grant Officer

Organizational Affiliation: Scripps Institution of Oceanography (SIO)

* Telephone Number: 858-822-1350
Fax Number: 858-534-5306

* Email: wparkiii@ucsd.edu

Application for Federal Assistance SF-424

*** 9. Type of Applicant 1: Select Applicant Type:**

H: Public/State Controlled Institution of Higher Education

Type of Applicant 2: Select Applicant Type:

Type of Applicant 3: Select Applicant Type:

* Other (specify):

*** 10. Name of Federal Agency:**

Department of Commerce

11. Catalog of Federal Domestic Assistance Number:

11.459

CFDA Title:

Weather and Air Quality Research

*** 12. Funding Opportunity Number:**

NOAA-OAR-OWAQ-2013-2003469

* Title:

FY 2013 Joint Hurricane Testbed

13. Competition Identification Number:

2297052

Title:

14. Areas Affected by Project (Cities, Counties, States, etc.):

Add Attachment | Delete Attachment | View Attachment

*** 15. Descriptive Title of Applicant's Project:**

Real-Time In-Situ TC Observations from Targeted Ocean Drifter Deployments

Attach supporting documents as specified in agency instructions.

Add Attachments | Delete Attachments | View Attachments

Application for Federal Assistance SF-424

16. Congressional Districts Of:

* a. Applicant: CA-053 | b. Program/Project: CA-053

Attach an additional list of Program/Project Congressional Districts if needed.

Add Attachment | Delete Attachment | View Attachment

17. Proposed Project:

* a. Start Date: 08/01/2013 | * b. End Date: 07/31/2015

18. Estimated Funding ($):

* a. Federal	213,661.00
* b. Applicant	0.00
* c. State	0.00
* d. Local	0.00
* e. Other	0.00
* f. Program Income	0.00
* g. TOTAL	213,661.00

*** 19. Is Application Subject to Review By State Under Executive Order 12372 Process?**

☐ a. This application was made available to the State under the Executive Order 12372 Process for review on .

☐ b. Program is subject to E.O. 12372 but has not been selected by the State for review.

☒ c. Program is not covered by E.O. 12372.

*** 20. Is the Applicant Delinquent On Any Federal Debt? (If "Yes," provide explanation in attachment.)**

☐ Yes ☒ No

If "Yes", provide explanation and attach

Add Attachment | Delete Attachment | View Attachment

21. *By signing this application, I certify (1) to the statements contained in the list of certifications and (2) that the statements herein are true, complete and accurate to the best of my knowledge. I also provide the required assurances** and agree to comply with any resulting terms if I accept an award. I am aware that any false, fictitious, or fraudulent statements or claims may subject me to criminal, civil, or administrative penalties. (U.S. Code, Title 218, Section 1001)**

☒ ** I AGREE

** The list of certifications and assurances, or an internet site where you may obtain this list, is contained in the announcement or agency specific instructions.

Authorized Representative:

Prefix: Mr. | * First Name: William

Middle Name:

* Last Name: Park

Suffix: III

* Title: Contract and Grant Officer

* Telephone Number: 858-822-1350 | Fax Number: 858-534-5306

* Email: wparkiii@ucsd.edu

* Signature of Authorized Representative: William Park III | * Date Signed: 12/06/2012

BUDGET INFORMATION - Non-Construction Programs

OMB Number: 4040-0006
Expiration Date: 06/30/2014

SECTION A - BUDGET SUMMARY

Grant Program Function or Activity (a)	Catalog of Federal Domestic Assistance Number (b)	Estimated Unobligated Funds		New or Revised Budget		
		Federal (c)	Non-Federal (d)	Federal (e)	Non-Federal (f)	Total (g)
1. NOAA OAR JHT	11.459	$	$	$ 213,661.00	$	$ 213,661.00
2.						
3.						
4.						
5. Totals		$	$	$ 213,661.00	$	$ 213,661.00

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SECTION B - BUDGET CATEGORIES

6. Object Class Categories	GRANT PROGRAM, FUNCTION OR ACTIVITY (1) NOAA OAR JHT	(2) N/A	(3)	(4)	Total (5)
a. Personnel	$ 11,004.00	$ 11,841.00	$	$	$ 22,845.00
b. Fringe Benefits					
c. Travel	1,582.00	1,582.00			3,164.00
d. Equipment	23,700.00	23,700.00			47,400.00
e. Supplies	400.00	420.00			820.00
f. Contractual	37,990.00	37,990.00			75,980.00
g. Construction					
h. Other	2,225.00	2,231.00			4,456.00
i. Total Direct Charges (sum of 6a-6h)	76,901.00	77,764.00			$ 154,665.00
j. Indirect Charges	29,261.00	29,735.00			$ 58,996.00
k. TOTALS (sum of 6i and 6j)	$ 106,162.00	$ 107,499.00	$	$	$ 213,661.00
7. Program Income	$	$	$	$	$

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SECTION C - NON-FEDERAL RESOURCES

(a) Grant Program	(b) Applicant	(c) State	(d) Other Sources	(e)TOTALS
8.	$	$	$	$
9.				
10.				
11.				
12. TOTAL (sum of lines 8-11)	$	$	$	$

SECTION D - FORECASTED CASH NEEDS

	Total for 1st Year	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
13. Federal	$ 106,162.00	$ 37,105.00	$ 23,019.00	$ 23,019.00	$ 23,019.00
14. Non-Federal	$				
15. TOTAL (sum of lines 13 and 14)	$ 106,162.00	$ 37,105.00	$ 23,019.00	$ 23,019.00	$ 23,019.00

SECTION E - BUDGET ESTIMATES OF FEDERAL FUNDS NEEDED FOR BALANCE OF THE PROJECT

(a) Grant Program	FUTURE FUNDING PERIODS (YEARS) (b)First	(c) Second	(d) Third	(e) Fourth
16. Future Years	$ 107,499.00	$	$	$
17.				
18.				
19.				
20. TOTAL (sum of lines 16 - 19)	$ 107,499.00	$	$	$

SECTION F - OTHER BUDGET INFORMATION

21. Direct Charges: Total Direct Charges: $154,665

22. Indirect Charges: Total Indirect Charges: $58,996

23. Remarks:

OMB Number: 4040-0007
Expiration Date: 06/30/2014

ASSURANCES - NON-CONSTRUCTION PROGRAMS

PLEASE DO NOT RETURN YOUR COMPLETED FORM TO THE OFFICE OF MANAGEMENT AND BUDGET. SEND IT TO THE ADDRESS PROVIDED BY THE SPONSORING AGENCY.

NOTE: Certain of these assurances may not be applicable to your project or program. If you have questions, please contact the awarding agency. Further, certain Federal awarding agencies may require applicants to certify to additional assurances. If such is the case, you will be notified.

As the duly authorized representative of the applicant, I certify that the applicant:

1. Has the legal authority to apply for Federal assistance and the institutional, managerial and financial capability (including funds sufficient to pay the non-Federal share of project cost) to ensure proper planning, management and completion of the project described in this application.

2. Will give the awarding agency, the Comptroller General of the United States and, if appropriate, the State, through any authorized representative, access to and the right to examine all records, books, papers, or documents related to the award; and will establish a proper accounting system in accordance with generally accepted accounting standards or agency directives.

3. Will establish safeguards to prohibit employees from using their positions for a purpose that constitutes or presents the appearance of personal or organizational conflict of interest, or personal gain.

4. Will initiate and complete the work within the applicable time frame after receipt of approval of the awarding agency.

5. Will comply with the Intergovernmental Personnel Act of 1970 (42 U.S.C. §§4728-4763) relating to prescribed standards for merit systems for programs funded under one of the 19 statutes or regulations specified in Appendix A of OPM's Standards for a Merit System of Personnel Administration (5 C.F.R. 900, Subpart F).

6. Will comply with all Federal statutes relating to nondiscrimination. These include but are not limited to: (a) Title VI of the Civil Rights Act of 1964 (P.L. 88-352) which prohibits discrimination on the basis of race, color or national origin; (b) Title IX of the Education Amendments of 1972, as amended (20 U.S.C.§§1681-1683, and 1685-1686), which prohibits discrimination on the basis of sex; (c) Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. §794), which prohibits discrimination on the basis of handicaps; (d) the Age Discrimination Act of 1975, as amended (42 U. S.C. §§6101-6107), which prohibits discrimination on the basis of age; (e) the Drug Abuse Office and Treatment Act of 1972 (P.L. 92-255), as amended, relating to nondiscrimination on the basis of drug abuse; (f) the Comprehensive Alcohol Abuse and Alcoholism Prevention, Treatment and Rehabilitation Act of 1970 (P.L. 91-616), as amended, relating to nondiscrimination on the basis of alcohol abuse or alcoholism; (g) §§523 and 527 of the Public Health Service Act of 1912 (42 U.S.C. §§290 dd-3 and 290 ee- 3), as amended, relating to confidentiality of alcohol and drug abuse patient records; (h) Title VIII of the Civil Rights Act of 1968 (42 U.S.C. §§3601 et seq.), as amended, relating to nondiscrimination in the sale, rental or financing of housing; (i) any other nondiscrimination provisions in the specific statute(s) under which application for Federal assistance is being made; and, (j) the requirements of any other nondiscrimination statute(s) which may apply to the application.

7. Will comply, or has already complied, with the requirements of Titles II and III of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (P.L. 91-646) which provide for fair and equitable treatment of persons displaced or whose property is acquired as a result of Federal or federally-assisted programs. These requirements apply to all interests in real property acquired for project purposes regardless of Federal participation in purchases.

8. Will comply, as applicable, with provisions of the Hatch Act (5 U.S.C. §§1501-1508 and 7324-7328) which limit the political activities of employees whose principal employment activities are funded in whole or in part with Federal funds.

9. Will comply, as applicable, with the provisions of the Davis-Bacon Act (40 U.S.C. §§276a to 276a-7), the Copeland Act (40 U.S.C. §276c and 18 U.S.C. §874), and the Contract Work Hours and Safety Standards Act (40 U.S.C. §§327-333), regarding labor standards for federally-assisted construction subagreements.

10. Will comply, if applicable, with flood insurance purchase requirements of Section 102(a) of the Flood Disaster Protection Act of 1973 (P.L. 93-234) which requires recipients in a special flood hazard area to participate in the program and to purchase flood insurance if the total cost of insurable construction and acquisition is $10,000 or more.

11. Will comply with environmental standards which may be prescribed pursuant to the following: (a) institution of environmental quality control measures under the National Environmental Policy Act of 1969 (P.L. 91-190) and Executive Order (EO) 11514; (b) notification of violating facilities pursuant to EO 11738; (c) protection of wetlands pursuant to EO 11990; (d) evaluation of flood hazards in floodplains in accordance with EO 11988; (e) assurance of project consistency with the approved State management program developed under the Coastal Zone Management Act of 1972 (16 U.S.C. §§1451 et seq.); (f) conformity of Federal actions to State (Clean Air) Implementation Plans under Section 176(c) of the Clean Air Act of 1955, as amended (42 U.S.C. §§7401 et seq.); (g) protection of underground sources of drinking water under the Safe Drinking Water Act of 1974, as amended (P.L. 93-523); and, (h) protection of endangered species under the Endangered Species Act of 1973, as amended (P.L. 93-205).

12. Will comply with the Wild and Scenic Rivers Act of 1968 (16 U.S.C. §§1271 et seq.) related to protecting components or potential components of the national wild and scenic rivers system.

13. Will assist the awarding agency in assuring compliance with Section 106 of the National Historic Preservation Act of 1966, as amended (16 U.S.C. §470), EO 11593 (identification and protection of historic properties), and the Archaeological and Historic Preservation Act of 1974 (16 U.S.C. §§469a-1 et seq.).

14. Will comply with P.L. 93-348 regarding the protection of human subjects involved in research, development, and related activities supported by this award of assistance.

15. Will comply with the Laboratory Animal Welfare Act of 1966 (P.L. 89-544, as amended, 7 U.S.C. §§2131 et seq.) pertaining to the care, handling, and treatment of warm blooded animals held for research, teaching, or other activities supported by this award of assistance.

16. Will comply with the Lead-Based Paint Poisoning Prevention Act (42 U.S.C. §§4801 et seq.) which prohibits the use of lead-based paint in construction or rehabilitation of residence structures.

17. Will cause to be performed the required financial and compliance audits in accordance with the Single Audit Act Amendments of 1996 and OMB Circular No. A-133, "Audits of States, Local Governments, and Non-Profit Organizations."

18. Will comply with all applicable requirements of all other Federal laws, executive orders, regulations, and policies governing this program.

19. Will comply with the requirements of Section 106(g) of the Trafficking Victims Protection Act (TVPA) of 2000, as amended (22 U.S.C. 7104) which prohibits grant award recipients or a sub-recipient from (1) Engaging in severe forms of trafficking in persons during the period of time that the award is in effect (2) Procuring a commercial sex act during the period of time that the award is in effect or (3) Using forced labor in the performance of the award or subawards under the award.

* SIGNATURE OF AUTHORIZED CERTIFYING OFFICIAL	* TITLE
William Park III	Contract and Grant Officer
* APPLICANT ORGANIZATION	* DATE SUBMITTED
The Regents of the University of California	12/06/2012

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FORM **CD-511**
(REV 1-05)

U.S. DEPARTMENT OF COMMERCE

CERTIFICATION REGARDING LOBBYING

Applicants should also review the instructions for certification included in the regulations before completing this form. Signature on this form provides for compliance with certification requirements under 15 CFR Part 28, 'New Restrictions on Lobbying.' The certifications shall be treated as a material representation of fact upon which reliance will be placed when the Department of Commerce determines to award the covered transaction, grant, or cooperative agreement.

LOBBYING

As required by Section 1352, Title 31 of the U.S. Code, and implemented at 15 CFR Part 28, for persons entering into a grant, cooperative agreement or contract over $100,000 or a loan or loan guarantee over $150,000 as defined at 15 CFR Part 28, Sections 28.105 and 28.110, the applicant certifies that to the best of his or her knowledge and belief, that:

(1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, 'Disclosure Form to Report Lobbying.' in accordance with its instructions.

(3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure occurring on or before October 23, 1996, and of not less than $11,000 and not more than $110,000 for each such failure occurring after October 23, 1996.

Statement for Loan Guarantees and Loan Insurance

The undersigned states, to the best of his or her knowledge and belief, that:

In any funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this commitment providing for the United States to insure or guarantee a loan, the undersigned shall complete and submit Standard Form-LLL, 'Disclosure Form to Report Lobbying,' in accordance with its instructions.

Submission of this statement is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required statement shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure occurring on or before October 23, 1996, and of not less than $11,000 and not more than $110,000 for each such failure occurring after October 23, 1996.

As the duly authorized representative of the applicant, I hereby certify that the applicant will comply with the above applicable certification.

* NAME OF APPLICANT

The Regents of the University of California

* AWARD NUMBER

pending

* PROJECT NAME

Centurioni 2013-0241 NOAA CIMEC

Prefix: Mr.

* First Name: William

Middle Name:

* Last Name: Park

Suffix: III

* Title: Contract and Grant Officer

* SIGNATURE: William Park III

* DATE: 12/06/2012

	YEAR 1			YEAR 2			
	months	%	AMOUNT	months	%	AMOUNT	TOTALS
Principal Investigator:							
Shuyi Chen	0.3	2%	3,582	0.3	2%	3761	7,343
Total Salaries			3,582			3,761	7,343
Fringe Benefits			781			820	1,601
Total Salaries & Fringe Benefits			4,363			4,581	8,944
Travel Domestic			1,500			1,500	3,000
Modified Total Direct Costs:			5,863			6,081	11,944
Facilities & Administrative Costs	Year 1 Year 2	55.0% 57.0%	3,225			3,466	6,691
TOTAL PROJECT COSTS			9,088			9,547	18,635

COPY

COLLEGES AND UNIVERSITIES RATE AGREEMENT

EIN: 15-90624458

DATE:10/16/2012

ORGANIZATION:

University of Miami
Office of the Controller
P.O. Box 248106
Coral Gables, FL 33124-1422

FILING REF.: The preceding agreement was dated 09/07/2012

The rates approved in this agreement are for use on grants, contracts and other agreements with the Federal Government, subject to the conditions in Section III.

SECTION I: INDIRECT COST RATES

RATE TYPES: FIXED FINAL PROV. (PROVISIONAL) PRED. (PREDETERMINED)

	EFFECTIVE PERIOD				
TYPE	FROM	TO	RATE(%)	LOCATION	APPLICABLE TO
FINAL	06/01/2011	05/31/2012	53.00	On-Campus	Org Rsch Med
PRED.	06/01/2012	05/31/2013	53.00	On-Campus	Org Rsch Med
PRED.	06/01/2013	05/31/2015	53.50	On-Campus	Org Rsch Med
FINAL	06/01/2011	05/31/2012	48.50	On-Campus	Org Rsch Main
PRED.	06/01/2012	05/31/2013	48.50	On-Campus	Org Rsch Main
PRED.	06/01/2013	05/31/2015	50.50	On-Campus	Org Rsch Main
FINAL	06/01/2011	05/31/2012	50.00	On-Campus	Org Rsch Marine
PRED.	06/01/2012	05/31/2013	50.00	On-Campus	Org Rsch Marine
PRED.	06/01/2013	05/31/2014	55.00	On-Campus	Org Rsch Marine
PRED.	06/01/2014	05/31/2015	57.00	On-Campus	Org Rsch Marine
FINAL	06/01/2011	05/31/2012	54.00	On-Campus	Instruction
PRED.	06/01/2012	05/31/2015	50.00	On-Campus	Instruction
FINAL	06/01/2011	05/31/2012	36.00	On-Campus	Other Sponsored Activities
PRED.	06/01/2012	05/31/2015	36.00	On-Campus	Other Sponsored Activities
FINAL	06/01/2011	05/31/2012	26.00	Off-Campus	All Programs
PRED.	06/01/2012	05/31/2015	26.00	Off-Campus	All Programs

TYPE	FROM	TO	RATE(%)	LOCATION	APPLICABLE TO
PROV.	06/01/2015	Until Amended			Use same rates and conditions as those cited for fiscal year ending May 31, 2015.

*BASE

Modified total direct costs, consisting of all salaries and wages, fringe benefits, materials, supplies, services, travel and subgrants and subcontracts up to the first $25,000 of each subgrant or subcontract (regardless of the period covered by the subgrant or subcontract). Modified total direct costs shall exclude equipment, capital expenditures, charges for patient care, student tuition remission, rental costs of off-site facilities, scholarships, and fellowships as well as the portion of each subgrant and subcontract in excess of $25,000.

ORGANIZATION: University of Miami

AGREEMENT DATE: 10/16/2012

SECTION I: FRINGE BENEFIT RATES**

TYPE	FROM	TO	RATE(%)	LOCATION	APPLICABLE TO
FIXED	6/1/2012	5/31/2013	21.90	All	Regular Faculty (A)
FIXED	6/1/2012	5/31/2013	19.20	All	Clinical Faculty (B)
FIXED	6/1/2012	5/31/2013	35.40	All	Other Staff (A)
FIXED	6/1/2012	5/31/2013	12.70	All	Part-Time (C)
PROV.	6/1/2013	Until amended			Use same rates and conditions as those cited for fiscal year ending May 31, 2013.

** DESCRIPTION OF FRINGE BENEFITS RATE BASE:

Salaries and wages.

SECTION II: SPECIAL REMARKS

TREATMENT OF FRINGE BENEFITS:

The fringe benefits are charged using the rate(s) listed in the Fringe Benefits Section of this Agreement. The fringe benefits included in the rate(s) are listed below.

TREATMENT OF PAID ABSENCES

Vacation, holiday, sick leave pay and other paid absences are included in salaries and wages and are claimed on grants, contracts and other agreements as part of the normal cost for salaries and wages. Separate claims are not made for the cost of these paid absences.

OFF-CAMPUS DEFINITION: For all activities performed in facilities not owned by the institution and to which rent is directly allocated to the project(s). the off-campus rate will apply. Grants or contracts will not be subject to more than one F&A cost rate. If more than 50% of a project is performed off-campus, the off-campus rate will apply to the entire project.

Equipment means an article of nonexpendable tangible personal property having a useful life of more than one year, and an acquisition cost of $2,500 or more per unit.

(A) Fringe Benefits include: FICA, Retirement, Life Insurance, Unemployment Compensation, Health Insurance, Workers' Compensation, Tuition Remission, Fringe Benefits Office and Professional Disability.

(B) Fringe Benefits include: FICA, Retirement, Life Insurance, Health Insurance, Workers' Compensation, Tuition Remission, Fringe Benefits Office and Professional Disability.

(C) Fringe Benefits include: FICA, Retirement, Unemployment, Workers' Compensation and Fringe Benefits Office.

SECTION III: GENERAL

A. LIMITATIONS:

The rates in this Agreement are subject to any statutory or administrative limitations and apply to a given grant, contract or other agreement only to the extent that funds are available. Acceptance of the rates is subject to the following conditions: (1) Only costs incurred by the organization were included in its facilities and administrative cost pools as finally accepted: such costs are legal obligations of the organization and are allowable under the governing cost principles; (2) The same costs that have been treated as facilities and administrative costs are not claimed as direct costs; (3) Similar types of costs have been accorded consistent accounting treatment; and (4) The information provided by the organization which was used to establish the rates is not later found to be materially incomplete or inaccurate by the Federal Government. In such situations the rate(s) would be subject to renegotiation at the discretion of the Federal Government.

B. ACCOUNTING CHANGES:

This Agreement is based on the accounting system purported by the organization to be in effect during the Agreement period. Changes to the method of accounting for costs which affect the amount of reimbursement resulting from the use of this Agreement require prior approval of the authorized representative of the cognizant agency. Such changes include, but are not limited to, changes in the charging of a particular type of cost from facilities and administrative to direct. Failure to obtain approval may result in cost disallowances.

C. FIXED RATES:

If a fixed rate is in this Agreement, it is based on an estimate of the costs for the period covered by the rate. When the actual costs for this period are determined, an adjustment will be made to a rate of a future year(s) to compensate for the difference between the costs used to establish the fixed rate and actual costs.

D. USE BY OTHER FEDERAL AGENCIES:

The rates in this Agreement were approved in accordance with the authority in Office of Management and Budget Circular A-21, and should be applied to grants, contracts and other agreements covered by this Circular, subject to any limitations in A above. The organization may provide copies of the Agreement to other Federal Agencies to give them early notification of the Agreement.

E. OTHER:

If any Federal contract, grant or other agreement is reimbursing facilities and administrative costs by a means other than the approved rate(s) in this Agreement, the organization should (1) credit such costs to the affected programs, and (2) apply the approved rate(s) to the appropriate base to identify the proper amount of facilities and administrative costs allocable to these programs.

BY THE INSTITUTION:

University of Miami

(INSTITUTION)

(SIGNATURE)

John R. Shipley

(NAME)

VP of Finance & Treasurer

(TITLE)

11/6/12

(DATE)

ON BEHALF OF THE FEDERAL GOVERNMENT:

DEPARTMENT OF HEALTH AND HUMAN SERVICES

(AGENCY)

(SIGNATURE)

Darryl W. Mayes

(NAME)

Director, Mid-Atlantic Field Office

(TITLE)

10/16/2012

(DATE) 0305

HHS REPRESENTATIVE: Steven Zuraf

Telephone: (301) 492-4855

OMB Number: 4040-0004
Expiration Date: 03/31/2012

Application for Federal Assistance SF-424

* 1. Type of Submission:
- [ ] Preapplication
- [x] Application
- [ ] Changed/Corrected Application

* 2. Type of Application:
- [x] New
- [ ] Continuation
- [ ] Revision

* If Revision, select appropriate letter(s):

* Other (Specify):

* 3. Date Received: 12/07/2012

4. Applicant Identifier:

5a. Federal Entity Identifier:

5b. Federal Award Identifier:

State Use Only:

6. Date Received by State:

7. State Application Identifier:

8. APPLICANT INFORMATION:

* a. Legal Name: University of Miami, RSMAS

* b. Employer/Taxpayer Identification Number (EIN/TIN): 590624458

* c. Organizational DUNS: 1527640070000

d. Address:

* Street1: 4600 Rickenbacker Causeway
Street2:
* City: Miami
County/Parish:
* State: FL: Florida
Province:
* Country: USA: UNITED STATES
* Zip / Postal Code: 331491031

e. Organizational Unit:

Department Name:

Division Name:

f. Name and contact information of person to be contacted on matters involving this application:

Prefix:
* First Name: Bonnie
Middle Name:
* Last Name: Townsend
Suffix:

Title: Team Manager

Organizational Affiliation:

* Telephone Number: 3054214084
Fax Number: 3054214876

* Email: btownsend@rsmas.miami.edu

Application for Federal Assistance SF-424

*** 9. Type of Applicant 1: Select Applicant Type:**

O: Private Institution of Higher Education

Type of Applicant 2: Select Applicant Type:

Type of Applicant 3: Select Applicant Type:

* Other (specify):

*** 10. Name of Federal Agency:**

Department of Commerce

11. Catalog of Federal Domestic Assistance Number:

11.459

CFDA Title:

Weather and Air Quality Research

*** 12. Funding Opportunity Number:**

NOAA-OAR-OWAQ-2013-2003469

* Title:

FY 2013 Joint Hurricane Testbed

13. Competition Identification Number:

2297052

Title:

14. Areas Affected by Project (Cities, Counties, States, etc.):

Add Attachment | Delete Attachment | View Attachment

*** 15. Descriptive Title of Applicant's Project:**

Real-Time In-Situ TC Observations from Targeted Ocean Drifter Deployments

Attach supporting documents as specified in agency instructions.

Add Attachments | Delete Attachments | View Attachments

Application for Federal Assistance SF-424

16. Congressional Districts Of:

* a. Applicant: FL-018 | b. Program/Project: FL-018

Attach an additional list of Program/Project Congressional Districts if needed.

Add Attachment | Delete Attachment | View Attachment

17. Proposed Project:

* a. Start Date: 08/01/2013 | * b. End Date: 07/31/2015

18. Estimated Funding ($):

* a. Federal	18,635.00
* b. Applicant	0.00
* c. State	0.00
* d. Local	0.00
* e. Other	0.00
* f. Program Income	0.00
* g. TOTAL	18,635.00

*** 19. Is Application Subject to Review By State Under Executive Order 12372 Process?**

☐ a. This application was made available to the State under the Executive Order 12372 Process for review on .

☐ b. Program is subject to E.O. 12372 but has not been selected by the State for review.

☒ c. Program is not covered by E.O. 12372.

*** 20. Is the Applicant Delinquent On Any Federal Debt? (If "Yes," provide explanation in attachment.)**

☐ Yes ☒ No

If "Yes", provide explanation and attach

Add Attachment | Delete Attachment | View Attachment

21. *By signing this application, I certify (1) to the statements contained in the list of certifications and (2) that the statements herein are true, complete and accurate to the best of my knowledge. I also provide the required assurances** and agree to comply with any resulting terms if I accept an award. I am aware that any false, fictitious, or fraudulent statements or claims may subject me to criminal, civil, or administrative penalties. (U.S. Code, Title 218, Section 1001)**

☒ ** I AGREE

** The list of certifications and assurances, or an internet site where you may obtain this list, is contained in the announcement or agency specific instructions.

Authorized Representative:

Prefix: | * First Name: Bonnie

Middle Name:

* Last Name: Townsend

Suffix:

* Title: Team Manager, Research Administration

* Telephone Number: 3054214084 | Fax Number: 3054214876

* Email: btownsend@rsmas.miami.edu

* Signature of Authorized Representative: Bonnie Townsend | * Date Signed: 12/07/2012

BUDGET INFORMATION - Non-Construction Programs

OMB Number: 4040-0006
Expiration Date: 06/30/2014

SECTION A - BUDGET SUMMARY

Grant Program Function or Activity (a)	Catalog of Federal Domestic Assistance Number (b)	Estimated Unobligated Funds		New or Revised Budget		
		Federal (c)	Non-Federal (d)	Federal (e)	Non-Federal (f)	Total (g)
1. NOAA-OAR-OWAQ-2013-2003469	11.459	$	$	$ 18,635.00	$	$ 18,635.00
2.						
3.						
4.						
5. Totals		$	$	$ 18,635.00	$	$ 18,635.00

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Prescribed by OMB (Circular A -102) Page 1

SECTION B - BUDGET CATEGORIES

6. Object Class Categories	GRANT PROGRAM, FUNCTION OR ACTIVITY (1) NOAA-OAR-OWAQ-2013-2003469	(2) N/A	(3)	(4)	Total (5)
a. Personnel	$ 3,582.00	$ 3,761.00	$	$	$ 7,343.00
b. Fringe Benefits	781.00	820.00			1,601.00
c. Travel	1,500.00	1,500.00			3,000.00
d. Equipment	0.00	0.00			
e. Supplies	0.00	0.00			
f. Contractual	0.00	0.00			
g. Construction	0.00	0.00			
h. Other	0.00	0.00			
i. Total Direct Charges (sum of 6a-6h)	5,863.00	6,081.00			$ 11,944.00
j. Indirect Charges	3,225.00	3,466.00			$ 6,691.00
k. TOTALS (sum of 6i and 6j)	$ 9,088.00	$ 9,547.00	$	$	$ 18,635.00
7. Program Income	$	$	$	$	$

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SECTION C - NON-FEDERAL RESOURCES

(a) Grant Program	(b) Applicant	(c) State	(d) Other Sources	(e)TOTALS
8.	$	$	$	$
9.				
10.				
11.				
12. TOTAL (sum of lines 8-11)	$	$	$	$

SECTION D - FORECASTED CASH NEEDS

	Total for 1st Year	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter
13. Federal	$ 9,088.00	$ 2,272.00	$ 2,272.00	$ 2,272.00	$ 2,272.00
14. Non-Federal	$				
15. TOTAL (sum of lines 13 and 14)	$ 9,088.00	$ 2,272.00	$ 2,272.00	$ 2,272.00	$ 2,272.00

SECTION E - BUDGET ESTIMATES OF FEDERAL FUNDS NEEDED FOR BALANCE OF THE PROJECT

(a) Grant Program	FUTURE FUNDING PERIODS (YEARS) (b)First	(c) Second	(d) Third	(e) Fourth
16. Year two	$ 9,547.00	$	$	$
17.				
18.				
19.				
20. TOTAL (sum of lines 16 - 19)	$ 9,547.00	$	$	$

SECTION F - OTHER BUDGET INFORMATION

21. Direct Charges: $11,944

22. Indirect Charges: $6,691

23. Remarks: The Rate Agreement for UM is predetermined at 55% MTDC for 6/1/13-5/31/14 and 57% MTDC for 6/1/14-5/31/15.

OMB Number: 4040-0007
Expiration Date: 06/30/2014

ASSURANCES - NON-CONSTRUCTION PROGRAMS

PLEASE DO NOT RETURN YOUR COMPLETED FORM TO THE OFFICE OF MANAGEMENT AND BUDGET. SEND IT TO THE ADDRESS PROVIDED BY THE SPONSORING AGENCY.

NOTE: Certain of these assurances may not be applicable to your project or program. If you have questions, please contact the awarding agency. Further, certain Federal awarding agencies may require applicants to certify to additional assurances. If such is the case, you will be notified.

As the duly authorized representative of the applicant, I certify that the applicant:

1. Has the legal authority to apply for Federal assistance and the institutional, managerial and financial capability (including funds sufficient to pay the non-Federal share of project cost) to ensure proper planning, management and completion of the project described in this application.

2. Will give the awarding agency, the Comptroller General of the United States and, if appropriate, the State, through any authorized representative, access to and the right to examine all records, books, papers, or documents related to the award; and will establish a proper accounting system in accordance with generally accepted accounting standards or agency directives.

3. Will establish safeguards to prohibit employees from using their positions for a purpose that constitutes or presents the appearance of personal or organizational conflict of interest, or personal gain.

4. Will initiate and complete the work within the applicable time frame after receipt of approval of the awarding agency.

5. Will comply with the Intergovernmental Personnel Act of 1970 (42 U.S.C. §§4728-4763) relating to prescribed standards for merit systems for programs funded under one of the 19 statutes or regulations specified in Appendix A of OPM's Standards for a Merit System of Personnel Administration (5 C.F.R. 900, Subpart F).

6. Will comply with all Federal statutes relating to nondiscrimination. These include but are not limited to: (a) Title VI of the Civil Rights Act of 1964 (P.L. 88-352) which prohibits discrimination on the basis of race, color or national origin; (b) Title IX of the Education Amendments of 1972, as amended (20 U.S.C.§§1681-1683, and 1685-1686), which prohibits discrimination on the basis of sex; (c) Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. §794), which prohibits discrimination on the basis of handicaps; (d) the Age Discrimination Act of 1975, as amended (42 U. S.C. §§6101-6107), which prohibits discrimination on the basis of age; (e) the Drug Abuse Office and Treatment Act of 1972 (P.L. 92-255), as amended, relating to nondiscrimination on the basis of drug abuse; (f) the Comprehensive Alcohol Abuse and Alcoholism Prevention, Treatment and Rehabilitation Act of 1970 (P.L. 91-616), as amended, relating to nondiscrimination on the basis of alcohol abuse or alcoholism; (g) §§523 and 527 of the Public Health Service Act of 1912 (42 U.S.C. §§290 dd-3 and 290 ee- 3), as amended, relating to confidentiality of alcohol and drug abuse patient records; (h) Title VIII of the Civil Rights Act of 1968 (42 U.S.C. §§3601 et seq.), as amended, relating to nondiscrimination in the sale, rental or financing of housing; (i) any other nondiscrimination provisions in the specific statute(s) under which application for Federal assistance is being made; and, (j) the requirements of any other nondiscrimination statute(s) which may apply to the application.

7. Will comply, or has already complied, with the requirements of Titles II and III of the Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 (P.L. 91-646) which provide for fair and equitable treatment of persons displaced or whose property is acquired as a result of Federal or federally-assisted programs. These requirements apply to all interests in real property acquired for project purposes regardless of Federal participation in purchases.

8. Will comply, as applicable, with provisions of the Hatch Act (5 U.S.C. §§1501-1508 and 7324-7328) which limit the political activities of employees whose principal employment activities are funded in whole or in part with Federal funds.

9. Will comply, as applicable, with the provisions of the Davis-Bacon Act (40 U.S.C. §§276a to 276a-7), the Copeland Act (40 U.S.C. §276c and 18 U.S.C. §874), and the Contract Work Hours and Safety Standards Act (40 U.S.C. §§327-333), regarding labor standards for federally-assisted construction subagreements.

10. Will comply, if applicable, with flood insurance purchase requirements of Section 102(a) of the Flood Disaster Protection Act of 1973 (P.L. 93-234) which requires recipients in a special flood hazard area to participate in the program and to purchase flood insurance if the total cost of insurable construction and acquisition is $10,000 or more.

11. Will comply with environmental standards which may be prescribed pursuant to the following: (a) institution of environmental quality control measures under the National Environmental Policy Act of 1969 (P.L. 91-190) and Executive Order (EO) 11514; (b) notification of violating facilities pursuant to EO 11738; (c) protection of wetlands pursuant to EO 11990; (d) evaluation of flood hazards in floodplains in accordance with EO 11988; (e) assurance of project consistency with the approved State management program developed under the Coastal Zone Management Act of 1972 (16 U.S.C. §§1451 et seq.); (f) conformity of Federal actions to State (Clean Air) Implementation Plans under Section 176(c) of the Clean Air Act of 1955, as amended (42 U.S.C. §§7401 et seq.); (g) protection of underground sources of drinking water under the Safe Drinking Water Act of 1974, as amended (P.L. 93-523); and, (h) protection of endangered species under the Endangered Species Act of 1973, as amended (P.L. 93-205).

12. Will comply with the Wild and Scenic Rivers Act of 1968 (16 U.S.C. §§1271 et seq.) related to protecting components or potential components of the national wild and scenic rivers system.

13. Will assist the awarding agency in assuring compliance with Section 106 of the National Historic Preservation Act of 1966, as amended (16 U.S.C. §470), EO 11593 (identification and protection of historic properties), and the Archaeological and Historic Preservation Act of 1974 (16 U.S.C. §§469a-1 et seq.).

14. Will comply with P.L. 93-348 regarding the protection of human subjects involved in research, development, and related activities supported by this award of assistance.

15. Will comply with the Laboratory Animal Welfare Act of 1966 (P.L. 89-544, as amended, 7 U.S.C. §§2131 et seq.) pertaining to the care, handling, and treatment of warm blooded animals held for research, teaching, or other activities supported by this award of assistance.

16. Will comply with the Lead-Based Paint Poisoning Prevention Act (42 U.S.C. §§4801 et seq.) which prohibits the use of lead-based paint in construction or rehabilitation of residence structures.

17. Will cause to be performed the required financial and compliance audits in accordance with the Single Audit Act Amendments of 1996 and OMB Circular No. A-133, "Audits of States, Local Governments, and Non-Profit Organizations."

18. Will comply with all applicable requirements of all other Federal laws, executive orders, regulations, and policies governing this program.

19. Will comply with the requirements of Section 106(g) of the Trafficking Victims Protection Act (TVPA) of 2000, as amended (22 U.S.C. 7104) which prohibits grant award recipients or a sub-recipient from (1) Engaging in severe forms of trafficking in persons during the period of time that the award is in effect (2) Procuring a commercial sex act during the period of time that the award is in effect or (3) Using forced labor in the performance of the award or subawards under the award.

* SIGNATURE OF AUTHORIZED CERTIFYING OFFICIAL	* TITLE
Bonnie Townsend	Team Manager, Research Administration
* APPLICANT ORGANIZATION	* DATE SUBMITTED
University of Miami, RSMAS	12/07/2012

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FORM **CD-511**
(REV 1-05)

U.S. DEPARTMENT OF COMMERCE

CERTIFICATION REGARDING LOBBYING

Applicants should also review the instructions for certification included in the regulations before completing this form. Signature on this form provides for compliance with certification requirements under 15 CFR Part 28, 'New Restrictions on Lobbying.' The certifications shall be treated as a material representation of fact upon which reliance will be placed when the Department of Commerce determines to award the covered transaction, grant, or cooperative agreement.

LOBBYING

As required by Section 1352, Title 31 of the U.S. Code, and implemented at 15 CFR Part 28, for persons entering into a grant, cooperative agreement or contract over $100,000 or a loan or loan guarantee over $150,000 as defined at 15 CFR Part 28, Sections 28.105 and 28.110, the applicant certifies that to the best of his or her knowledge and belief, that:

(1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.

(2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, 'Disclosure Form to Report Lobbying.' in accordance with its instructions.

(3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure occurring on or before October 23, 1996, and of not less than $11,000 and not more than $110,000 for each such failure occurring after October 23, 1996.

Statement for Loan Guarantees and Loan Insurance

The undersigned states, to the best of his or her knowledge and belief, that:

In any funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this commitment providing for the United States to insure or guarantee a loan, the undersigned shall complete and submit Standard Form-LLL, 'Disclosure Form to Report Lobbying,' in accordance with its instructions.

Submission of this statement is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required statement shall be subject to a civil penalty of not less than $10,000 and not more than $100,000 for each such failure occurring on or before October 23, 1996, and of not less than $11,000 and not more than $110,000 for each such failure occurring after October 23, 1996.

As the duly authorized representative of the applicant, I hereby certify that the applicant will comply with the above applicable certification.

* NAME OF APPLICANT

University of Miami, RSMAS

* AWARD NUMBER

NA

* PROJECT NAME

Prefix:

* First Name: Bonnie

Middle Name:

* Last Name: Townsend

Suffix:

* Title: Team Manager, Research Administration

* SIGNATURE: Bonnie Townsend

* DATE: 12/07/2012