

## Report for the year 2020 and future activities

### SOLAS 'Mexico'

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*This report has two parts:*

- **Part 1:** reporting of activities in the period of January 2020 - Jan/Feb 2021
- **Part 2:** reporting on planned activities for 2021 and 2022.

*The information provided will be used for reporting, fundraising, networking, strategic development and updating of the live web-based implementation plan. As much as possible, please indicate the specific SOLAS 2015-2025 Science Plan Themes addressed by each activity or specify an overlap between Themes or Cross-Cutting Themes.*

- 1 Greenhouse gases and the oceans;
  - 2 Air-sea interfaces and fluxes of mass and energy;
  - 3 Atmospheric deposition and ocean biogeochemistry;
  - 4 Interconnections between aerosols, clouds, and marine ecosystems;
  - 5 Ocean biogeochemical control on atmospheric chemistry;
- Integrated studies of high sensitivity systems;  
Environmental impacts of geoengineering;  
Science and society.

**IMPORTANT:** *This report should reflect the efforts of the SOLAS community in the entire country you are representing (all universities, institutes, lab, units, groups, cities).*

**First things first...Please tell us what the IPO may do to help you in your current and future SOLAS activities. ?**

### **PART 1 - Activities from January 2020 to Jan/Feb 2021**

#### **1. Scientific highlight**

The Gulf of Mexico Environmental Baseline Atlas is a geographical representation of the physical, chemical, biological and ecological characteristics of the ecosystem that is mainly focused on the Exclusive Economic Zone of Mexico. This region is of strategic importance since it supplies natural resources, harbors high biodiversity, sustains tourism, and provides ecosystem services, which are closely linked to social well-being and the national economy. After five year the results from the

project was able to produce useful information for Mexico written in eleven volumes (<https://atlasigom.cicese.mx/#tomos>)

The volumes content is derived from the research effort carried out between 2015-2020 by specialists from different disciplines that make up the Gulf of Mexico Research Consortium (CIGoM). It is made up of eleven volumes that show the prevailing conditions of climate, circulation and waves, as well as hydrographic, bio-geochemical, biological and ecological patterns.

Due to its size, it represents so far the most extensive oceanographic characterization of the country and is an indispensable tool for planning and decision-making.



**2. Activities/main accomplishments in 2020 (e.g., projects; field campaigns; workshops and conferences; model and data intercomparisons; capacity building; international collaborations; contributions to int. assessments such as IPCC; collaborations with social sciences, humanities, medicine, economics and/or arts; interactions with policy makers, companies, and/or journalists and media).**

A Mexican oceanographic observation network of physical, geochemical and ecological processes in the Gulf of Mexico started in March of 2015 and will finished in 2020. The project was approved by the CONACYT (Consejo nacional de Ciencia y Tecnología)-SENER (Secretaría de Energía)-Hidrocarbons Fund to a consortium led by CICESE (Centro de Investigación Científica y De Educación Superior de Ensenada) and participating institutions CINVESTAV -IPN (Centro de Investigación y de estudios Avanzados del Instituto Politécnico nacional) Mérida, CIDESI (centro de ingeniería y Desarrollo Industrial), UABC (Universidad Autónoma de Baja California), several research Institutes from UNAM (Universidad Nacional Autónoma de México, ICMYL (Instituto de Ciencias del Mar y Limnología), CCA (Coordinación de Cooperación Académica), IBT (Instituto de Biotecnología), INECC (Instituto nacional de Ecología y Cambio Climático)-SEMARNAT (Secretaría del Medio Ambiente y Recursos naturales) and Baja Innova, SAPI de CV (Sociedades Anónimas Promotoras de Inversión). In addition, international institution was also involved as, Scripps Institution of Oceanography, Woods Hole Oceanographic Institution, UC Santa Barbara, RSMUS-UoF (Rosentiel School of Marine and

Atmospheric Science), Texas A&M (USA), LOCEAN (Laboratoire d'Etudes en Géophysique et Océanographie Spatiale), UPMC (University Pierre and Marie Curie)-Paris and LEGOS (Laboratoire d'Etudes en Géophysique et Océanographie Spatiale), from France and GEOMAR from Germany. This interdisciplinary project proposes for five years the creation of a comprehensive system of oceanographic observations and numerical models to generate scenarios of potential impacts of large oil spills. The project objectives are to strengthen the scientific, technological infrastructure and human capacity of the Mexican oceanographic community to address the challenges associated with the exploitation of hydrocarbons in the Gulf of Mexico, using an interdisciplinary approach and implementing cutting edge technologies.

### **3. Top 5 publications in 2020 (only PUBLISHED articles) and if any, weblinks to models, datasets, products, etc.**

Cai, W., Xu Y., Feely, R.A. et al. (2020). Controls on surface water carbonate chemistry along North American ocean margins. *Nat Commun* 11, 2691. [Doi.org/10.1038/s41467-020-16530-z](https://doi.org/10.1038/s41467-020-16530-z).

Norzagaray C.O. , J.M. Hernandez-Ayon, R. Castro, L.E. Calderon-Aguilera, T. Martz, J. A. Valdivieso-Ojeda, R. Lara-Lara. (2020). Seasonal controls of the carbon biogeochemistry of a fringing coral reef in the Gulf of California, Mexico. *Continental Shelf Research* 211, 104279.

Delgadillo-Hinojosa, F., Félix-Bermúdez, A., Torres-Delgado, E. V., Durazo, R., - 11/12/2020  
Camacho-Ibar, V., Mejía, A., . . . Linacre, L. (2020). Impacts of the 2014–2015 Warm-Water Anomalies on Nutrients, Chlorophyll- a and Hydrographic Conditions in the Coastal Zone of Northern Baja California. *Journal of Geophysical Research: Oceans*, 125.

Félix-Bermúdez, A., F. Delgadillo-Hinojosa, M. A., E. V. Torres-Delgado, and 09/09/2020  
A. Muñoz-Barbosa (2020), Does Sea Surface Temperature Affect Solubility of Iron in Mineral Dust? The Gulf of California as a Case Study, *Journal of Geophysical Research: Oceans*, 125(9), e2019JC015999, [doi:10.1029/2019jc015999](https://doi.org/10.1029/2019jc015999).

Muñoz-Barbosa, A., F. Delgadillo-Hinojosa, E. V. Torres-Delgado A. Félix- 07/07/2020  
Bermúdez, and R. Castro (2020), Baja Californian dust deposition and atmospheric input of iron to the Gulf of California during the summer, *Marine Chemistry*, 225, 103850, [doi:10.1016/j.marchem.2020.103850](https://doi.org/10.1016/j.marchem.2020.103850).

### **4. Did you engage any stakeholders/societal partners/external research users in order to co-produce knowledge in 2020? If yes, who? How did you engage?**

We offer a workshop about the Ocean with the senators in Mexico City ending 2019. We wrote a document published in 2020. We participate about the topic “The Ocean Acidification in Mexico”.

## **PART 2 - Planned activities for 2021 and 2022**

### **1. Planned major national and international field studies and collaborative laboratory and modelling studies (incl. all information possible, dates, locations, teams, work, etc.).**

Mexican Institution as CICESE, Colegio de La Frontera and The University of Baja California endorse and support a proposal EAST AND GULF COAST OCEAN ACIDIFICATION OBSERVING SUPPORT: GOMECC-4 CRUISE, SHIP OF OPPORTUNITY (SOOP) AND MAPPING EFFORTS submitted to the NOAA/OAR Ocean Acidification Programmed this September to October 18<sup>th</sup> 2021. The proposal addresses a critical need to perform high quality measurements of the 4

inorganic carbon parameters in the Gulf of Mexico, necessary to provide a quality synoptic view of ocean acidification in the region.

This need is well recognized and articulated in several planning efforts at national and international levels including the Gulf of Mexico coastal carbon workshop organized in March 2013 by OCB and NACP.

**2. Events like conferences, workshops, meetings, summer schools, capacity building etc. (incl. all information possible).**

**3. Funded national and international projects/activities underway.**

2021 Seatrec FIND Project Proposed Science Mission

The proposed mission of a frequently profiling ( $\leq 1$  cycle per day) float over a prolonged period (years), sustained by energy harvesting technology, presents a unique opportunity to make scientific discoveries. Most floats profile on the 10-day Argo mission and those that profile more frequently generally carry only physical (and occasionally biooptical) sensors and expend their batteries more rapidly, limiting their science potential. To take advantage of the FIND Project opportunity, we propose to add chemical and bio-optical sensors (costs covered by NOAA) to the NavisSL1 float to study primary production, carbon export, air-sea fluxes of oxygen and carbon dioxide gas, as well as modulation of ocean heat content and physical and biogeochemical transformations driven by ubiquitous mesoscale structures in the Gulf of Mexico (GOM). While some of these processes have been evaluated individually on rapidly profiling floats in other regions, capturing these processes simultaneously and over multiple years will provide new information in a poorly observed region that is characterized by economically important fisheries, extensive physical and biogeochemical gradients, and extreme weather systems. The GOM exhibits a year-round  $>10$  °C temperature gradient within the upper 1000m and is home to one of NOAA's BGC Argo pilot arrays. We propose to deploy the Navis-SL1 float in the southwestern deep basin of the GOM during a fall 2022, Mexican-lead research cruise. This float would complement four NOAA BGC-Apex floats deployed in US GOM waters during 2021. The Navis-SL1 float deployment will be coordinated with Mexican seaglider fleet deployments and the resulting data will be assimilated into ongoing US and Mexico-led regional modelling efforts.

**4. Plans / ideas for future national or international projects, programmes, proposals, etc. (please indicate the funding agencies and potential submission dates).**

Mexico as a part of the NorthAmerica's HuB is also part of the Ocean Acidification Research for Sustainability (OARS) - Providing society with the observational and scientific evidence needed to sustainably identify, monitor, mitigate and adapt to ocean acidification; from local to global scales

OARS will foster the development of the science of ocean acidification including the impacts on marine life and sustainability of marine ecosystems in estuarine-coastal-open ocean environments. The programme will address the SDG target 14.3 'Minimize and address the impacts of Ocean Acidification (OA), including through enhanced scientific cooperation at all levels'. Key components include: 1) enhancing regional collaborative efforts, 2) coordination of capacity building in science, 3) codesign and implement observation and research to address the threat of ocean acidification, and 4) communication and delivery of the outputs to policy makers and communities.

**5. Engagements with other international projects, organisations, programmes, etc.**

**Comments**