AmeriGEOSS: A GEO Initiative - Work Programme 2017-2019 Implementation Plan

Table of contents

Executive Summary

The AmeriGEOSS initiative is a cooperative effort of the sixteen (16) GEO country members in the Americas that enables their benefit from addressing societal needs with a common perspective. The regional response is entrenched in the institutional and technical capabilities of the country members, and in the resources of other GEO initiatives. AmeriGEOSS will focus its activities in the four (4) priority areas (PAs) selected at the 2014 Americas Caucus meeting: Agriculture, Disaster risk reduction, Water, Ecosystems/Biodiversity, and in foundational activities, e.g. GEONETCast and capacity building. Policy mandates from GEO global PA's apply to the AmeriGEOSS regional activities. Although these four (4) areas are of great importance to the region, we recognize that the priorities and needs vary by country. This difference may determine the participation of GEO-member countries in some Working Groups but not in others.

To provide strategic direction for cooperation and to advocate for the local and national interests, AmeriGEOSS members will participate in regional and PA working groups and other collaborations established through High Level cooperation agreements between and among countries in the Americas to provide the connection between the national and regional understanding of the needs, and the possibility for greater support to AmeriGEOSS activities. AmeriGEOSS seeks to increase institutional and personal capacity through cooperation, acquisition and sharing of technology, training, and through the engagement of experts, stakeholders, and decision-makers in the process of decision-making and implementation of sound policies.

AmeriGEOSS provides the regional perspective within the GEO Implementation Plan 2017-2019 by reflecting the local, national, and regional interests for short and long-term planning, development, and implementation of GEO activities in the region. The strategic objectives and relevance of the AmeriGEOSS Initiative to the GEO Strategic Objectives are outlined below. The activities between 2017-2019 will include completion of the regional working group Terms of Reference and initiation of group activities, the establishment of PA working groups, the development and initiation of projects within the PAs, the continuation of activities related to the GEONETCast system, the coordination and development of capacity building activities, and the identification of country-member needs and contributions in the area of their interest.

1. Synopsis of objectives and benefits

The specific goals of the AmeriGEOSS initiative are to 1) address user identified priority coverage gaps, 2) develop actionable tools and services, 3) build capacity in GEO-member

countries by leveraging existing expertise, technology, and efforts in-country and across the region, and 4) apply the knowledge and capabilities of partner members to address gaps and challenges.

AmeriGEOSS will contribute to GEO's strategic objectives (SO) Advocate (SO-1), Engage (SO-2), and Deliver (SO-3) as follows.

SO-1 Advocate - AmeriGEOSS will:

- Promote membership in GEO to non-GEO members countries in the Americas.
- Promote the implementation and strengthening of regional Earth observing systems.
- Promote open community-developed data standards and data sharing. The term "data" refers not only to the observations obtained through in situ or satellite monitoring, but also to information obtained through modeling.
- Promote the integration of data products that bring together in situ and satellite observations in the relevant areas of cooperation.
- Advocate for GEO-Country members in the region to become authorized users of the International Charter of Space and Major Disasters

To meet this objective, AmeriGEOSS will coordinate GEO sessions at other organizations events, continue the GEO-CIEHLYC webinars, conduct capacity building activities organized and coordinated through and with the PA's Working Groups, and develop collaborations that demonstrate the benefit of the use of Earth Observations to decision making.

SO-2 Engage - AmeriGEOSS will:

- Strengthen institutional and personal capacity, through sustained and targeted training in the use of Earth Observation (EO) technologies and information.
- Enable countries to benefit from improved environmental understanding, to better address societal needs in the following areas: Agriculture, Disaster risk reduction, Water, and Ecosystems including Biodiversity monitoring.
- Continue (with the support of the GEO Secretariat) providing the *CIEHLYC monthly webinars in Spanish*. AmeriGEOSS invites scientists and government organizations of all countries in the region to provide instruction in their areas of expertise and related to the AmeriGEOSS priority areas. AmeriGEOSS is the only Regional Initiative with an established non-English recurrent monthly activity since 2014.

To meet this objective, AmeriGEOSS will coordinate capacity building activities through the AmeriGEOSS PA working groups in collaboration with country members and GEO participating organizations.

(**SO-3 Deliver**) - AmeriGEOSS will:

- Leverage technical resources, and scale up existing capabilities throughout the region so that Earth Observations take a leading role in the decision making process.

To accomplish these ambitious strategic goals AmeriGEOSS members and participant organizations will:

- Develop the AmeriGEOSS Platform to connect people to information and EO infrastructure, providing applications and tools for understanding and decision making.
- Develop and assist in the coordination of pilot projects,
- Facilitate interoperability of data resources for reuse at global, regional and/or national scales
- Promote learning and mentoring of water data tools, standards, conventions and best practices for improved environmental understanding at the local level.
- Engage stakeholders to address global and regional challenges.
- Assist in activities that will lead to the strengthening of regional observing GEO networks.
- Use and promote, where appropriate, foundational activities of GEO
- Foster regional cooperation to increase institutional and personal capacity through the acquisition and sharing of technology and training, and engage experts, stakeholders, and decision makers in the process of decision making through cooperation.
- AmeriGEOSS will use high level cooperation agreements between and among countries in the Americas to improve protection, conservation and sustainable management of natural resources and the environment, and increase transparency and public participation in the environmental decision making process.

2. Relationship to previous developments and results

America's-member countries have been working to contribute to the development of GEO in several social benefit areas. The AmeriGEOSS initiative will continue to provide leadership and contributions, building on previous contributions. Previous activities and outcomes by Priority Areas and contributions by countries include:

Agriculture

- Argentina and Brazil led activities in the implementation of the GLAM platform and capacity building activities through the Train of Trainers concept for other countries in the Americas.

Disaster Risk Reduction

- Chile is leading activities in the disaster area under cooperation with the US.

Water

- **GEONETCast** is a foundational activity of AmeriGEOSS with a strong hydro-met user community in the region with systems in the following ten (10) countries: USA, Mexico, Brazil, Costa Rica, El Salvador, Barbados, Puerto Rico, Colombia, Argentina, and Chile. This user community is lead by NOAA and INPE, and coordinate activities with the Satellite Utilization and Products Division of the WMO Space Programme. Current providers of water data are the U.S., Brazil, El Salvador, Argentina, and Costa Rica. In 2014-2015, Colombia led an outreach campaign for the implementation of the GEONETCast system throughout the region. The outcome of this campaign was the implementation of the following systems in Colombia and Chile:
    - IDEAM (National Hydro-met Service of Colombia) - Bogota
    - IDIGER (Instituto Distrital de Gestion Del Riesgo) - Bogota
    - Corporación Autónoma del Magdalena (corMagdalena), Honda Tolima
    - CORPOCHIVOR (corporación Autónoma de Chivor) - Garagoa Boyacá
    - Universidad Nacional - Bogotá
    - Corporación Autónoma Valle del cauca (CVC) - Cali
    - Universidad of La Serena - Chile
- The Centre of Hydrologic and Spatial Information for Latin America and the Caribbean (CIEHLYC), a technical network established in 2011, provides a unique GEO perspective in the areas of outreach and capacity building activities in the region. This group of water and remote sensing experts from governments and academia, have created an international non-profit network that coordinates and develop activities of water-

related projects in Latin America and the Caribbean. The United States, co-directs the network's activities of capacity building and project development with Mexico, Chile, and Argentina. http://www.earthobservations.org/webinar_ch.php

- Under NOAA's IWP: As a significant step forward to transform NOAA's water prediction services, NOAA has implemented a new National Water Model (Version 1.0).. The National Water Model is a NOAA-led interagency, effort that relies on the National Hydrographic Dataset of the USGS and EPA, as well as the National Streamflow Information Program of the USGS. Its development was advanced by the National Center for Atmospheric Research (NCAR), in partnership with CUASHI (Consortium for the Advancement of Hydrologic Sciences, Inc) and the National Science Foundation. Recent activities of IWP in 2015 and 2016 and conducted by the US National Water Center for the implementation of the National Water Model (NWM - WRF-hydro) included:
    - The initial NWM CONUS evaluation has been completed for streamflow. Note that this is an evolving process and further calibrations will be performed.
    - The *Strategic Research Engagement* will continue with the academic community through the Consortium of Universities (CUAHSI) and in collaboration with the National Science Foundation (NSF). The Summer Institute will be hosted at the U.S. NWC in Tuscaloosa, AL, USA.
- **GEO Great Lakes** This project helps fulfill public policy and strategic initiatives in the GL region that advance data exchange. GEO Great Lakes is part of the Global Earth Observation System of Systems (GEOSS). Representatives from Environment Canada, US EPA, USGS and others, work to make bi-national datasets discoverable (easy to find), transparent (easy to understand) and interoperable (easy to use). http://64.9.208.36/geo-greatlakes/content/about-us

Ecosystems/ Biodiversity

- The vision of the Global Marine Biodiversity Observation Network (MBON) is to advance and expand marine biodiversity knowledge to improve our understanding on how marine biodiversity changes through time and support its conservation, sustainability, and better management practices. To accomplish this, the Global MBON connects and supports existing national and regional marine observation programs. The framework is a partnership between these programs and the Global Ocean Observing System (GOOS/IOC-UNESCO), the Ocean Biogeographic Information System (OBIS/IOC-UNESCO), and the Group on Earth Observations Biodiversity Observation Network (GEO BON).

The U.S. has initiated a Marine Biodiversity Observation Network (Marine BON) demonstration project, with stations in Florida (Florida Keys coral reefs), California (Monterey Bay and Santa Barbara Channel), and Alaska (Chukchi Sea, oil exploration areas). These pilots are funded under a partnership of U.S. Federal agencies that include National Aeronautics and Space Administration (NASA), National Oceanic and Atmospheric Administration (NOAA), Bureau of Ocean Energy Management (BOEM) and private industry (Shell Oil). The Smithsonian Institution has also initiated a large international marine biodiversity research program - the Tennenbaum Marine Observatories Network, and is partnering with the U.S. demonstration projects. Marine BON is a contribution by the U.S. to GEO BON. The Latin American branch of the global network Chloro-GIN. http://www.antares.ws is also an important effort in the region. Antares is managed by Mexico (University of Baja California) and the objective of this network of marine monitoring data is to generate high quality in situ data that enables the ability to discern between natural and anthropogenic variability.

- The development of BON in a Box for terrestrial ecosystems was piloted in Latin America by the Alexander von Humboldt Institute of Colombia on behalf of GEO BON, and will continue to develop the BON in a Box initiative together with other American countries and extend its application to marine areas and ecosystem services.

Foundational Activities

- For the past two decades the United States through the Federal Geographic Data Committee (FGDC) has fostered collaboration for the development and advancement of Spatial Data Infrastructure. The FGDC supports national and international Spatial Data Infrastructure (SDI) development and is actively engaged with Group on Earth Observations (GEO) & Global Earth Observations System of Systems (GEOSS) and United Nations Committee of Experts on Global Geospatial Information Management (UN-GGIM). To support the vision of a global system-of-systems for access to all types of geospatial information, the international Group on Earth Observations (GEO) Executive Committee has officially accepted three tasks contributions from the FGDC Secretariat. One of these tasks is the definition of a model web portal/platform system that would provide access to existing distributed national portals and systems: The AmeriGEOSS community has been selected for this activity. This activity will support the development of a pilot/prototype community resource that supports AmeriGEOSS engagement, advocacy and delivery of EO data, information, knowledge and regional services.
- Capacity building activities will continue to leverage ongoing activities by NASA's DEVELOP and ARSET programs. The DEVELOP National Program is a capacity building

effort led by NASA to address environmental and public policy issues through interdisciplinary research projects that apply the lens of Earth observations to community concerns around the globe. These projects build capacity in both participants that work on projects and organizations who partner with the program to better prepare them to address environmental challenges. In support of the AmeriGEOSS initiative, Past projects include the Peru Climate, Mexico Ecological Forecasting and Costa Rica Water projects which partnered with a variety of governmental and non-governmental organizations.

3. Participants/contributors

AmeriGEOSS participants, their role, their country, and their email address with organizational affiliation are listed below.

Ivan DeLoatch (Sponsor, AmeriGEOSS Platform**)** USA. ideloatch@usgs.gov
Eldrich Frazier (Lead, AmeriGEOSS Platform) USA. efrazier@usgs.gov
Paul Seymour (Lead, GNC-A) - USA. paul.seymour@noaa.gov
Diego Souza - (Lead, GNC-A) - Brazil. diego.souza@cptec.inpe.br
Luiz Augusto Machado (Sponsor, GNC-A) - Brazil. luiz.machado@cptec.inpe.br
Brad Doorn - (Co-lead, GEOGLOWS) - USA. bradley.doorn@nasa.gov
Angélica Gutiérrez-Magness - (Co-lead, GEOGLOWS and CIEHLYC) - USA. angelica.gutierrez@noaa.gov
Nathaniel Booth - (Co-lead, GEOGLOWS) - USA. nlbooth@usgs.gov
Norberto Pablo Vidal - (Partner, water data) - Argentina. npvidal@ambiente.gob.ar
Peter Salamon - (Lead, GLOFAS) - JRC/EU. peter.salamon@jrc.ec.europa.eu
Jim Nelson (Partner, GEOGLOWS) - USA. jimn@byu.edu
Cesar Garay - (Partner, GEOGLOWS) - Colombia. cesar.garay@cirmag.org.co
Nancy Searby - (sponsor, DEVELOP, ARSET) - USA. nancy.d.searby@nasa.gov
Ana Prados - (Lead, NASA-ARSET) USA. ana.i.prados@nasa.gov
Lauren Childs - (Lead, NASA-DEVELOP) USA. lauren.m.childs@nasa.gov
Gabrielle Canonico (Lead, MBON Pole to Pole) - USA. gabrielle.canonico@noaa.gov
Ward Appletans (Sponsor, Marine Bon in a Box) - UNESCO. w.appeltans@unesco.org
Maria Cecilia Londono (Lead, Marine BON in a Box) - Colombia. mlondono@humboldt.org.co
Frank Muller Karger (PI, MBON Pole to Pole) - USA carib@usf.edu
Don Sullivan (Lead, Disaster Risk Reduction) - USA. donald.v.sullivan@nasa.gov
Juan Carlos Fallas (Contributor, GNC-A) - Costa Rica. jcfallas@imn.ac.cr
Carlos M. DiBella (Partner, GEOGLAM) - Argentina. carlos.m.dibella@gmail.com

Alyssa K. Whitcraft (Lead, GEOGLAM) - USA. akwhitcraft@geoglam.org
Divino Figueiredo (Partner, GEOGLAM) - Brazil. divino.figueiredo@inmet.gov.br
Heather McNairn (Partner, GEOGLAM) - Canada. heather.mcnairn@agr.gc.ca
Mike Gill (Contributor, GEOBON) - Canada mike.gill@polar.gc.ca
Gail Faveri (Contributor, GEO Great Lakes) – Canada Gail.Faveri@ec.gc.ca

4. Description of activities

AmeriGEOSS initiative activities will include the general geographic scope of North, Central, and South America. Individual activities may be focused in smaller regions and at national or sub-national scales, depending on the need and the activity. Descriptions of activities in each area described briefly below. Additional details can be found in Section 6, Planning.

Coordination

- The Coordination Working Group will provide overall coordination of the AmeriGEOSS initiative, and is described in Section 9 Management and Governance.
- Colombia and Ecuador are launching an outreach campaign during the next two years to promote the participation of non-GEO members in the Americas in GEO. A 2016-Fall Embassies event is being planned by GEO-Ecuador to take place in Geneva.

Agriculture

- GEOGLAM is expanding its Crop Monitor activities to encompass more countries and more crops - including those regionally significant in Latin America - while the associated Rangeland and Pasture Productivity (RAPP) Monitor (which covers the meat production facet of food security) will complete prototyping and reach the implementation stage. Both activities should increase coverage of the food production and security situation in Latin America, engaging national partners along the way. Further, Latin American GEOGLAM - a regional network aiming to engage broader participation in GEOGLAM from Latin American countries, to improve national capacity for agricultural monitoring, and to leverage regional connections toward attaining GEOGLAM's goals - will continue to be developed. This may include additional training workshops and bilateral or multilateral research collaborations. Under GEOGLAM, investments have been made in Mexico, Brazil, and Argentina to strengthen the national capacity to utilize remote sensing-based methodologies.

Disaster Risk Reduction

- GEO has a number of community activities and emerging global initiatives addressing floods, tsunamis, and disaster risk management. For example, Geohazard Supersites

and Natural Laboratories (GSNL) is a global initiative that provides access to spaceborne and in-situ geophysical data of selected sites prone to earthquake, volcano or other hazards to enable research, monitoring, and collaboration between partners and end users. AmeriGEOSS is working to harness these GEO activities and regionalize them to address regional and country-level needs. The disasters working group is defining priorities to be addressed and working with the GEO community activities, emerging global initiatives, and the GSNL initiative to get the priority needs met.

Water

- AmeriGEOSS will be actively engaged with the GEO Global Water Sustainability (GEOGLOWS) initiative focused on water resource management including the full water cycle and the cryosphere, water quality management, water availability, and sustainable management.
- In conjunction with GEONETCast-Americas, AmeriGEOSS will continue to expand hydrology and meteorology users and improve operational systems that provide water data to users.
- The Community of Hydrologic and Spatial Information for Latin America and the Caribbean (CIEHLYC), a technical network established in 2011, will continue to coordinate and develop water-related projects and activities in Latin America and the Caribbean.
- In the United States, the National Oceanic and Atmospheric Administration (NOAA) is transforming their water prediction services with an improved National Water Model, which is now fully operational on the National Weather Service Weather and Climate Operational Supercomputing System... The United States and Canada are collaborating in the Great Lakes to make bi-national datasets discoverable (easy to find), transparent (easy to understand) and interoperable (easy to use).

Ecosystems/ Biodiversity

- The AmeriGEOSS initiative will continue to engage with related GEO global initiatives, including GFOI and GEO BON.
- Mexico is hosting the Marine Biodiversity Network Polo-a-Polo of the Americas Workshop in September 2016. The workshop will focus on the integration of existing monitoring projects on biodiversity in the Americas and on the identification of shared interests for the conservation and management of living resources. This integration will use practical, regional, and global collaboration frameworks.
- Pole-to-Pole - The development of BON in a Box is piloted in Latin America by the Alexander von Humboldt Institute of Colombia.

Foundational Activities

- In 2017 the Applied Remote Sensing Training Program will develop about 10 online courses in the areas of water resources, disasters, health, air quality, and land management that will be available to all.
- In 2017 CIEHLYC will continue to provide monthly webinars and will expand its outreach, and capacity building to include other areas with the nexus to water. These webinars provide the constant presence of GEO in the region, as well as the stage to local scientists to show their research and projects to the regional community as well as the stage to other GEO Initiatives and Programs to be exposed to the region. These webinars CIEHLYC will also conduct "follow-up surveys" (for CIEHLYC-workshops and the AmeriGEOSS week) to gather information on how the knowledge acquired in these workshops are used in the participant's job activities.
- Colombia initiated the documentation of the status of open data policy in each of the GEO-member countries in the Americas In 2016, and is encouraging the GEO-members to submit such information.
- In 2017, AmeriGEOSS participants will explore the development of a blog or other communications approaches describing AmeriGEOSS contributions to make them more visible to the overall community.
- The AmeriGEOSS Coordination Working Group will explore the possibility to create an information channel to share reports, training information for the priority areas. This should be open and accessible to all 4 areas of priority areas.
- AmeriGEOSS Coordination Working Group members will promote the creation of national subgroups in the 4 priority areas. The countries individually need to start the conversation of GEO, including a conversation to set guidelines and to consider asking for 1 administrative and 1 technical contact for each priority areas. This will be discussed at the upcoming Caucus meeting in Russia and beyond.
- AmeriGEOSS week 2016 was a success as logistical and technical resources from multiple agencies, and multiple countries were leveraged to provide capacity building in the region. AmeriGEOSS week 2016 was hosted by GEO-Colombia in collaboration with CIEHLYC. Fifteen organizations joined efforts to provide four (4) courses in the priority areas to almost 200 participants. AmeriGEOSS weeks are planned annually.
- The "community" site on the GeoPlatform for AmeriGEOSS members to collaborate and support AmeriGEOSS efforts will continue to be developed.
- In 2016 The AmeriGEOSS community assisted Uruguay and Guatemala to become authorized users of the International Charter of Space and Major Disasters. In 2017,

AmeriGEOSS will continue to advocate the use of the Disaster Charter data in the region.

5. Involvement of end-users

More efficient approaches are needed in a multilingual region with a wide diversity of capabilities. A process will be developed to facilitate the co-design of new products and to continuously identify, articulate, and refine user needs for products at multiple scales. Users should have access to data and the uncertainties in data and prediction products to assist them in using the information in risk management frameworks. The responsibility for this activity will fall in the PAs Working groups, which will help in the conduct of gap analysis to clarify the adequacy of existing products and services and the need for new services.

One of the initial activities in AmeriGEOSS that takes into consideration this complexity of needs and services is the development of the AmeriGEOSS platform, which is already providing concrete examples of a strong community engagement. Throughout 2016, working sessions have been held between potential users and the platform developers to tailor the platform according to the user needs. One of these recommendations was to establish collaboration with GeoSUR, a regional initiative that seeks to integrate and disseminate spatial data in Latin America and the Caribbean. The portals of both groups are now connected, and users of the AmeriGEOSS platform will be able to access GeoSUR assets and vice-versa. It was also recommended to reach out to Inter-American Institute for Global Change Research (IAI), a scientific organization using science to influence policy decisions in the region. AmeriGEOSS leadership participated in the 2016 - IAI-Scientific Advisory Committee (SAC) meeting held in New York; both groups agreed to explore further collaboration to open IAI data through the AmeriGEOSS platform.
Regarding data registering through the GCI, Chile is one of the few countries providing assets (11,654 assets as of 2016) along with the US and Canada. At the moment, the AmeriGEOSS water Working Group is exploring with Argentina's Ministry of Science and Technology (MINCYT) on registering their water data through the GCI and making it available through the AmeriGEOSS platform.
The Working Group of Ecosystem and Biodiversity has initiated an active outreach for the MBON Pole to Pole workshop to take place in September 2016 in Mexico. Participants from eleven (11) countries will meet to produce a manuscript describing the vision and benefits of the Regional MBON Pole-to-Pole of the Americas and a pathway for implementing this network, and how this links to a global MBON. The meeting also seeks to determine the mechanism to share data throughout the region, with potential collaboration with OBIS (UNESCO-IOC). The

participant countries are: Argentina, Belize, Brazil, Canada, Colombia, Costa Rica, Venezuela, Australia, Ecuador, USA, and Mexico, along with representatives from OBIS (UNESCO-IOC) and GOOS BioEco (UNESCO-IOC)

6. Planning, including specific milestones and deliverables

The years of Implementation for major activities are included below. The planning of AmeriGEOSS activities is subject to approval and budget availability in some cases so this plan will evolve. As of this time, the specific milestones and deliverables are detailed below. Each technical working group will keep its own major milestone schedule and report periodically to the AmeriGEOSS Coordination Working Group. The Coordination Working Group will keep a high-level milestone schedule.

A goal for AmeriGEOSS will be to include a mechanism for monitoring and evaluation. Some activities, e.g. ARSET trainings, already use surveys to collect feedback and adapt trainings.

The schedule of activities below is organized by the priority technical areas of agriculture, disasters, water, and biodiversity and ecosystem sustainability.

Agriculture

- **2017 – 2025: GEOGLAM** will expand its Crop Monitor activities to encompass more countries and more crops - including those regionally significant in Latin America - while the associated Rangeland and Pasture Productivity (RAPP) Monitor (which covers the meat production facet of food security) will complete prototyping and reach the implementation stage. Both activities should increase coverage of the food production and security situation in Latin America, engaging national partners along the way. Further, Latin American GEOGLAM - a regional network aiming to engage broader participation in GEOGLAM from Latin American countries, to improve national capacity for agricultural monitoring, and to leverage regional connections toward attaining GEOGLAM's goals - will continue to be developed. This may include additional training workshops and bilateral or multilateral research collaborations. Under GEOGLAM, investments have been made in Mexico, Brazil, and Argentina to strengthen the national capacity to utilize remote sensing-based methodologies. In 2017 we expect to engage Colombia and Chile with two pilot projects targeting tropical agricultural crops. These efforts will include training workshops, sharing of best practices, and the transfer and installation of various EO-based monitoring systems to national monitoring agencies.

Disasters

- **2016: Disaster Charter/AmeriGEOSS Program Manager's training,** Bogota Colombia July 11-15, 2016.
- **2017**: Establish the disasters working group, and define priorities to be addressed in the region. During AmeriGEOSS week 2016, identify needs and potential working group participants.
- **2017 – 2019:** For floods and landslides, integrate existing and emerging models and monitoring capabilities with GEOSS-compatible interfaces.
- **2017 – 2019:** For earthquakes and tsunamis, expand GNSS algorithms for early warnings in sub-regions where GNSS stations are present and expand the SAR interferometry deformation monitoring capabilities.
- **2017 – 2019:** For volcanoes, integrate SAR, optical, and LIDAR capabilities to provide modeling and monitoring of pre-eruption signs in sub-regions most affected by volcanoes.
- **2017 – 2019:** For other hazards, e.g. algal blooms, oil slicks, coffee rust, and frost, examine interest in subregions, define needed capabilities, and setup prototype systems.
- In 2017, USGEO (Don Sullivan) and GEO-Colombia (Ricardo Quiroga) will provide detailed information on current efforts (Disaster Working Group). Geo-Colombia will also obtain information from the Humboldt Institute.

Water

All activities in the water area are part of the GEOGLOWS initiative. Under the GEOGLOWS framework, we will seek to respond to the challenges posed to EO to advance and achieve meaningful SDGs indicators in the water area.

- **2017:** GEO-Colombia is hosting a National stakeholders meeting in 2017 for the development of National water SDGs indicators.
- **2017:** GEO-Argentina is promoting the registration of in-situ national and regional water data through the AmeriGEOSS platform to the GEOSS Common Infrastructure (GCI).
- **2017**: Develop **Version 2.0 of the Integrated Water Prediction** (IWP) prediction system to meet the needs of the US community for better predictions but also creates opportunities for other nations to develop their capacity. WRF-hydro model will be upgraded to quantify and simulate anthropogenic impacts on the water cycle.

- **2017-2019: IWP in the Great Lakes Region.** The current implementation of the National Hydrologic Model (NHYM), which uses the WRF-Hydro modeling system, is limited in the Great Lakes region to the area within the United States. This limitation is due to the lack of harmonized data that enables the implementation of this community modeling, specifically, the lack of spatial data on hydrologic network topology and geophysical attributes for the Great Lakes region. The Great Lakes Environmental Research Laboratory (GLERL) will lead the development of the geospatial fabric of the hydrological model in collaboration with Environment Canada (EC), and will take the lead in the research of new model capabilities to be implemented in the operational system at the NWC. This collaboration is reflected in the NOAA-Environment Canada (EC) bilateral agreement under the hydrological thematic area.
- **2016:** NOAA/GLERL hosted a **workshop on the development of binational data for hydrological modeling applications across Great Lakes** basin for June 14-16, 2016 in Ann Arbor, Michigan. This effort is intended to support the development and implementation of new state-of-the-art hydrological modeling systems across the entire Great Lakes basin, including both the United States and Canada.
- **2017 – 2019:** With the integration in 2016 of GEO Great Lakes to the GEOGLOWS initiative, and with the transition in the U.S. to new leadership (Co-lead, Dr. Jesse Feyen), we will be leveraging this effort in support of IWP in the Great Lakes region. Leadership of GEO Great Lakes in Canada remains with Dr. Gail Favery.
- **2017-2025: Capacity Building activities in the Water area.** Innovators Program - The NWC is already becoming an R&D hub with the National Water Center Innovators Program, a partnership between NWS and the academic community (Interagency Agreement between NSF and NOAA). This knowledge and lessons learned will be disseminated through capacity building activities (webinars and training workshops) organized by CIEHLYC and in collaboration with hydro-met organizations in the region and CUAHSI members. Existing tools and WMO frameworks are leveraged by this effort.
- **2017-2025: Use of hydrological in-situ data in global forecasts.** This pilot project seeks to use historical discharge data from the Magdalena River in Colombia, made available by CIRMAG, for the calibration of the Copernicus Global Flood Awareness System (GloFAS) by the JRC/EU. The long-term objective of this project is to use data from gauges with near-real-time (NRT) runoff observations, which can be served through an OGC-Sensor Observation Service (SOS) to improve the GloFAS forecasts through bias correction.

Ecosystems/Biodiversity

- **2016-2017: Pole to Pole - MBON in the Americas** will hold the first working group meeting September 26 - 30, 2016, hosted by CONABIO/Mexico, to develop a community of practice and foster collaboration on science and sharing of data, and to explore connections of existing observing programs along the coasts of the Americas. AmeriGEOSS will link existing efforts to form groups of networks, and to provide pathfinder activities to foster regional collaboration. The Pole-to-Pole MBON in the Americas is a first step toward establishing a regional collaborative network that supports groups in the American continents. The primary objective of this workshop is to produce specific proposals that seek funding to build elements of an MBON in the Americas, integrating perspectives from researchers and high-level government officials. The document produced during this meeting should address the topics below. A draft implementation plan will be developed with input of workshop participants prior to the meeting.
    - Outline the societal benefits of an MBON;
    - Explain how MBON will enable national and regional biodiversity assessments and contribute to a global program to inform national commitments such as to the Convention of Biological Diversity (CBD), the UN Sustainable Development Goals, and the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES);
    - Identify mechanisms to sustain a regional network, including specific funding mechanisms;
    - Identify and propose linkages to current observing programs, in a collaborative, practical framework;
    - Identify data and knowledge gaps on marine ecosystems in the region, including technologies that can be used such as different field or remote sensing methods;
    - Propose observational requirements to monitor a minimum number of essential variables that inform about ecosystem state and biodiversity change (possibly agree on one or two variables common to all monitoring programs as a pilot);
    - Define steps to develop and document existing best practices and methodologies used in the region and that can contribute to *BON in a Box*;
    - Identify common needs in capacity building (science, data management, and technical);
    - Identify regional leaders to carry proposals forward and maintain the MBON efforts.

- **2017 – 2019:** Development of the **Marine BON in a Box** by Humboldt and INVEMAR in

Colombia. In-kind contribution from IOC/OBIS (Ward Appletans and Pieter Provoost), as well as the GEO BON Marine Ecosystems Working Group MBON task team members. It is intended to share best practices and serves as a technology transfer and capacity building mechanism. This effort integrates marine and terrestrial resource assessments for an integral ecosystem perspective. A fundamental objective of the tool is to help network decision makers and experts, so that they can co-design solutions to national or regional problems, including addressing goals of international treaties (e.g. Sustainable Development Goals, Convention on Biological Diversity Aichi Targets, and IPBES assessments). Ultimately, BON in a Box will help attain greater harmonization of observation design and data collection, management, analysis and reporting amongst and between nations. Concrete steps for implementation include:

- Identifying country interests and requirements (e.g. resource management and conservation targets).
- Identifying and pursuing historical and existing sampling tools and facilitating access to relevant data.
- Defining contributions to a marine BON in a Box. A basic principle of the Marine BON in a Box will be to select specific essential variables (i.e. essential ocean variables and essential biodiversity variables) and deploy web-based tools that can be used within an intranet or broadly and openly across the internet to collect:
    - Information based on an EOV specification shee
    - Document who is measuring the EOV and where and how
    - Document best practices and standards and provide sampling advice
    - Develop sets of scientific products that are useful for monitoring status and trends and to answer questions

- **2017 – 2019:** This ecosystems activity will engage with GEO initiatives addressing **Sustainable Development Goals** and **Ecosystems Accounting** to explore linkages and address regional needs, including linkages to ongoing activities with UNGGIM-Americas.

Foundational Activities

- **AmeriGEOSS week-2016**, June 7-10, Bogota Colombia. Fifteen (15) global organizations joined efforts to provide 32-hrs/course of capacity building with the following courses:
    - **SAR/Disaster:** 35 students from Ecuador and Colombia. Three (3) instructors from NASA and ESA.
    - **GEOGLAM/Agriculture**: 51 students from Colombia and Chile. Five (5) instructors from Argentina, Brazil, USA, and Canada.

- **GEONETCast -GOES-R**: 46 students from Chile, Mexico, Peru, Colombia, and Ecuador. Five (5) Instructors from Brazil and UA.
- **GEOGLOWS/Water:** 35 students from Colombia, Argentina, and Chile. Two (2) instructors from USA/BYU and NOAA.

- **2016-2017: AmeriGEOSS Platform**. One of the most notable collaborations within the 2016 – 2017 AmeriGEOSS work plan has come through a partnership with the US Federal Geographic Data Committee (FGDC) with the development of the AmeriGEOSS platform which can be described as the gathering point of the regional community. The platform will not only provide access to regional, national, and local data from a variety of sources, but it will connect people to information and EO infrastructure, providing applications and tools for understanding and decision making. This project is aligned with the FGDC 2016 Work plan task: *The GDWG will work with flagships, initiatives and communities to evolve the GEOSS Architecture through pilots and prototypes to enhances the GEOSS Common Infrastructures capabilities.*
    - FGDC will establish a "community" site on the GeoPlatform for AmeriGEOSS members to collaborate and support AmeriGEOSS efforts.
    - Within the "community" site, FGDC will establish a resource that supports keyword, topical and thematic EO data (e.g. Agriculture, Water, Disaster, Biodiversity and Ecosystems etc.), and search and discovery of data, information and knowledge from data providers within the AmeriGEOSS community and GEO.
    - FGDC will test services with various stakeholders in the AmeriGEOSS community.
    - FGDC will develop a pilot/prototype report that summarizes results and makes recommendations to advance GEOSS development.
- **2017-2019: GEONETCast (GNC-A)**. Since 2014, the user community of the GNC-A system has significantly increased and expanded to areas other than meteorology. GEONETCast has been approved for use as an auxiliary data distribution system by the Disaster Charter as the GNC-A system provides fast data delivery/download in case of poor internet. The demand for new products and for a larger carrying capacity is a priority for AmeriGEOSS. Countries like the U.S., Brazil, El Salvador, Argentina, and Costa Rica are product providers and this list will be expanded to other countries and to other priority areas like marine and disaster products. In 2016, the United States expanded the GNC-A bandwidth to 6 megabit per second and is developing tools for monitoring, reporting, and configuration of the system. In addition, it is updating user station implementation and specification guidelines. GEONETCast will seek GEO member or participant organizations investment to increase the transmission capacity in the region. We will

seek also cooperation and funding among the user community for the improvement of the SigmaCast tools used for data management and visualization.

- AmeriGEOSS will promote the integration of data products that bring together in situ and satellite observations in the relevant areas of cooperation. This task is shared among the system users in the Americas. Among the activities for the period 2017 – 2019 are:
    - GEONETCast will expand the number of providers in areas like marine and disaster products.
    - Develop and test a GEONETCast planning tool and a User-friendly interface (including a service desk).
    - Develop a GEONETCast User Guide
    - A test with Costa Rica /collaboration is being planned between the Disaster Charter and GEONETCast WG (
- **2017 – 2019: NASA DEVELOP** will focus three or more **feasibility projects** per year on non-U.S. Latin American countries in the areas of agriculture, water resource management, disaster risk reduction, and ecosystems to build skills in participants and decision-makers and address an identified need. These projects will build on the success of previous work in the region, such as the Peru Climate, Mexico Ecological Forecasting and Costa Rica Water projects which partnered with a variety of governmental and non-governmental organizations. Projects will be driven by decision makers' needs and scoped to fit DEVELOP's rapid 10-week term length. The goal of these projects is to empower the current and next generation of decision makers in the use of Earth observations to enhance decision-making processes. DEVELOP projects will work to focus on needs in AmeriGEOSS countries less emphasized to date.
- **2017 – 2019: The NASA Applied Remote Sensing Training Program** ARSET will develop about 10 online courses in the areas of water resources, disasters, health, air quality, and land management that will be available to all. Training materials are translated into Spanish and it is anticipated that at least one online course will be broadcast live in Spanish.. A pre-requisite for the training will be an on-demand ARSET online training available through the program website. The target audience will be environmental professionals. The training will be 3-5 days in duration and it will be delivered in Spanish or English depending on the audience. Surveys will be used at the completion of every training to assess the value of training to participants, and another survey will be used six months after each training to assess the impact of the training on participant's decision-making activities. Information from both surveys will be used to plan the on-site training for the following year. The trainings will build on recent ARSET activities in

the region conducted in support of AmeriGEOSS.

- The AmeriGEOSS Coordination Working Group will identify a lead and develop a survey prior to AmeriGEOSS 2017 to determine what courses should be provided. Each country should set a plan for capacity building, identifying specific needs.

7. Data management & data policy

The AmeriGEOSS initiative plans to use the datasets already available on the GEO portal, and those being developed by GEO global initiatives and flagships, rather than developing them within the initiative. In cases where AmeriGEOSS does create new datasets, the AmeriGEOSS initiative will strive to advocate that all participants follow GEO's data principles. Nations without needed infrastructure and/or data policies will be provided examples of what is working in other Americas member nations.

8. Risk assessment

The potential risks that may be encountered by the AmeriGEOSS initiative include:

- Lack of commitment and engagement by GEO Country members.
- Lack of appropriate expertise: Engaging leaders in the priority areas and in volunteer activities such as AmeriGEOSS can be a challenge. The managers in charge of these programs will need to support the recruitment and retention of key experts in the programme.
- Long-term sustainability of the initiative: This program will require continuous innovation and stimulation. There is always a challenge to demonstrate value added benefits to ensure that the program continues to attract interest and management support.
- Individualism by participating GEO members: to be successful there must be trust by the participants and equality in terms of the sharing of data and benefits from the projects.

In order to address these risks, the AmeriGEOSS initiative will:

- Bring issues as they arise to the AmeriGEOSS regional working group, and escalate them to the Americas Caucus as needed.
- Use the outcomes of high level cooperation agreements between and among countries

in the Americas to advance the AmeriGEOSS activities in the priority areas.

9. Management and governance

The Americas Caucus, led by the GEO Principals of the country members, provides oversight of the AmeriGEOSS Initiative. The AmeriGEOSS Coordination Working Group (CWG) members will provide leadership and coordination of the AmeriGEOSS initiative. The Coordination Working Group Terms of Reference was developed at AmeriGEOSS Week in June 2016, is being piloted, and will be approved at the November 2016 Caucus meeting.

The purpose of the AmeriGEOSS Coordination Working Group established by the Americas Caucus Principals is to coordinate and build on institutional and technical capabilities of its country Members, and to leverage the resources of other regional and global initiatives, to support the development and implementation of the GEO Strategic Plan 2016 - 2025: Implementing GEOSS, for the benefit of the Americas. Duties include: advising the GEO Principals of the Americas Caucus on the activities of the priority areas; adopting an inclusive approach; identifying and communicating local, national, and regional interests of the AmeriGEOSS Country Members and stakeholders for activity planning; promoting and coordinating regionalization of GEO global and foundational activities; fostering national and regional cooperation; working towards common AmeriGEOSS objectives; recommending indicators of success and monitoring progress towards AmeriGEOSS objectives; and demonstrating the value of EO through its uses, especially in decision-making.

The Terms of Reference outlines the AmeriGEOSS initiative approach to Coordination Working Group leadership though a chair and vice-chair; membership that includes up to two representatives per country; meetings annually in person and monthly by telecon; reporting to the Americas Caucus; and costs incurred being the responsibility of the GEO Member Countries and POs that incur them.

10. Summary of committed resources and annual budget(s)

The investment in this initiative currently includes in-kind contributions from CONAE from Argentina; National Weather Service from Belize; INPE, National Hydrometeorological Services, and ITAMARATY from Brazil; Environment and Climate Change Canada from GEO Canada;

Ministry of Foreign Affairs from GEO Chile; IDEAM, the Humboldt Institute, and CIRMAG from GEO Colombia; CNE and IMN from Costa Rica; MMRREE and FIMCBOR-ESPOL from Ecuador; SERNA from Honduras; INEGI, AEM, and UABC from Mexico; ANAM from Panama; GUYRA from Paraguay; CONIDA and National Agrarian University from Peru; NOAA, NASA, USGS, and FGDC from USGEO; Military Geographic Service from Uruguay; and observer MARN from Guatemala. Additional participants are continuing to join the technical working groups. Representatives of the AmeriGEOSS Coordination Working Group have committed to periodic telecons and meetings with AmeriGEOSS and with their national GEO counterparts, with an estimated value of $10K/year per the 16 members plus one observer, or $170K/year.

In addition to AmeriGEOSS coordination, in-kind commitments have been made from multiple global GEO initiatives, including GEOGLAM, GEOGLOWS, GEO BON, and GEONETCast, to focus on AmeriGEOSS regional engagement. Based on one training or workshop at a minimum and pilot projects, the in-kind contribution from each global initiative is estimated at $30K/year/initiative, of $120K/year.

Specific contributions in the priority thematic areas are also being provided. NOAA will contribute with the National Water Center Laboratory. NOAA and NASA will contribute with activities and the coordination of the GEO BON MBON Pole-to-Pole project. The Humboldt Institute will contribute with the BON in a Box activity. CIRMAG, Colombia and the JRC-EU will contribute through their use of hydrological data for global forecasts. NOAA and the GEO Secretariat will contribute with technical support for CIEHLYC's monthly webinars. NASA will also contribute capacity building projects and trainings through the DEVELOP and the NASA-ARSET Programs. Data products through the GEONETCast-A system will be in-kind contributions from the contributing countries. The USGS will contribute with the pilot project to develop the AmeriGEOSS Platform Community Resource. These activities vary in scope. Estimated in-kind contributions are expected to total $500K/year but will increase as the programme grows.

Based on estimated in-kind contributions for coordination, global initiative contributions, and specific activity contributions, the projected AmeriGEOSS resources total $790K/year.

ANNEXES

ANNEX A - Technical Annex

None

ANNEX B - Acronyms and Abbreviations

ARSET - Applied Remote Sensing Training

BON - Biodiversity Observation Network

BOEM - U.S. Bureau of Ocean Energy Management

CEOS - Committee on Earth Observation Satellites

Chloro-GIN - Chlorophyll Globally Integrated Network

CIEHLYC - Comunidad para la Información Espacial e Hidrográfica para Latinoamérica y el Caribe

CIRMAG - Centro de Investigación Científica del Rio Magdalena - Colombia

CORPOCHIVOR - Corporación Autónoma Regional de Chivor

CUAHSI - Consortium of Universities for the Advancement of Hydrologic Science, Inc.

DEVELOP - Digital Earth Virtual Environment Learning Outreach Project

EC - Environment Canada

EO - Earth Observation

EOV - Essential Ocean Variables

EPA - U.S. Environmental Protection Agency

FGDC - Federal Geographic Data Committee

GDWG - GEOSS Development Working Group

GEO - Group on Earth Observations

GEO BON - Group on Earth Observations Biodiversity Observation Network

GEOGLAM - Group on Earth Observations Global Agricultural Monitoring

GEOGLOWS - GEO Global Water Sustainability

GEOSS - Global Earth Observation System of Systems

GL - Great Lakes

GLAM - Global Agricultural Monitoring
GLOFAS - Global Flood Awareness System
GNC-A - GEONETCast Americas
GLERL - Great Lakes Environmental Research Laboratory
IDEAM - Instituto de Hidrología, Meteorología y Estudios Ambientales de Colombia
IDIGER - Instituto Distrital de Gestión de Riesgos y Cambio Climático de Colombia
IAHS - International Association of Hydrological Sciences
INPE - Instituto Nacional de Pesquisas Espaciais - Brazil
INVEMAR - José Benito Vives de Andréis Instituto de Investigaciones Marinas y Costeras
IOC - Intergovernmental Oceanographic Commission
IPBES - Intergovernmental Platform on Biodiversity and Ecosystem Services
IWP - Integrated Water Prediction
JRC - Joint Research Centre - European Commission
MBON - Marine Biodiversity Observation Network
NASA - U.S. National Aeronautics and Space Administration
NHYM - National Hydrologic Model
NOAA - U.S. National Oceanic and Atmospheric Administration
NRT - Near Real Time
NWS - U.S. National Weather Service
NWC - U.S. National Water Center
OBIS - Ocean Biogeographic Information System
OGC - Open Geospatial Consortium
PAs - Priority Areas
RAPP - Rangeland and Pasture Productivity
SO-# - GEO Strategic Objective
SOS - Sensor Observation Service
UNESCO - United Nations Educational, Scientific and Cultural Organization
USGS - U.S. Geological Survey
WMO - World Meteorological Organization

ANNEX C - List of references

None

ANNEX D - Short CV of Project Leader

The Americas Caucus, led by the GEO Principals of the country members, provides oversight of the AmeriGEOSS Initiative. The AmeriGEOSS Regional Working Group (RWP) members will provide leadership and coordination of the AmeriGEOSS initiative. Angélica Gutiérrez-Magness from NOAA and USGEO serves as the AmeriGEOSS Point of Contact. Her short CV is as follows:

Since 2009 and as part of her responsibilities in NOAA, Dr. Gutiérrez-Magness co-leads and coordinates activities related to the Group on Earth Observations (GEO) for the Americas. Her activities include collaborations and project development among countries and organizations in the region. She leads the working group of the Americas Caucus: "The Centre of Hydrologic and Spatial Information for Latin America and the Caribbean" (CIEHLYC), a technical network established in 2011, that provides a unique GEO perspective in the areas of outreach and capacity building activities in the region. Her career as a mathematical modeler was initiated at the EPA-Chesapeake Bay Program Office where she participated in the Program's activities to address the Bay's water quality impairments. Later on she was a hydrologist for the USGS where she led projects in the area of watershed and water quality modeling. Until 2014, she was a research associate at the CEE University of Maryland – College Park with activities related to the application of remote sensing data to predict nitrogen concentrations in forested areas undergoing natural and man-made deforestation. She is a watershed hydrologist with 20+ years of experience in the fields of hydrological and water quality modeling and uncertainty analyses. At the NOAA/NWC, she manages the international projects of hydrology, including those in the bilateral NOAA-Environment Canada, and others related to the WMO Commission for Hydrology.

She is a member of the U.S delegation for the Joint Commission Meetings (JCM) with countries in the Americas on Science and Technology Cooperation, as well as a member of the NWS/National Water Center (NWC) coordination team. Dr. Gutiérrez-Magness also provides

project planning and coordination support for the development of the Integrated Water Resources Science and Services (IWRSS) modeling and stakeholder interaction projects and is the NOAA lead for the Global Water Sustainability (GEOGLoWS) initiative and the AmeriGEOSS initiative.

ANNEX E - List of Participants

Ivan DeLoatch (Sponsor, Community Resource on the GEO Platform**)** USA. ideloatch@usgs.gov
Paul Seymour (Lead, GNC-A) - USA. paul.seymour@noaa.gov
Diego Souza - (Lead, GNC-A) - Brazil. diego.souza@cptec.inpe.br
Luiz Augusto Machado (Sponsor, GNC-A) - Brazil. luiz.machado@cptec.inpe.br
Brad Doorn - (Co-lead, GEOGLOWS) - USA. bradley.doorn@nasa.gov
Angélica Gutiérrez-Magness - (Co-lead, GEOGLOWS and CIEHLYC) - USA. angelica.gutierrez@noaa.gov
Jerad Bales - (Co-lead, GEOGLOWS) - USA. jdbales@usgs.gov
Peter Salamon - (Lead, GLOFAS) - JRC/EU. peter.salamon@jrc.ec.europa.eu
Jim Nelson (Partner, GEOGLOWS) - USA. jimn@byu.edu
Cesar Garay - (Partner, GEOGLOWS) - Colombia. cesar.garay@cirmag.org.co
Nancy Searby - (sponsor, DEVELOP, ARSET) - USA. nancy.d.searby@nasa.gov
Ana Prados - (Lead, NASA-ARSET) USA. ana.i.prados@nasa.gov
Lauren Childs - (Lead, NASA-DEVELOP) USA. lauren.m.childs@nasa.gov
Ricardo Cabezas Cartes (Co-chair CIEHLYC). Chile rcabezas@userena.cl
Eduardo SantaMaria del Angel (Co-chair CIEHLYC, Lead Antares). Mexico santamaria@uabc.edu.mx
Gabrielle Canonico (Lead, MBON Pole to Pole) - USA. gabrielle.canonico@noaa.gov
Ward Appletans (Sponsor, Marine Bon in a Box) - UNESCO. w.appeltans@unesco.org
Maria Cecilia Londono (Lead, Marine BON in a Box) - Colombia. mlondono@humboldt.org.co
Frank Muller Karger (PI, MBON Pole to Pole) - USA carib@usf.edu
Sergio Cerdeira (Partner, MBON Pole to Pole) - Mexico. scerdeira@conabio.gob.mx
Don Sullivan (Lead, Disaster Risk Reduction) - USA. donald.v.sullivan@nasa.gov
Stu Frye - facilitator for the AmeriGEOSS Disasters component USA. stuart.frye@nasa.gov
Milena Marrugo (Partner, MBON Pole to Pole) – Colombia. milena.marrugo@parquesnacionales.gov.co
Gail Favery (Lead, GEO GL) - Canada. Gail.Faveri@ec.gc.ca

Drew Gronewold (Partner, IWP) - USA. drew.gronewold@noaa.gov
Juan Carlos Fallas (Contributor, GNC-A) - Costa Rica. jcfallas@imn.ac.cr
Jorge Pierini (Co-chair CIEHLYC), Argentina. jpierini@criba.edu.ar
Carlos M. DiBella (Partner, GEOGLAM) - Argentina. carlos.m.dibella@gmail.com
Alyssa K. Withcraft (Lead, GEOGLAM) - USA. akwhitcraft@geoglam.org
Divino Figueiredo (Partner, GEOGLAM) - Brazil. divino.figueiredo@inmet.gov.br
Heather McNairm (Partner, GEOGLAM) - Canada. heather.mcnairn@agr.gc.ca