2020-2022 GEO Work Programme
Implementation Plans for GEO Community Activities

Climate Observation, Simulation and Impacts

(Activity ID: 75)

1. Executive Summary

- ***Full title of the Community Activity***
  Climate Observation, Simulation and Impacts

- ***Short title or acronym (all capital letters, maximum of 20 characters)***
  CLIMATE-OBS

- ***Proposed or existing category (i.e. Community Activity)***
  Community Activity

- ***Overview (summary of section 2 below)***

  Earth-orbiting satellites have enabled scientists to collect many different types of information about our planet and its climate on a global scale. This body of data, collected over many years, reveals the signals of a changing climate.

  This community activity aims to firstly enable the integration of GEOSS and Earth System Grid Federation (ESGF) and other world-wide climate data systems to augment GEOSS's observation data with climate reanalysis data, and Earth system model simulation data to present the past, current, and future climate information. This enhanced climate data access capability in GEO will benefit studies in all the eight SBAs, in particular, Biodiversity and Ecosystem Sustainability, Disaster Resilience, Food security and sustainable agriculture, Public Health Surveillance, Sustainable Urban Development.

  Focusing on the impacts of changing climate, this community activity will further present how water, energy, transportation, wildlife, agriculture, ecosystems, and human health experiencing the effects of a changing climate.

  This community activity is expected to raise public awareness of a changing climate by enabling access to the climate data, and by presenting its impacts. All the eight GEO SBAs is expected to be enriched by consider the short-term and the long-term impacts of a changing climate.

- ***Planned activities (summary of section 4 below)***

  On accessing to the climate data, IPCC WCRP CMIP infrastructure (ESGF), CORDEX, NASA's CREATE, Reanalysis.org, Copernicus C3S will be the major data systems to be considered. In particular, the first step is fulfilling the integration of the GEOSS PLATFORMand ESGF to make climate modal simulation data accessible for GEO users.

  GlobalChangeONE's capabilities will be examined to enable a new collaborative analysis paradigm for reanalyses, observational data and climate simulations in this community activity as well.

  On presenting the impacts of a changing climate, how water, energy, transportation, wildlife, agriculture, ecosystems, and human health are experiencing the effects of a changing climate will be collected, organized, and presented in a dedicated web portal for GEO users to interact with.

- ***Points of Contact (primary contact persons for the Community Activity and their email addresses)***

  Yuqi Bai (Tsinghua University/CNSA/China), yuqibai@mail.tsinghua.edu.cn

  Michel Rixen (WCRP), mrixen@wmo.int

2. Purpose

- ***Rationale (i.e. evidence of need) for the Community Activity.***

  "The Group on Earth Observations (GEO) is an intergovernmental partnership that improves the availability, access and use of Earth observations for a sustainable planet." To fully fulfill this goal, GEOSS must evolve to promote not only the access to observation data, but promote services that might provide greater understanding to all the components that make up the Earth System.

  These understandings must be advanced by climate and weather models that can improve global and regional guidance to the Vulnerability, Impact and Adaptation (VIA) communities of climate change and extreme weather events.

  There is a pressing demand for regional (extreme) weather and seasonal predictions to satisfy both the modelers themselves in the GEO community, and for use by emergency management personnel, policy makers and long-term city, energy, water and agricultural planners.

  Due to a rapidly increasing scale of global climate simulations and the need for not only access but knowledge of the appropriate use of climate information (including reanalyses, observational data and climate simulations), new areas of collaboration using shared infrastructures and on-line services need to evolve within GEOSS.

  By considering the short-term and long-term impacts of a changing climate, activities in all the eight GEO SBAs will certainly benefit from this new endeavor.

- ***Actual and/or planned outputs of the Community Activity (i.e. data sets, open methods, information products or services, or other openly available results intended for external users) and their geographical scope.***

  The primary focus of this activity is a coherent cluster of 2 main themes: 1) climate data access; 2) demonstration of the impacts of a changing climate.

  Climate information (mainly including reanalyses and climate simulations) will be made available for GEOSS users, along with access tools and visualization capabilities.

  A GEO community portal dedicated on climate will present how water, energy, transportation, wildlife, agriculture, ecosystems, and human health are

experiencing the effects of a changing for GEO users to interact with.

- ***Actual and/or intended users of the outputs and the expected types of decisions these outputs are expected to inform.***

  This Task will assist users of all levels of expertise to find and discover climate and weather information to feet their own needs. Since the climate information covered in this Task could consist of hundreds of meteorological variables over the last 3 or more decades (i.e. reanalyses), and the future situation of climate information (i.e. simulation) , this Task will benefit a broad range of SBA areas, including Biodiversity and Ecosystem Sustainability, Disaster Resilience, Food security and sustainable agriculture, Public Health Surveillance, Sustainable Urban Development.

3. Background and Previous Achievements

1) Successfully engaged the WGCM Infrastructure Panel of WCRP, which is responsible for describing infrastructure requirements and defining technical specifications for WCRP Coupled Model Intercomparison Project (CMIP6).

2) Started the dialog between WGCM Infrastructure Panel of WCRP and GEOSS team.

3) Started the registration process for the climate simulation data, especially those are being produced by CMIP6 participants, in the GEOSS yellow page system.

4. Activities (1 page)

- ***Summary of key planned tasks to be undertaken by the Community Activity during the 2020-2022 period.***

1) Leverage the IPCC WCRP CMIP infrastructure for access to climate model outputs under the ESGF international collaboration;

2) Promote the wider development and use of ESGF for climate simulations at all spatial and temporal scales and Earth System domains, including regional downscaling (CORDEX), seasonal and decadal predictions and WCRP core projects model development and intercomparison initiatives;

3) Advance GEO collaborations and linkages to NASA’s CREATE (reanalysis clearinghouse); and Reanalysis.org;

4) Collaborate with the Decadal Forecast Exchange data in that context. Links with contributions from the Copernicus C3S;

5) Leverage GlobalChangeONE to enable a collaborative analysis paradigm for reanalyses, observational data and climate simulations.

6) Collect, organize, and present the impacts of a changing climate on water, energy, transportation, wildlife, agriculture, ecosystems, and human health in a dedicated GEO Climate community portal for GEO users to interact with.

5. Governance

- ***Description of the governance structure for the Community Activity, including the mandates of steering/advisory/management committees, if applicable.***

1) Dr. Yuqi Bai and Michel Rixen are two co-chairs of this community activity.

2) Dr. Bai used to be the task lead for the GEOSS Component and Service Registry (2007-2011), and a member of the GEO Infrastructure Implementation Board (IIB). He is very familiar with the GEOSS architecture.

3) Dr. Bai is now a member of the WGCM Infrastructure Panel of WCRP. Over the last year, he has gradually improved his understanding of the world climate simulation data infrastructure.

4) Michel Rixen is a Senior Scientific Officer of the World Climate Research Programme where he leads the overall coordination of observations, data and modeling efforts.

5) Activities in Michel's portfolio include amongst others the Working Group on Coupled Modeling (WGCM) and its flagship project CMIP (Coupled Model Intercomparison Project), the Working Group on Subseasonal to Interdecadal Prediction (WGSIP), the Working Group on Numerical Experimentation (WGNE), the COordinated Regional climate Downscaling Experiment (CORDEX), and the WCRP Data Advisory Council (WDAC) and WCRP Modeling Advisory Council (WMAC). Promote the wider development and use of ESGF for climate simulations at all spatial and temporal scales and Earth System domains, including regional downscaling (CORDEX), seasonal and decadal predictions and WCRP core projects model development and intercomparison initiatives.

5) In the last two years, these two co-chairs have identified the issues related the climate data access in GEOSS. They have then successfully raised the awareness of these issues in both of the GEO community and WCRP group. The dialog between these two teams has started.

6) These two co-chairs will continually work on the integration of the GEOSS Platform and ESGF, which is a world-wide distributed network for CMIP climate simulation data to ensure a concrete progress of this community activity during 2020 – 2022.

- ***Description of the roles of key leadership positions in the Community Activity.***

1) Dr. Yuqi Bai and Michel Rixen are closely working together in identifying the integration issues, proposing the technical solutions, facilitating the dialog between GEOSS Platform and ESGF, and finally fulfilling the integration these two world-wide data systems.
2) There is still a slight difference between their roles. Dr. Yuqi Bai will more work on technical issues, while Michel Rixen is more on management ones.

6. Data Policy

- ***Policy of the Community Activity regarding data availability, including degree of adherence to the GEOSS Data Sharing Principles and GEOSS Data Management Principles.***

  The reanalysis data and climate simulation data that are expected to be accessed is already publically available. They meet some the GEOSS DataCore criteria. This community activity will increase the degree of adherence to the GEOSS Data Sharing Principles and GEOSS Data Management Principles for these reanalysis data and simulation data. Making them as GEOSS Data-Core will be one of the aims.

- ***Description of how the outputs of the Community Activity, and the methods used to produce them, will be made accessible, including relevant URLs or permanent identifiers.***

  One of the outputs of this community activity will be the access to the reanalysis data and climate simulation data that are independently maintained by ESGF and other international partners. This new capability will be fulfilled by the integration of the GEOSS Platform and these data systems. It will be made accessible to GEOSS users through GEOSS PLATFORM.

Tables

Excel file is attached separately.

Annexes (additional annexes may be added as required)

I. Acronyms and abbreviations

WCRP = World Climate Research Programme

ESGF = Earth System Grid Federation

CMIP = Coupled Model Intercomparison Project

Cordex = Coordinated Regional Climate Downscaling Experiment

II. Brief CV of Project Leader (s)

Dr. Yuqi Bai

Yuqi Bai is an associate professor of Tsinghua University. His research interests include spatiotemporal data model, big data management, Standards and specifications, cyberinfrastructure for remotely sensed data and geographic information. He is leading effort at Tsinghua University to build GlobalChangeONE, a cyberinfrastructure dedicated for global change studies.

He used to be the task lead for the GEOSS Component and Service Registry (2007-2011), a member of the GEOSS IIB.

He is the project Lead for ISO TC/211 19130-3 Project, a member of the CHINA-GEO Science and Technology Advisory Board, a member of the WGCM Infrastructure Panel of WCRP. He is a co-chair of the Access to climate data Community Activity (GEO 2017-2019), and a member of the GEOSS Evolution and Architecture (GEOSS-EVOLVE).

Michel Rixen

Michel Rixen is a Senior Scientific Officer of the World Climate Research Programme where he leads the overall coordination of observations, data and

modeling efforts.

Activities in his portfolio include amongst others the Working Group on Coupled Modeling (WGCM) and its flagship project CMIP (Coupled Model Intercomparison Project), the Working Group on Subseasonal to Interdecadal Prediction (WGSIP), the Working Group on Numerical Experimentation (WGNE), the COordinated Regional climate Downscaling Experiment (CORDEX), and the WCRP Data Advisory Council (WDAC) and WCRP Modeling Advisory Council (WMAC). He also ensures these groups are closely coordinated with partner programmes such as the World Weather Research Programme (WWRP) and the Global Climate Observing System (GCOS).

Before joining the WCRP Secretariat in Geneva in 2011, he worked as a researcher at University of Liège, Belgium from 1995 to 2001 and a EU Marie Curie Post-Doc Fellow at the National Oceanography Centre in Southampton from 2001 to 2003, after which he joined the NATO Undersea Research Centre (NURC) in La Spezia, Italy where he managed the Meteorology and Oceanography Program and led numerous experiments at sea as Scientist in Charge.

Michel Rixen holds a Ph.D. in Physics (Oceanography) from University of Liège, Belgium, and an Executive Master of Business Administration (EMBA) from the International University of Monaco. He holds M.Sc. Degrees in Computer Engineering, Oceanography, Applied Mathematics, Environmental Sciences, and a Professorship accreditation — all from University of Liège, Belgium. He has published five books as a guest editor and more than 65 peer-reviewed papers, and has organized and chaired many international scientific conferences.