

Report to CLIVAR SSG-20

Panel or Working Group: Variability of the American Monsoon Systems (VAMOS)

1. **Contributions to developing CLIVAR science and fit, where appropriate, to the CLIVAR imperatives**
 - a) Development of a Latin American and Caribbean (LA&C) steering committee and scoping workshop plan:
 - Defining research needed to improve climate predictions at regional and local scales.
 - Outline oriented research to address the needs of climate information of specific socio-economic sectors sensitive to climate.
 - The initial steering committee was formed with representation from CLIVAR and GEWEX programs. A first planning meeting was held in Buenos Aires, March 2013. This committee welcomes input and participation from other WCRP programs in the discussion and prioritization of integrative research strategies for the LA&C region
 - b) Extensive work in assessing and promoting improvements in oceanic and atmospheric infrastructure in the Intra-America Seas region through IASCLiP
 - Identify the magnitude of oceanic observing system decay over the last 3 decades.
 - Coordination with collaborators in the Caribbean, NOAA, NSF and Mexico in the design, installation and use of Global Positioning System (GPS) precipitable water sensor networks in the Intra-America seas region and in Mexico.
 - c) Contributed to develop a US CLIVAR Working Group focusing on equatorial SST biases. The US CLIVAR WG "Upper-Ocean Heat Budget Synthesis for the Eastern Equatorial Pacific and Atlantic Oceans" was announced in late February 2012. The WG contains extensive international participation.
 - The group is led by VAMOS Panel Members Paquita Zuidema and Rob. Wood, along with Simon de Szoeke and Roberto Mechoso.
 - The interests of this group couple closely to VAMOS interests in predicting the pan-American monsoon, modeling and predicting SST variability in the pan-American seas, and improving the prediction of droughts and floods.
 - The initial activities focus on building a large set of existing observations and modeling activities to quantify the different processes contributing to the ocean heat budget in the Pacific, with an emphasis on the role of transients. In the Atlantic, the development of an observational-model surface heat budget comparison for all CMIP5-type models.
 - d) Contributed summary findings from North and South American research activities to a 10-year U.S. CLIVAR programmatic review which summarizes the contributions of VAMOS to U.S. CLIVAR process studies such as NAME, MESA, SALLJEX, VOCALS and IASCLiP."
 - e) VAMOS contributions to GDIS through the development of a unified Atlas of Extremes for the Americas: "Characterizing extremes for the recent past over the Americas"
<http://gmao.gsfc.nasa.gov/research/subseasonal/atlas/Extremes.html>

2. Briefly list any specific areas of your panel's activities that you think would contribute to the WCRP Grand Challenges as identified by the JSC at its most recent meeting¹

- a) VAMOS members D. Gochis, R. Arritt and VAMOS ICPO contact C. Ereno have been involved in developing the Tiger Team white paper for "CLIVAR Grand Challenge: Intraseasonal, seasonal and interannual variability and predictability of monsoon systems"
- b) VAMOS member Hugo Berbery and VAMOS ICPO contact C. Ereno have been involved in the planning and kickoff meeting of the WCRP Conference for Latin America and the Caribbean. A report will soon be distributed.
- c) VAMOS member B. Kirtman is involved in developing the Tiger Team white paper for "CLIVAR Grand Challenge: Decadal variability in the climate system and its predictability"
- d) VAMOS panel has provided feedback to the proposal for a Pan-WCRP Monsoon Advisory Panel (PMAP, lead by Ken Sperber and Harry Hendon) developed by AAMP, which includes the coordination and develop of the CLIVAR Research Challenges and the GEWEX Grand Challenges that have monsoon foci in order to effectively support the WCRP Grand Challenges
- e) VAMOS panel member R. Wood, as a member of the US CLIVAR Scientific Steering Committee, is contributing to the US CLIVAR Scientific Strategic Plan. The plan lays out goals and strategies for US CLIVAR for the next fifteen years and its scientific focus is closely aligned with the WCRP grand challenges.
- f) VAMOS panel members R. Wood and P. Zuidema are working with S. de Szoeko and C.R. Mechoso in leading the US CLIVAR WG on synthesis of observations and models for the Eastern Tropical Ocean regions.
- g) VAMOS panel member R. Wood coauthored a WCRP position paper "Aerosol cloud-mediated radiative forcing: highly uncertain and opposite effects from shallow and deep clouds" that addresses one of the WCRP grand challenges.

3. Key new science findings in the context of the new ocean-atmosphere CLIVAR (1-3 suggestions)

- a) Improved understanding of the linkages between Intra-Americas Seas warm pool extent and circulation features in the Caribbean and North America that lead to drought persistence (R. Fu)
- b) Improved climatological understanding of the linkage between vertical wind-shear

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- 1. Provision of skillful future climate information on regional scales (includes decadal and polar predictability)
- 2. Regional sea-level rise
- 3. Cryosphere response to climate change (including ice sheets, water resources, permafrost and carbon)
- 4. Improved understanding of the interactions of clouds, aerosols, precipitation, and radiation and their contributions to climate sensitivity
- 5. Past and future changes in water availability (with connections to water security and hydrological cycle)
- 6. Science underpinning the prediction and attribution of extreme events

and precipitation anomalies in the Caribbean region (A. Douglas and P. Englehart)

c) Initial documentation of some of the cross-hemispheric flow characteristics and precipitation anomalies in the Americas (I. Cavalcanti)

d) Better climatological characterization of the linkage between MJO-related intraseasonal modes and variability in American monsoon precipitation (North and South America) (V. Krishnamurthy, V. Misra, P. Kelly, B. Mapes)

e) Improved understanding of the coastal circulation, atmospheric diurnal cycle and dynamics, and ocean heat budget for the southeast Pacific (papers from VOCALS by Garreaud, Munoz, de Szoeko, Wyant, Rahn, Toniazzo, Mechoso, and others)

f) Improved understanding of the factors controlling the formation of pockets of open cells in stratocumulus decks, precipitation and aerosol-cloud interactions and the quantification of the first aerosol indirect effect (papers from VOCALS by Wood, Kazil, Wang, Bretherton, Feingold, Zuidema, and others)

4. Key science questions that you anticipate your community would want to tackle in the next 5-10 years within the context of the new ocean-atmosphere CLIVAR (1-3 suggestions)

a) How do cross-hemispheric (north-south) teleconnections and circulation structures modulate onset and demise of the American monsoon systems?

b) What are the underlying causes for the persistent sea surface temperature bias structures in coupled ocean-atmosphere models in the tropical Atlantic and how do those biases interact with the seasonal cycles of convection in the Americas?

c) What are the impacts of intraseasonal global modes (MJO) on the seasonal evolution of the American Monsoons?

5. Cooperation with other WCRP projects, other global change bodies (e.g., IGBP) and links to applications

a) CLARIS LPB, also known as Hydroclimate and Society in La Plata Basin, was the main component of the CLIVAR/GEWEX endorsed La Plata Basin Regional Hydroclimate Project (LPB). Its Final Meeting took place in Punta del Este, Uruguay on September 17-21, 2012. The results of the four-year-project were presented to the scientific community and different stakeholders that cooperated during the project.

b) The IAI supported a multi-institution project "The Impact of Land Cover and Land Use Changes on the Hydroclimate of the La Plata Basin (referred as LCLUC-LPB for short)". This project was also a part of LPB and was completed about the same time as CLARIS-LPB.

c) With the completion of CLARIS LPB and the LCLUC-LPB, LPB was also formally ended, although several activities still continue.

d) The VAMOS panel, with full support and engagement of CLIVAR, GEWEX and the JSC, has taken lead in forming the Scientific Steering Committee for WCRP Conference on Climate and Society for Latin America and the Caribbean, planned to be held in Montevideo, Uruguay, 17-21 March 2014. This committee, that represents diverse and relevant science interests for the region, has representatives from JSC, CLIVAR and GEWEX.

- e) The next meetings of the GEWEX Hydroclimatology Panel (GHP) and GEWEX Data and Assessments Panel (GDAP), that will take place in Rio de Janeiro, in early September 2013, has been considered as a preparatory stage for the WCRP LA&C conference.
- f) The VAMOS panel in partnership with WCRP CORDEX has applied to an ICSU proposal for the Project: Regional Climate Downscaling over South America, Central America and the Caribbean: A coordinated effort to pursue Vulnerability, Impacts and Adaptation studies in the region.

This proposal has been supported by a number of international and regional and national organizations:

- ICSU ROLAC: Regional Office for Latin America and the Caribbean,
- Inter American Institute for Global Change Research (IAI), San Jose dos Campos, Brazil,
- Caribbean Community Climate Change Centre (CCCCC), Belize,
- International Center for Theoretical Physics, Earth System Physics (ICTP), Trieste, Italy,
- Oficina Nacional de Meteorologia (ONAMET), Dominican Republic,
- Instituto Geofísico de Peru (IGP), Lima, Peru, and
- Centro de Investigaciones del Mar y la Atmósfera (CIMA), Buenos Aires, Argentina.

The ICSU Secretariat has recently confirmed that the Committee on Scientific Planning and Review (CSPR) has approved the proposal and two workshops are being coordinated by VAMOS and WCRP-CORDEX, more information at item 8.

- g) As reported in section 1, VAMOS contributed to develop a US CLIVAR Working Group focusing on equatorial SST biases. VAMOS membership is contributing to the organization of the next PIRATA/Tropical Atlantic Climate Experiment (TACE) meeting for fall 2013.
- h) VAMOS membership participation in international cloud modeling assessments focused on the southeast Pacific, such as the VOCA large scale model assessment (phase one: Wyant et al., 2011, phase two currently underway); coordination with WMO International Cloud Modeling Workshop on an intercomparison focused on aerosol processing by precipitating marine stratocumulus, based on an observational case from VOCALS; two of the current round of NSF/NOAA funded Climate Process Team projects involve use of data from VOCALS.

6. Activities in the context of scientific capacity building and career support?

- a) Conducted a community workshop that summarized progress in modeling of the American monsoon systems in Petropolis, Brazil (June 2012)
 - Summarized progress on issues outlined in the original VAMOS modeling plan
 - Identified key new priorities for future work to improve coupled models of the American monsoon climate systems (e.g. high resolution ocean modeling, cloud resolving modeling of continental convection,

understanding dynamics of cross-hemispheric transport processes, the role of aerosols from biomass burning in precipitation formation)

- b) Coordinate regional climate change downscaling and climate change impacts investigations through the CORDEX community (detailed activities and specific proposals are discussed in detail below)
- c) Two main capacity building activities has been encouraged by the panel, the support for students and young scientists' participation in workshop and meetings, and expert visits to Central American and Caribbean countries as part of the IASCLiP project.
- d) The VAMOS team organized and supported the CLIVAR VAMOS Workshop on Modeling and Predicting Climate in the Americas, in Petropolis, Brazil, 4-6 June 2012, which was aimed at attracting participation of early-career scientists into climate research and climate-services activities.
- e) VAMOS membership participated in the organization of the COCONet Data and Research Workshop, held in Tulum, Mexico, from September 28-30, 2012. This workshop focused on longer-term operations and maintenance training for GPS stations installed in the Caribbean and discussed the establishment of regional data centers.
- f) A new coordinated effort to pursue Vulnerability, Impacts and Adaptation studies in the region is being developed in partnership with the WCRP, to hold two VAMOS/CORDEX workshop. A first training workshop will be held at the Instituto Geofísico del Peru, in early September, 2013. The second workshop, focused on Central American and the Caribbean, will be hosted by the Oficina Nacional de Meteorología, Dominican Republic, in April 2014.
- g) VAMOS has also addressed some outreach activities through the VAMOS list, and published a Joint Edition of the CLIVAR Exchanges and the VAMOS! Newsletter, No. 59, June 2012.
- h) Cross-cutting AGU fall 2012 Session on Regional Climate in the Eastern Tropical Oceans: What Processes determine Sea Surface Temperature?

7. Activities in the context of knowledge exchange with societal actors?

- a) Most of the questions related to knowledge exchange with societal actors will be addressed during the WCRP Conference on Climate and Society for Latin America and the Caribbean, but will also has been taken into account at the Kick Off meeting of the Scientific Steering Committee of the conference, held in Buenos Aires, 4-5 March 2013.
- b) The CLARIS LPB Project (A Europe-South America Network for Climate Change Assessment and Impact Studies in La Plata Basin) was built around a large consortium open to social sciences, which allowed incorporating additional perspectives into the project, enriching its objectives and approaches. Two subprojects were of particular interest to social actors:
 - An interface for improving prediction capability of climate change societal impacts
 - Land use change, agriculture and socio-economic implications

A number of results on these activities can be found at the special issue on La Plata Basin of CLIVAR-Exchanges No. 57 (http://eprints.soton.ac.uk/204197/1/98857_NOC_Clivar_Exchanges_A4_44pp.HR_FINAL.PDF)

8. New activities being planned, including timeline, request for endorsements, potential for new funding opportunities

- a) The VAMOS panel has developed in partnership with the WCRP, a new effort to hold two VAMOS/CORDEX workshops. A first training workshop focused in South American CORDEX domain will be held at the Instituto Geofísico del Peru, in early September, 2013. The second workshop, focused on Central American and the Caribbean, will be host by the Oficina Nacional de Meteorologia, Dominican Republic, in April 2014.
- b) These workshops will have a shared focus on presentation of regional climate model results and climate modeling capacity building focused on the corresponding regions.
- c) Participation from related disciplines is welcome as the effort seeks promote the use and improvement of regional climate model scenarios for various applications
- d) Working with regional climate scientists and members of the international CORDEX community request for meeting support have been submitted and an ICSU grant of € 30,000 has been recently approved.
- e) Solicitation of modeling output from US and international modeling centers towards an observational assessment of model surface energy budget biases in the tropical Atlantic occurring spring of 2013.
- f) Proposals for International field experiments are currently under development, focused on smoke-cloud interactions in the southeast Atlantic. The target date is September-October, 2016.

9. Workshops / meetings planned

- a) 16th session of the VAMOS panel, Lima, Peru on 9-10September 2013
- b) VAMOS is involved in the planning of the VAMOS/CORDEX Workshop on Latin-America and Caribbean: Regional climate downscaling and impact studies. Phase I- South America, Lima, Peru, on 11-13 September 2013
- c) VAMOS panel is working in the organization of the WCRP conference for Latin America and Caribbean, Learning to live with climate: developing, linking, and applying climate knowledge, Montevideo, Uruguay on 17-21 March, 2014.

10. Issues for the SSG

- a) How does the SSG foresee regional programs transitioning into the currently proposed suite of broader panels without losing regional identity and the community of funders and collaborators who support regionally-targeted programs? (i.e. domestic-level funding sources for regional research projects)

- b) The JSC has asked VAMOS and other members of the science community to organize a Latin American and Caribbean Conference on Climate and Society with the objective of identifying new priorities for a new regional group within the WCRP structure. What are the CLIVAR regional themes that the SSG would want to see included in the context of the new group?

Annex A

Proforma for CLIVAR Panel and Working Group requests for SSG approval for meetings

Requests should be made through D/ICPO (rogbar@noc.ac.uk), against the following headings:

- 1. Panel or Working Group:**
- 2. Title of meeting or workshop:**
- 3. Proposed venue:**
- 4. Proposed dates:**
- 5. Proposed attendees, including likely number:**
- 6. Rationale, motivation and justification, including: relevance to CLIVAR themes & JSC cross cutting topics and any cross-panel/working group links and interactions involved:**
- 7. Specific objectives and key agenda items:**
- 8. Anticipated outcomes (deliverables):**
- 9. Format:**
- 10. Science Organising Committee (if relevant):**
- 11. Local Organising Committee (if relevant):**
- 12. Proposed funding sources and anticipated funding requested from WCRP:**