Provision of skillful and actionable future climate information on regional scales

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(with contributions of W. Baethgen (IRI), G. Podestá (RSMAS), and White paper on WCRP GC: Provision of skillful future climate information on regional )
• It is recognized that adaptation to both current and projected climate variability and change is best undertaken locally and regionally.

• As highlighted in the 2009 World Climate Conference, the provision of skillful and actionable (near and long term) climate information at regional to local scales for use in Impact, Adaptation and Vulnerability (IAV) studies represents one of highest priorities for the climate research community.

• The provision of regional climate information is also intended to constitute the basis for the Global Framework on Climate Services (GFCS) launched by the World Meteorological Organization (WMO).
Providing effective, needs-based climate services requires:

(1) mechanisms that allow for user needs to inform the development and provision of climate services and for promoting the demand for climate services where the needs are insufficiently recognised;

(2) a physical means of communicating climate information;

(3) accurate observations and monitoring of climate and relevant non-climatic variables;

(4) an understanding of the climate system and its impacts and how they can be predicted; and

(5) sufficient capacity in all parts of the process of climate service development, delivery, evaluation and use to ensure that the benefits of climate knowledge are maximised in all countries.

OMM (2011)
Challenge for the WCRP scientific community in the America

- RESEARCH (balance between basic and oriented research)
Some of the scientific frontiers of relevance for the region

• **F1. Intra-seasonal and seasonal predictability and prediction** Identify and understand phenomena that offer some degree of intra-seasonal to inter-annual predictability, skillfully predict these climate fluctuations and trends

• **F2. Decadal variability, predictability and prediction** Identify and understand phenomena that offer some degree of decadal predictability and skillfully predict these climate fluctuations and trends

• **F3. Reliability and value of long term regional climate projections** Provide reliable regional climate projections for the 21\textsuperscript{st} century and beyond for use in IAV studies

• **F4. Interactions across multiplicity of drivers and feedbacks at the regional scale** Provide increased understanding of the interplay across the different drivers, processes and feedbacks which characterize regional climate at different spatial and temporal scales

• **F5. Definition of usefulness: Informing the risk management and decision making space** Provide information that constitutes a solid and targeted basis for decision making concerning risk management and response options in specific sectors and contexts.

*(From White paper on WCRP GC: Provision of skillful future climate information on regional Filippo Giorgi, Fred Semazzi, Carolina Vera, Bruce Hewitson, Ted Shepherd, CLIVAR, SPARC, WMAC, GEWEX, WGSIP)*
Gaps between provision and use of climate information

- Quality of dynamical models & observations
- Accessibility
- Scale – space and time
- Specificity – variable and format
- Communication
- Timeliness

→ Can we increase the value and usability of the information?

L. Goddard (IRI)
The root of the problem

• Lack of fit between:
  – Capabilities of climate science and current products
  – Needs, expectations and existing protocols of decision-makers
What have we learned?

- **Sustained dialog** among producers and users of climate information
  - *Mutual learning*
- Together, learn to **match capabilities and needs** (“expectation management”)

G. Podestá (RSMAS)
Adaptation strategies

Scott et al. (2012)
Adaptation strategies

Scott et al. (2012)
Managing the Risks of Extreme Events and Disasters
In order to have an impact on the development, policy and decision making of socio-economic sectors sensitive to climate, the development and provision of climate information should be:

- Oriented by the demand

- Focused in problems

  Warning: “Research” versus “Consultant work”

- Inter-disciplinary

- Made in the context of chain of experts & chain of information

W. Baethgen (IRI)
Cadenas de Información

Información Climática?

Academia (Ciencia Básica)  ↔ Investigación Aplicada  ↔ Instituciones de “Borde” Traducen Ciencia en Información Implementable  ↔ Implementadores (Trabajo de Campo)

Cuando un eslabón es débil o no existe, la solución no es saltarlo sino Crearlo y / o Fortalecerlo

En la práctica: Muchas Cadenas en Redes

W.E. Baethgen 2010
¿How is the current situation in Argentina

Regional Climate Services

CIMA-DCAO ↔ SMN ↔ Stakeholders

Climate Services in Projects or Programs

Academic sector (inter-disciplinary) ↔ Public Institutions ↔ Stakeholders

Private Institutions
Integration of decadal climate predictions, ecological models and human decision-making models to support climate-resilient agriculture in the Argentine Pampas (P.I. G. Podestá, funded by NSF + Argentina funding agencies)

• Motivation: The Pampas have undergone major land use transitions (from pastures to 100% agriculture) in response to combined effects of rainfall increases and social-economic context.

• There is concern among stakeholders about implications of return to a drier epoch. Will agriculture still be viable?
Objectives

1. “Translate” decadal climate projections into likely outcomes (land use, crop yields and profits) of alternative climate scenarios and viable adaptation actions

2. Foster dialogue between climate scientists and agricultural stakeholders to (i) understand climate information needs, beliefs, values and constraints, and (ii) provide feedback that will inform future climate model development and communication.

Agriculture in the Pampas has expanded and intensified. Most impressive is the huge expansion of soybean. The figure shows soybean planted on the side of a national highway near Carmen de Areco, Buenos Aires.
It takes many actors...

Academic
- University of Miami
- Columbia University (IRI, CRED)
- Univ. of Colorado
- Manhattan College
- Univ. of Buenos Aires

Governmental
- Argentine Met Service
- INTA
- Of. de Riesgo Agropecuario
- NCAR

Non-governmental
- AACREA

Private sector
- Insurance sector
- Agricultural commodity exchanges
- Agricultural commodity traders
• In November 2011, we organized a first workshop in Mendoza, Argentina dedicated to the identification of the major causes of climate vulnerability for the society in the Central Southern Andes. The workshop gathered more than 35 stakeholders from governmental, public and private institutions, including insurance companies, wineries, regional cooperatives, etc.

• During the workshop, we joined stakeholders and researchers from different disciplines (climate, hydrology, agriculture, sociology, etc.) to identify the major topics of relevance to build a sustainable climate-proof agenda.

• Three major topics were identified by the stakeholders as key issues for the social and economic sustainable development of the region.
  – T1: Potential and limit to the sustainability of the regional socio-economic system in the context of present and future water availability
  – T2: Vulnerability of the regional socio-economic system in the context of extreme climate events
  – T3: Vulnerability of urban areas to extreme climate events.

• A proposal was submitted to the France ANR “Facing societal & enviromental impacts “ Program
The need of climate information goes beyond CLIVAR or GEWEX agendas
Water resources in central Andes

- The winter snowpack in the Andes between 30° and 37°S is the primary source of surface runoff and water supply in the adjacent lowlands of Chile and Argentina.
- Over 10 million people depend, either directly or indirectly, on this freshwater for:
  - domestic consumption
  - irrigation
  - industries
  - hydroelectric generation

Under dry condition, the melting of the ice stored in the Andean glaciers and permafrost provided streamflows up to 40% of the long-term means!
Challenge for the WCRP scientific community in the America

- RESEARCH
  - balance between basic and oriented research
  - Interdisciplinary (within and beyond WCRP)

- Chain of experts or actors / chain of information

- Ways of access to data (models & observations)

- Capacity building