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Collaborative processes in action: climate services and impact-based forecasts for southern South America



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- The social context poses pressing scientific and democratic challenges around the strategic objective of providing climate services and impact-based forecasts.
- Assurance of the quality of knowledge and the legitimacy of decision-making procedures becomes crucial.
- Academia, government organizations and social agents interact to co-produce relevant and robust knowledge able to support collective action.
- Cognitive and pragmatic difficulties are multiple but must be overcome.

What is there in a name? "climate service"

"the timely production and delivery of useful climate data, information, and knowledge to decision makers" (National Research Council, 2001).

A road to a new paradigm: climate services

2001

 A Report of the US National Academy of Sciences highlighted that "climate is becoming an increasingly important element of the public and private decisionmaking process" and that "the timely production and delivery of useful products through direct and accessible user interface" could limit national risks. New advances in the understanding of the climate system provided the opportunity to perform experimental predictions of seasonal-to-interannual climate patterns, and more reliable climate projections on the decade-to-century timescales.

2009

• At the World Climate Conference the World Meteorological Organization (WMO) a Global Framework for Climate Services (GFCS) was established "to guide the development and application of science-based climate information and services in support of decision-making." The vision expressed at this conference was "to enable society to better manage the risks and opportunities arising from climate variability and change, especially for those who are most vulnerable to such risks."

Five components of the GFCS OMM



Fuente: WMO G.FCS Office

New main targets start to capture scientists' attention

- not just production but "interpretation", assessment, and synthesis of diagnostic and forecast climate information on multiple time scales
- "tailoring," communication, and dissemination of that information
- "translation" of climate information into plausible impacts and outcomes (including ranges of uncertainty or credibility of these estimates) of viable adaptive actions in agricultural production and water management
- exploration of the institutional structures able to support the this new type of co-production, co-exploration of usable, actionable knowledge

Two main senses of the concept of co-production of knowledge and services

- ID articulating talents, perspectives and values needed to produce new types of knowledge.
 Natural and social sciences.
- Intertwined transformations of identities, institutions, languages and discourses that characterize the workings of science and technology within society.

Emerging approach: collaborative research networks (CRN)



- To produce usable/ actionable knowledge,
- To support adaptation decisions,
- To provide straightforward estimates of uncertainty,
- To meet the needs of climatesensitive sectors.



- researchers,
- stakeholders
- outreach specialists
- User-centric research programs

Landmarks: previous international initiatives

1972

- A pioneering event that led to the recognition of the societal importance of environmental issues has been the **United Nations (UN) Conference on the Human Environment** that took place in Stockholm, Sweden.
- Predecessor of **1992- 2012 Rio conferences**, highlighted the importance of global environmental problems, and recognized the role of science and technology, research and education as well global cooperation as essential for protecting the Earth's environment in the future.
 - The United Nations Environment Programme (UNEP) was created and two international research programs were established in the following years: the World Climate Research Programme (WCRP) to assess climate predictability and project the response of the climate system to human activities, and the International Geosphere Biosphere Programme (IGBP) with the objective of investigating the links between the Earth's biological, chemical, and physical processes and their interactions with human systems. Both programs mobilized a large interdisciplinary community of scientists in different parts of the world, and developed an active portfolio that became the intellectual basis for providing authoritative science-based information to policymakers.

1988

• The Intergovernmental Panel for Climate Change (IPCC) was established under the auspices of the WMO and the UNEP as a major attempt to disseminate information on the outcome of climate research and particularly in support of the United Nations Framework Convention on Climate Change. The Panel does not carry its own research, but has produced and published every 6–8 years detailed assessments of the scientific literature that includes quality-checked scientific information of relevance for policymakers. The IPCC process has been directly useful to international negotiators who have been involved in the Conference of Parties (COP) of UNFCCC. Increasingly, IPCC reports have taken a broad and global perspective dealing not only with the physical climate system, but also with issues related to impacts, vulnerability, mitigation, and adaptation.

Time Line of Natural Science and Social Science Interactions in the Development of the Global Change Research Programs



A long path

From

То

- changes in the land use and soil coverage
- vulnerability
- mitigation
- adaptation

- scientific credibility
 - independence
 - inclusion
 - equity

Collaboration in action: sources of this presentation

- 2012-2018 A multi-national project on the provision of climate services in southeastern South America titled "Towards usable climate science - Informing sustainable decisions and provision of climate services to the agriculture and water sectors of southeastern South America" funded by the Inter-American Institute for Global Change Research (IAI), which in turn receives major support from the US NSF.
- 2014-2016 Project "Hydro-climate Services in La Plata River Basin." Funded by the Inter-American Development Bank (IADB). Specific limitations or barriers for the development, implementation, and provision of climate services, from both the supply and demand sides were analyzed.
- 2014-2016. Project "Transferring Climate Knowledge in the science-policy interface for adaptation to drought in Uruguay" funded by the Inter-American Institute for Global Change Research (IAI), US NSF. Maldonado, Uruguay.
- 2018-2019 Component "Collaborative exploration of associations between drought indices and sectoral or environmental impacts for the development of an early warning system and drought mitigation", of the multisectoral and transdisciplinary project "Argentine Adaptation Fund: Increasing Climate Resilience and Improving Sustainable Land Management in the Southwest of the Province of Buenos Aires, Argentina", Research Agreement of the National Meteorological Service and Ministry of Environment and Sustainable Development of Argentina. Funded by World Bank.

I will present two experiencies

- 1. 2012-2018 "Towards usable climate science -Informing sustainable decisions and provision of climate services to the agriculture and water sectors of southeastern South America"
- 2. 2018-2019 "Collaborative exploration of associations between drought indices and sectoral or environmental impacts for the development of an early warning system and drought mitigation",

The provision of climate services in SESA



Regional focus





Strong interaction of our IAI Collaborative Research Network with the Regional Climate Center for southern South America (RCC-SSA) established by the WMO's Regional Association III (South America)

Plausible institutional structure for a WMO Regional Climate Center (RCC)



Before the creation of RCC-SSA

- Limitations or barriers for the development, implementation, and provision of climate services used then to lie on the lack in regular communication and innovative partnerships between scientists and institutions (mainly operational and governmental) of different backgrounds.
- Relationships were rather strong at a bilateral level but there was not yet a broader network.

ID collaborative activities

- Modeling , analyzing available models
- Sharing observations collected by the meteorological stations of each institution and developing information interfaces;
- Creating inter-institutional communication channels to build mutual knowledge and trust, avoid duplication of efforts, and improve public accessibility to enlarged data bases;
- Co-organizing panels, meetings and training seminars;
- Common design and participation in research projects of mutual interest;
- Sharing and exchange of trained personnel; and
- Elaboration of several products, namely diagnostic reports, climate maps and forecasts for public information and special users.

After the creation of RCC-SSA

- Limitations ...started to lie in the recognition of the lack of knowledge about users and their understanding and use of climate products.
- The exploration of channels of regular communication and innovative partnerships including stakeholders became a priority.
- A main target and axis of reflection was to identify and classify "users" and to discuss the roles assigned to them not to repeat old research trends and mistakes.

"True in the models" vs "true in the target systems"

- Huge difficulties of probabilistic/statistical inferences based on multiple models
- Conveying uncertainty estimates depends on the audience and the "moment". Performative aspect of forecasts.
- The message must be unique, simple and clear, suitable to the recipient, timely, and must follow a familiar format.
- Experience and tacit k., conservatism and low controversy inferencies prevail.

Redefined collaborative actions

- Re-elaboration of climate products (improve diagnosis and forecast in different scales)
- Creation of spaces for dialogue and common work to evaluate current products usefulness and co-design new ones.
- Construction of climate information platforms conceived as public goods that should guarantee accessibility and interoperability.
- Recurrent inter-institutional communication channels to develop and deploy early warning systems, think on impacts on farm outcomes, avoid misunderstandings of probabilistic information.
- Enhancing collaboration of S & N scientists within the climate community to help users to expand options and act on climate monitoring and forecasts.

A collaborative turn

- The creation of the RCC-SSA triggered a deliberate dynamics of cooperation, explicitly oriented towards the enhancement of previous bonds and the creation of innovative institutional structures and partnerships.
- A more frequent and systematic thinking about the processes in progress and the commotion of previous identities (personal, institutional and professional) carried the reorientation of concerns to the acknowledgment of a huge gap between what scientists think as their responsibility and what public think scientists' responsibility.

What we have done

- We combined scientific research on climate with research to improve the way in which climate information and knowledge is analyzed, assessed, synthesized, communicated and merged with the needs, procedures and decision protocols of climate-sensitive sectors of society.
- We honored an *strong and early involvement of a wide range of stakeholders* in southeastern South America (SESA), who have worked closely with researchers at universities and mission-oriented agencies, helping to design the agenda and multiplying outreach venues.
- By working closely with countries in the RCC-SSA (Brazil, Argentina, Uruguay, Paraguay, Bolivia and Chile) we ensured that the products developed had a close fit to current regional needs, thus enhancing the likelihood of adoption and use.
- We are an example of collaborative production of knowledge between scientists (social and natural) and stakeholders around the provision of climate services in SESA by the recently launched RCC-SSA

Compilation of regional climate and sectoral (water, agricultural) data sets

- compilation of a regional database of daily climate data for the period 1961-present for about 322 meteorological stations throughout the region
- implementation of quality control protocols for historical climate data
- manual verification of flagged "suspicious" records
- imputation (filling) of missing data values through modern statistical approaches
- calculation of monthly aggregate statistics and "climatic normals"

This data base constitutes a major step for the region, being the first time that countries in SESA have collaborated to produce a consolidated set of climate data, consistently controlled for quality.

Example: Number of weather stations and daily weather records included in the data base of the Regional Climate Center for southern South America

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Towards the implementation of regional drought monitoring and assessment system

- calculation of various drought indicators to monitor conditions over SESA
- development of a consensus "implementation plan" for a regionally-coordinated approach to drought monitoring, warning, and mitigation.

Ultimate goal: To implement a system for monitoring, planning, and responding to drought (now in progress).

Research activities oriented to improving climate forecasts

Example of items relevant for improving climate forecasts, from subseasonal to seasonal time range, and therefore, important for improving the climate services in Southeastern South America:

- Interdecadal variability with regard to its relationships with interannual variability, such as the interference between the Interdecadal Pacific Oscillation (IPO) and ENSO;
- Impact of interdecadal and interannualmodes of variability on daily rainfall characteristics;
- Intraseasonal variability (Madden- Julian Oscillation-MJO) and its impacts, with emphasis on its teleconnections and its influence on extreme events.
- Role of climate variability in different time-scales in producing extreme events in the La Plata Basin.
- Assessment of the skill of models of the Subseasonal to Seasonal (S2S) Project for predicting in a subseasonal time range the MJO and its impacts over South America, as well as extreme events, with focus on populous regions of the Parana-La Plata Basin.
- Assessment of the skill of models of the Subseasonal to Seasonal (S2S) Project for predicting variability of the South American monsoon.

Collaboration: early career scientists

- Soil moisture estimations from coupled and uncoupled land surface models Hydroclimatology of the Mamoré region (Bolivia-Brasil)
- Analysis of the usefulsess of GLDAS derived soil moisture
- Long-term numerical simulation with the MCGA CPTEC and soil moisture assimilation on a global scale
- Generation and use of frost information in Argentina
- Implementation in Paraguay of the BHOA (Balance hidrológicooperativo para el agro) developed by FAUBA

Joint Assessment of Soil Moisture Indicators (JASMIN)

This effort aimed at identifying the strengths and weaknesses of different approaches to assess soil moisture – a central component of the hydrological balance – including in-situ measurements, satellite observations, water balance estimates with different levels of complexity, and land surface model computations.

Argentine Agricultural Agency (INTA); Argentine Space Agency (CONAE); Argentine National Weather Service; Office of Agricultural Risks (Ministry of Agriculture); University of Maryland (UMD); National University of the Littoral (UNL); School of Agriculture (UBA); Institute of Astronomy and Space Physics (IAFE, CONICET/UBA); Center for Research of the Sea and Atmosphere (CIMA, CONICET/UBA); Institute for Plains Hydrology "Dr. Eduardo J. Usunoff" (UNICEN)

Crop yields and index insurance

implementing within-season forecasts of yields of important crops (e.g., soybeans) issued for various locations and times from planting to harvest. www.prorindes.com

helping to develop various climate-related indices that can be used as part of "parametric" crop insurance products.

CRC-SSA: innovative partnerships

- Monitoring the creation of new partnerships among GO and NGO institutions, scientists, and stakeholders
- Documenting the process
- Seasonal consensual forecast meetings,
- Working groups on climate products
- Dialog tables with climate sensitive sectors,
- Regional Foros
- Communication of climate information



2da . Mesa de diálogo entre actores del sector agropecuario y generadores de información meteorológica y climática *Instituto de Clima y Agua - INTA Castelar, 26 de agosto de 2015*

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ÚLTIMAS NOTÍCIAS | 17h27min • PT - PADRE PEDRO BALDISSERA - Padre Pedro defende fim dos salários vitalícios de ex-governado

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Comissão de Proteção Civil promove workshop sobre os efeitos do "El Niño"



Gosto 24 Tweet 1 G+1 0

Santa Catarina está novamente ameaçada pelos efeitos do El Niño. O fenômeno, que já foi confirmado por pesquisadores, deve influenciar o cima pelo menos até o outono de 2016. Para promover a atualização das informações e das questões que envolvem as suas consequências econômicas e sociais para o estado, a Comissão de Proteção Civil em parcena com a UFSC está realizando a partir dem parcena quarta-feriar (10), no auditión o Antrionieta de Barros da Assembleia Legistátiva, o workshop "El Niño 2015: Conhecer para mitigar os esus impactos".

A+ A-

O deputado Patrício Destro (PSB), presidente da comissão,

destacou que o principal objetivo do evento é informar e preparar os catarinenses para tentar diminuir os prejuízos cacaidados em decorrência da influência que o fenômeno execte no clima do estado. "Em 2008, quando ele passou por aquí nós tivemos uma grande catástrofe natural com centenas de mortos. O que a gente quer é tentar se preventir, quer ter tempo para poder se preparar para isso". O deputado defendeu a prevenção como o mecanismo mais eficiente e com menor custo para salvar vidas.

O El Niño é um fenômeno climático caracterizado pela alteração da temperatura no Oceano Pacífico influenciando o clima em diversas regiões do planeta e especialmente no sui da América do Sul. Té uma perturbação atmosférica causada pela liberação de calor latente que se propaga através de ordas la no pacífico equatorial em direções preferenciais", definit a professora e pesquisadora da Universidade Federal do Paraná U/FFR), Alice Marlene Grimm. A professora, natural de Rio do Sul, tomou se uma especialista no assunto depos que sua familia teve a casa destruida pelas enchentes que atingiram o estado em 1983. Ela creditou a morte da própira mãe ao choque de ser retenda às pressas de casa devido a elevação Subita das águas.

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108/2015 08h21 - Atualizado em 20/08/2015 08h21

El Niño deve intensificar período de chuvas durante a primavera em SC

Fenômeno foi o assunto principal de fórum climático em Florianópolis. Chuva deve ficar acima da média, principalmente a partir de outubro.



O El Niño foi o assunto principal de um forum climático, que aconteceu nesta quarta-feira (19) em Florianôpolis e reuniu especialistas do Brasil interio e também do exterior. A ideia foi discutir os efetos e os possiveis impactos que o fenômeno pode causar em Santa Catarina.

"A gente teve um julho extremamente chuvoso, um agosto quente e isso tudo è influência dele. Nos próximos meses vai continuar influenciando", afirma o meteorologista da Central RBS de Meteorologia Leandro Puchataki.



Meteorologia alerta 21/08/2015/ 07h09

El Niño mais forte em 20 anos chega trazendo chuvas e risco de enchente em Santa Catarina

Reunidos em congresso em Florianópolis, especialistas alertaram para efeitos do fenômeno a partir de novembro



Thiago Santaella thiago santaella@diario.com.b

Pela primeira vez em quase 20 anos, **Santa Catarina** volta a ter seu clima afetado por **El Niño** de forte intensidade. Outras ocorrências haviam sido registradas, mas todas fracas ou moderadas. E as previsões climáticas apontam para um novembro com mais efeitos provocados pelo fenômeno, com chuvas de maior intensidade e a possibilidade de enchentes.

SC aguarda dois novos radares meteorológicos Oeste de SC deve ser a mais afetada pelas chuvas Iniciativas de prevenção de desastres ficam para 2016

— Santa Catarina registra uma média de 6,3 eventos extremos por mês na média dos anos con El Niño- explica a meteorologista Alice Marlene Grimm, especialista no assunto e palestrante em um workshop promovido em parceria entre a Universidade Federal de Santa Catarina (UFSC) e a Assembleia Legislativa do Estado (Marco) na unarta equitación desta comuna

Media coverage

Alice Grimm participated in:

The Workshop "El Niño 2015: conhecer para mitigaros seus impactos" (El Niño: to know to mitigate its impacts), sponsored by the Legislative Assembly of the State of Santa Catarina, Brazil (Assembleia Legislativa do Estado de Santa Catarina- ALESC). See news in: http://agenciaal.alesc.sc.gov.br/index.php/noticia_single/comissaeo-de-protecaeo-civil-promove-workshop-sobre-os-efeitos-do-el-nino

http://diariocatarinense.clicrbs.com.br/sc/geral/noticia/2015/08/el-nino-mais-forte-em-20-anos-chega-trazendo-chuvase-risco-de-enchente-em-santa-catarina-4829711.html

• And TV news and interview in:

http://g1.globo.com/sc/santa-catarina/noticia/2015/08/el-nino-deve-intensificar-periodo-de-chuvas-durante-primaveraem-sc.html



Members of de IAI-CRN 3035

Impact-based forecast. A pilot project



Gap between

- forecasts and warnings of hydro-meteorological events and
- an understanding of their potential impacts

(although many severe events have been well forecast, with accurate warning information disseminated in a timely fashion by the responsible NMHS).

Improving the understanding of the potential impacts of severe hydrometeorological events poses a challenge to NMHSs and their partner agencies, particularly disaster reduction and civil protection agencies (DRCPAs).

Red de instituciones SIAT SOBA



Drought impact

"an observable loss or change that occurred at a specific place and time because of drought".

An issue that has been relatively neglected not only in South America but throughout the world is the linkage of drought indicators with impacts

Cuadro 1.Ejemplos de impactos



Relationship among the key elements of an impact forecast system



Source: WMO (2015). Guidelines on Multi-hazard Impact-based Forecast and Warning Services.

Risk matrix



Source: WMO (2015). Guidelines on Multi-hazard Impact-based Forecast and Warning Services.

Present and near future collaboration

- 2017 7-11 August Workshop towards the design of a South American Drought Implementation System (DIS) to provide affected actors with information and tools to (i) monitor and predict drought onset, evolution, and recovery, (ii) assess its diverse region- and sector-specific impacts, and (iii) help prepare for, respond to, and mitigate the risks of this phenomenon. Buenos Aires, Argentina. Organizers NOAA (EEUU) y WMO (UN), more than 80 participants representative of the NMHS of South America and México, multilateral and international organizations, and sectoral stakeholders.
- 2019-2021 SISSA (Sistema de Información sobre Sequías para SudAmérica) SADIS (South American Drought Information System) Funded by the Inter-American Development Bank (IADB) and EUROCLIMA.

The main DIS functions include

- (i) drought observation and monitoring through in situ, satellite-based and model data,
- (ii) predictions, projections and forecasting of drought,
- (iii) interdisciplinary research on the links between drought characteristics and its likely impacts on different sectors and regions,
- (iv) compilation, production and synthesis of information to support drought planning, preparedness, mitigation and response,
- (v) outreach to enhance awareness and knowledge about drought, and
- (vi) the implementation of a drought portal or repository where relevant

Climate value chain



