

Urban and coastal environments...in South America

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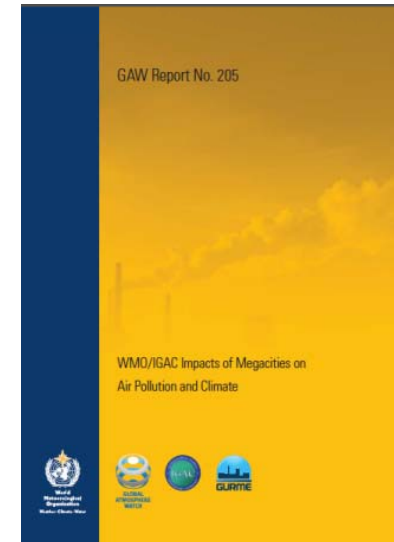


Funding Agency



Outline

- M-cities: not enough 10 M inhab! (South America)
- Impacts of coastal m-cities
 - Physical: circulation, water and aerosols
 - Chemical: air quality and biogeochemistry
- Summary and invitations



Megacities and Large Urban Agglomerations in the Coastal Zone: Interactions Between Atmosphere, Land, and Marine Ecosystems

Roland von Glasow, Tim D. Jickells, Alexander Baklanov, Gregory R. Carmichael, Tom M. Church, Laura Gallardo, Claire Hughes, et al.

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Number 1

AMBIO
A JOURNAL OF THE HUMAN ENVIRONMENT
KUNGL. VETENSKAPSKA AKADEMIE

What is a M-city?

Traditional view: > 10 M inhab

- Buenos Aires is, has been and will be a M-city 😊
- Not so Santiago ☹



~13 M inhab

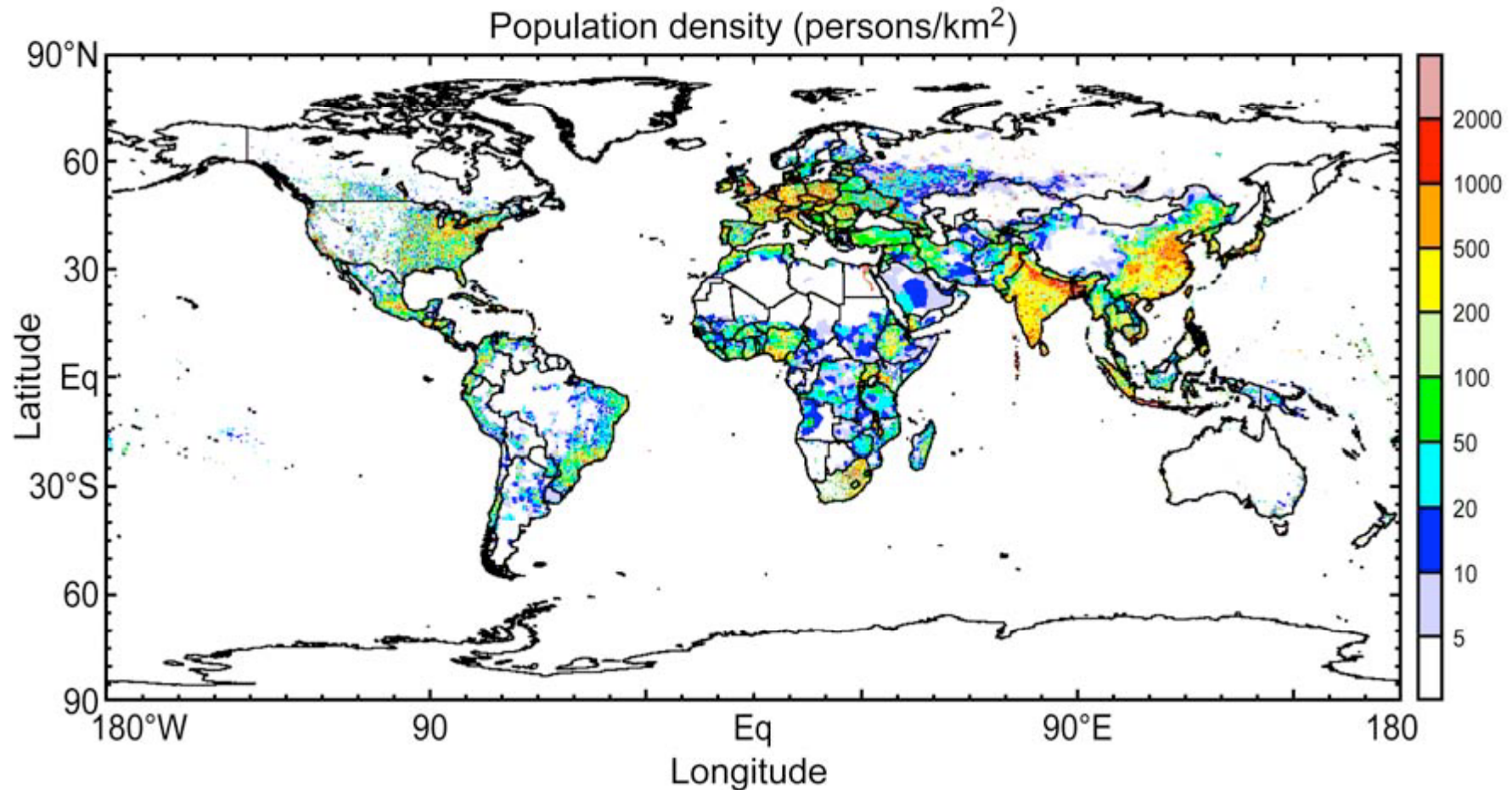
Process/Impact oriented view

- Santiago and Buenos Aires are m-cities 😊



~6. M inhab

If not population...population density?



IGAC/GAW book 2012, ~2010 data

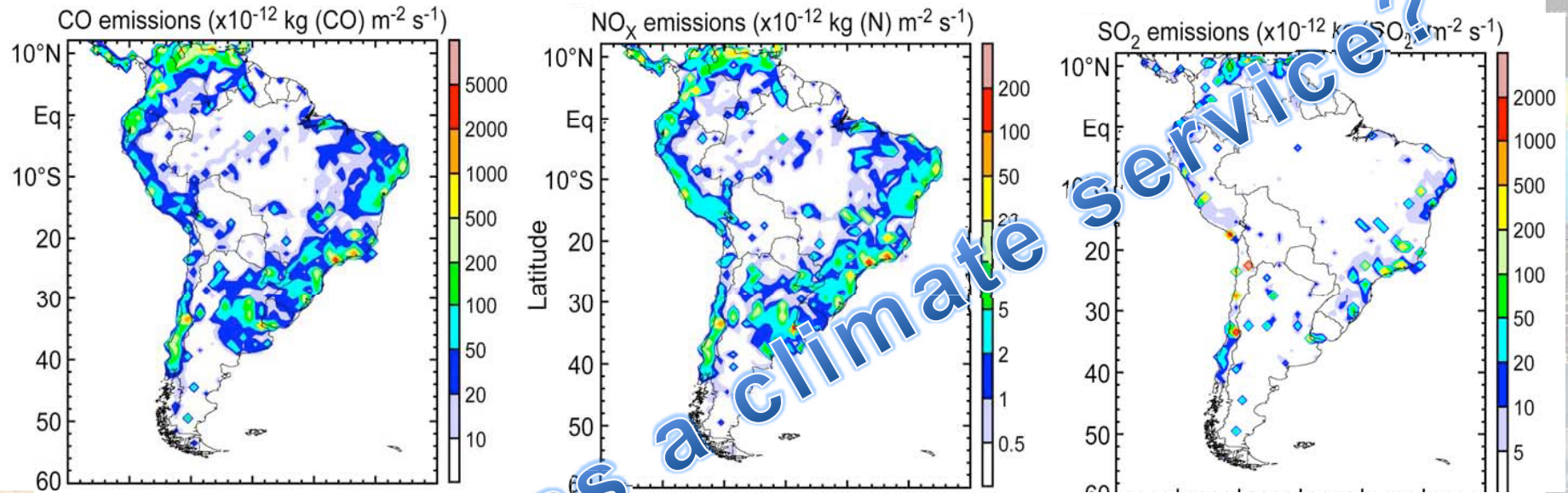
WRCP LAC 2014

M-cities/ intensive **energy**, water/ waste consumption/production



- Carbon emissions from cities represent the single largest human contribution to climate change (Duren & Miller, 2012, Nature CC)
- Cities are responsible for 73% of the world's energy use. International Energy Agency, 2008

Urban and industrial emissions



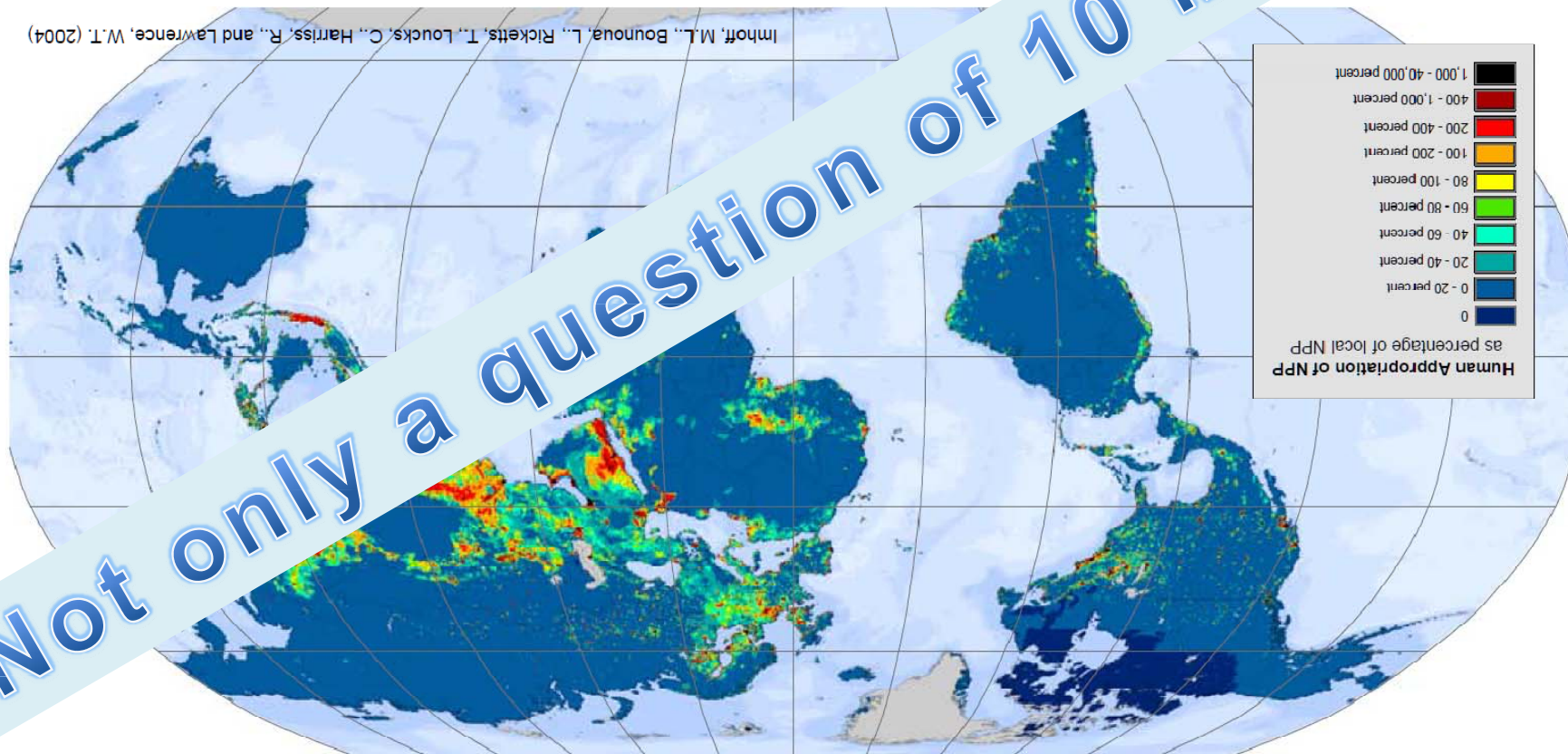
Notice how close to the coast these emissions occur!!!!

Three hundred trout are needed to support one man for a year. The trout, in turn, must consume 90 000 frogs, that must consume 27 million grasshoppers that live off of 1 000 tons of grass.

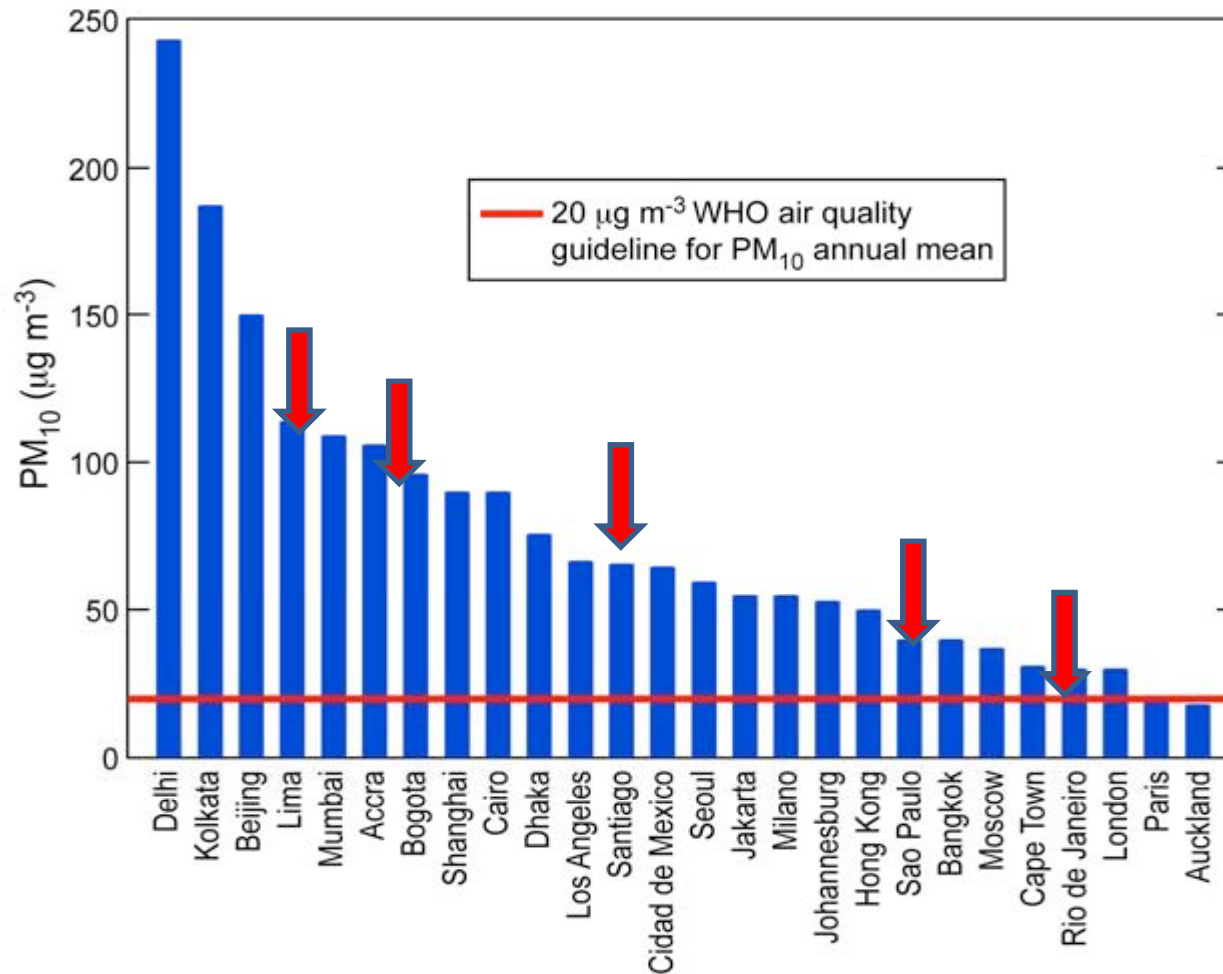
— G. Tyler Miller, Jr., *American Chances* (1963)

Imhoff, M.L., Bounoua, L., Rickerts, T., Loucks, C., Harris, R., and Lawrence, W.T. (2004)

Not only a question of 10 M inhab

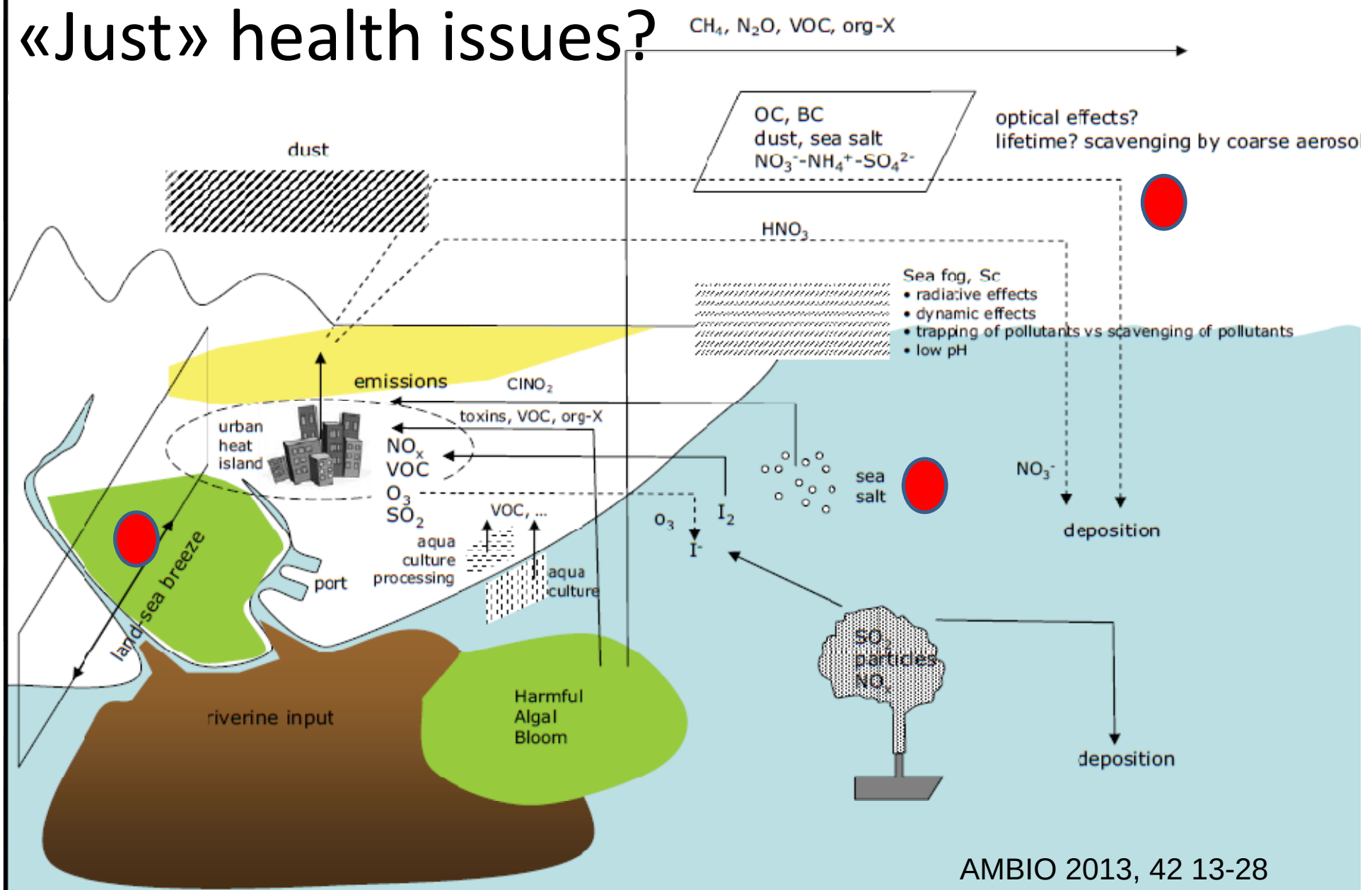


Hazy and dirty skies!



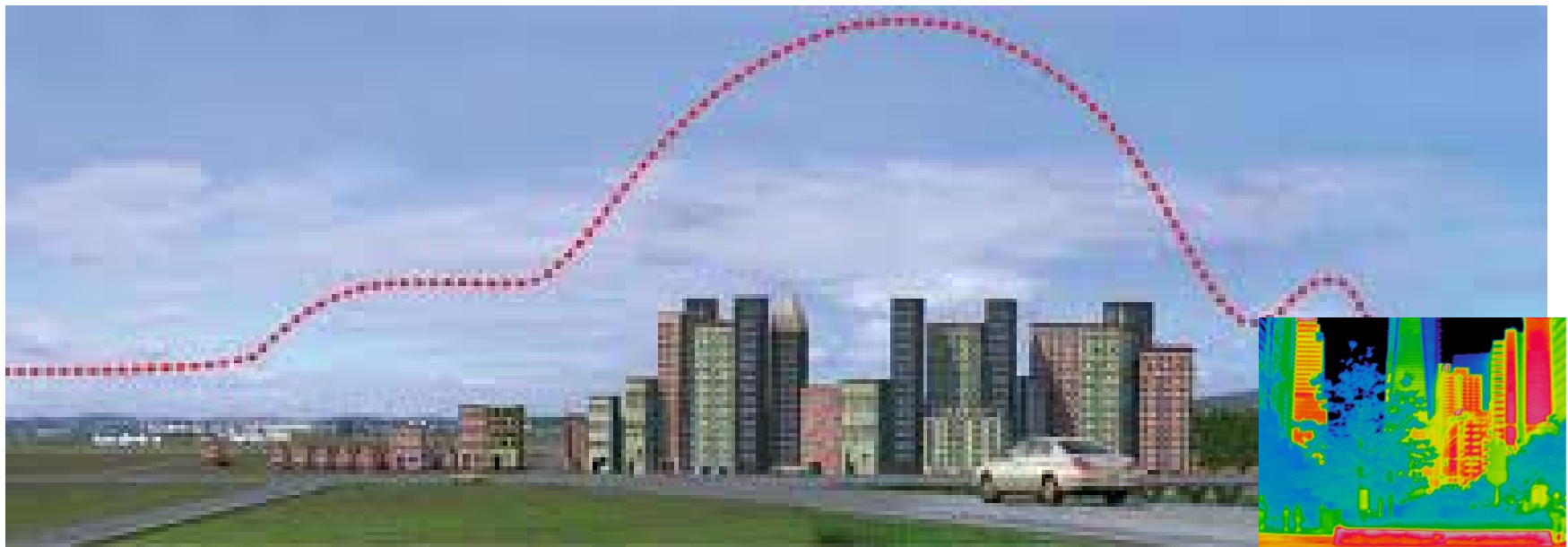
Not only a matter of concentrations...but of exposure and population!!!

«Just» health issues?



AMBIO 2013, 42 13-28

Changes in local and meso-scale circulation systems

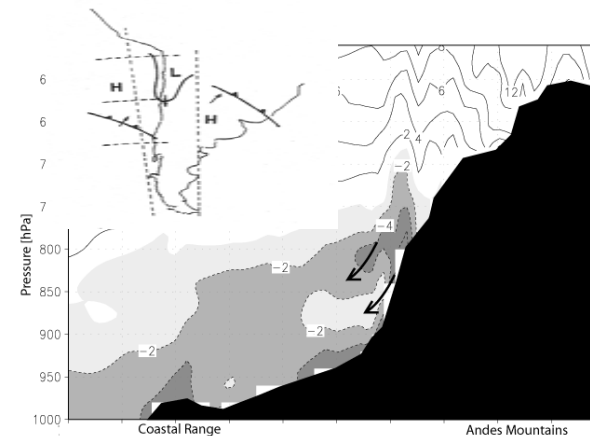
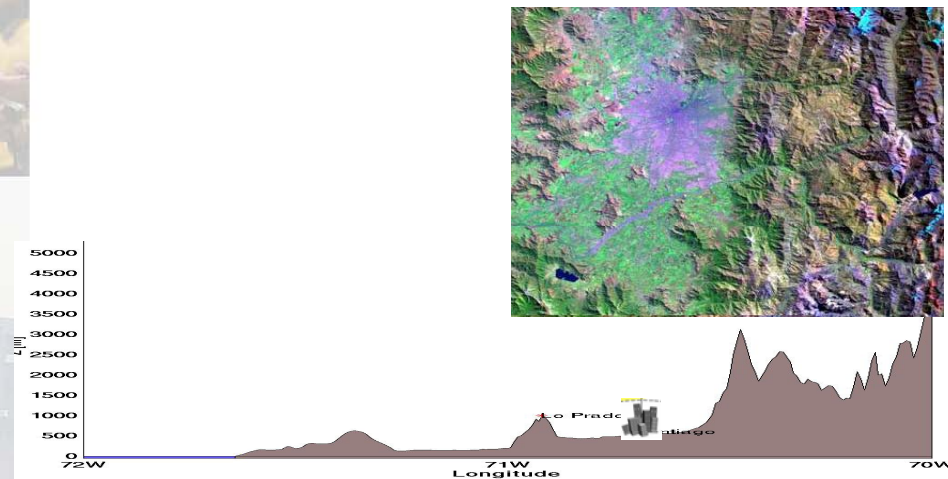
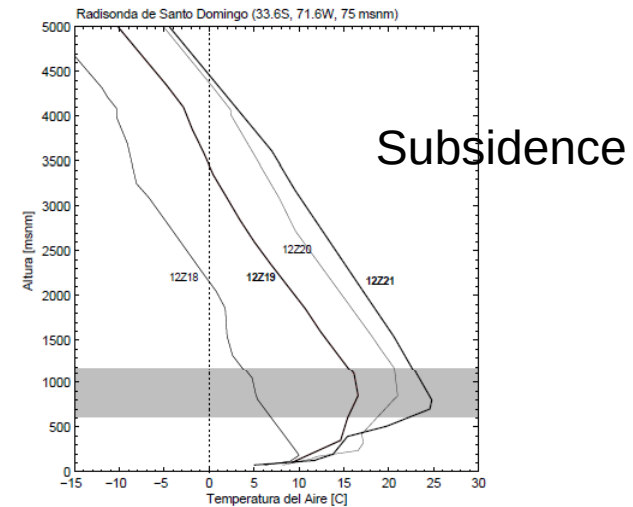
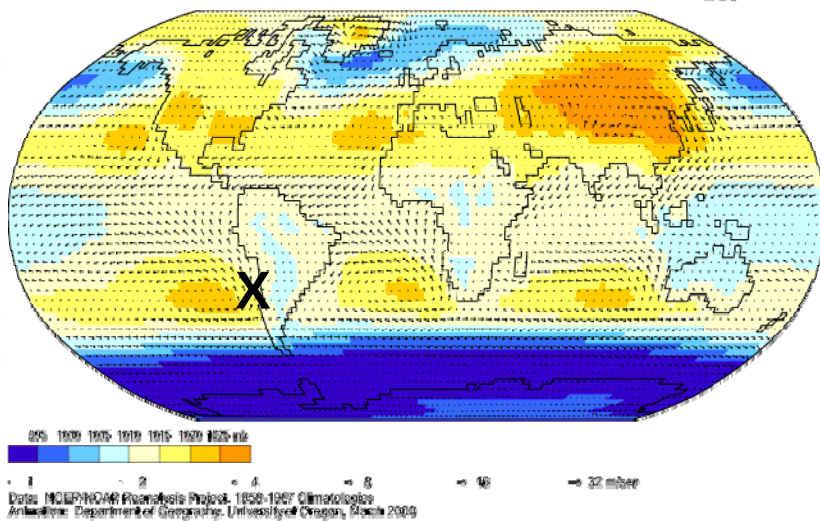


Surface roughness increases may lead to a decrease in wind intensity
Temperature & temperature gradients increase promoting mixing

Baklanov et al, 2009

Meso-scale circulation matters too!

Sea-Level Pressure and Surface Winds



Coastal lows

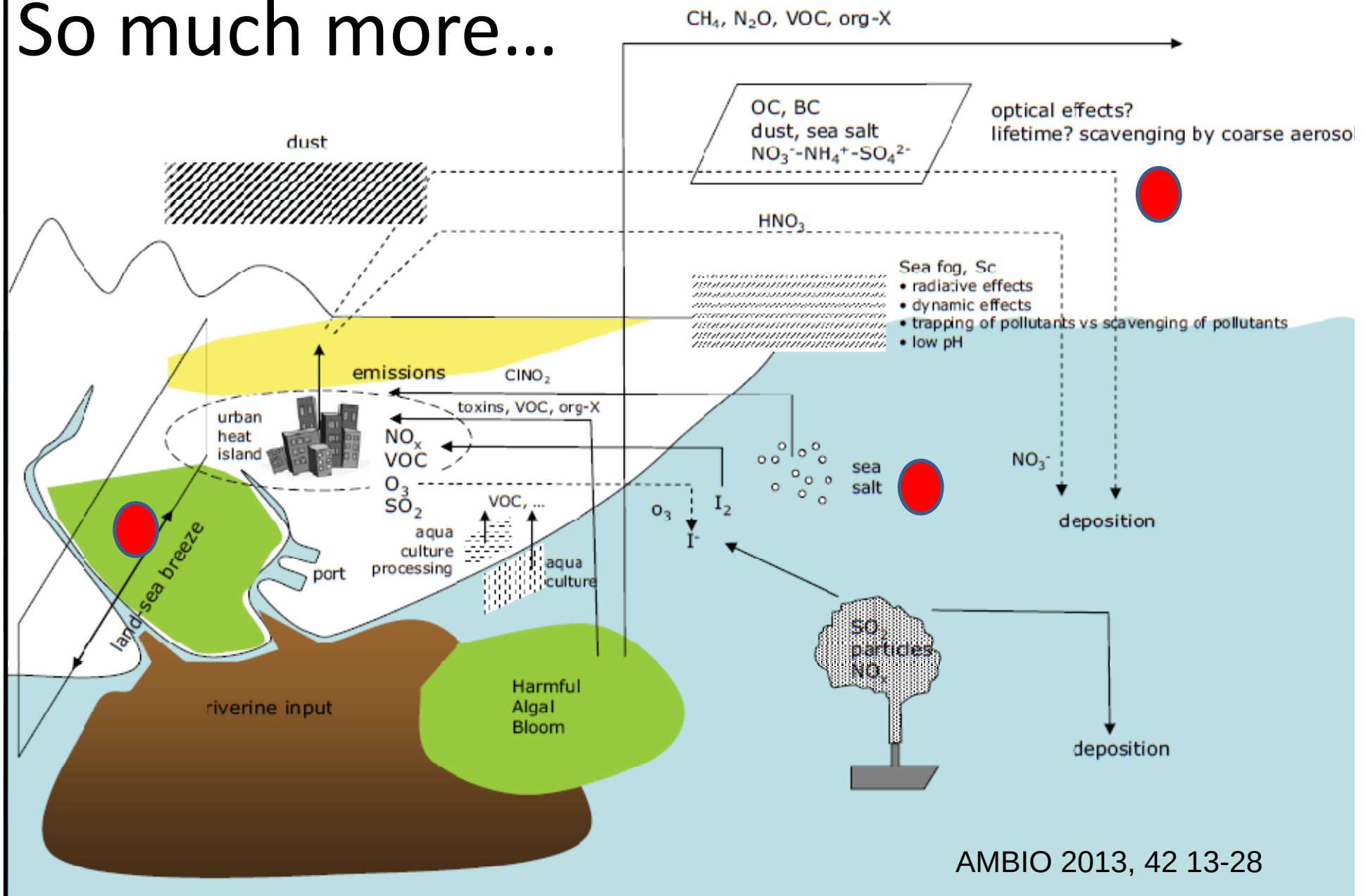
Radiatively-driven circulation over complex terrain

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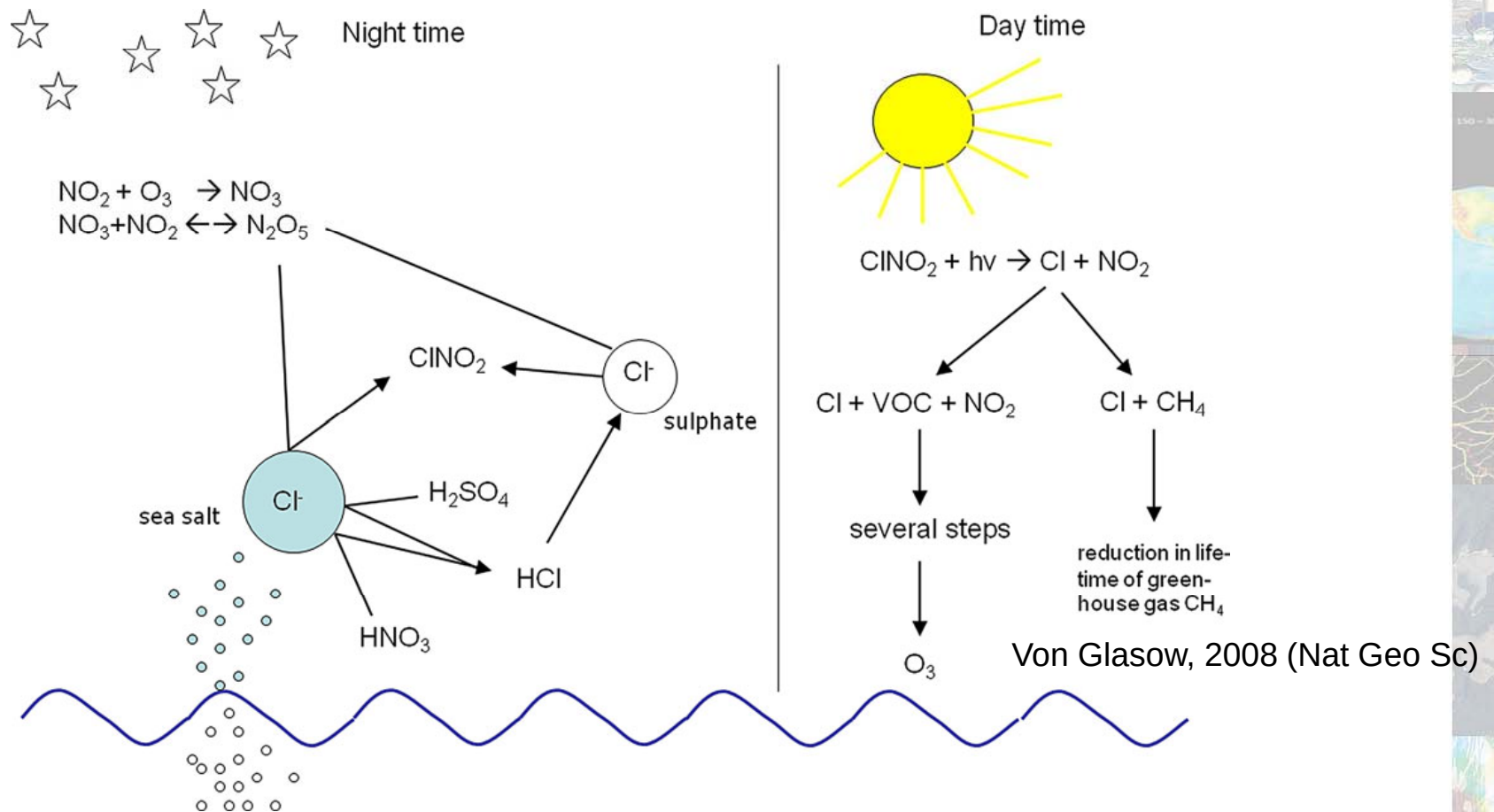
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Earth system science for Chile: a sound basis for building resilience in a changing climate

So much more...



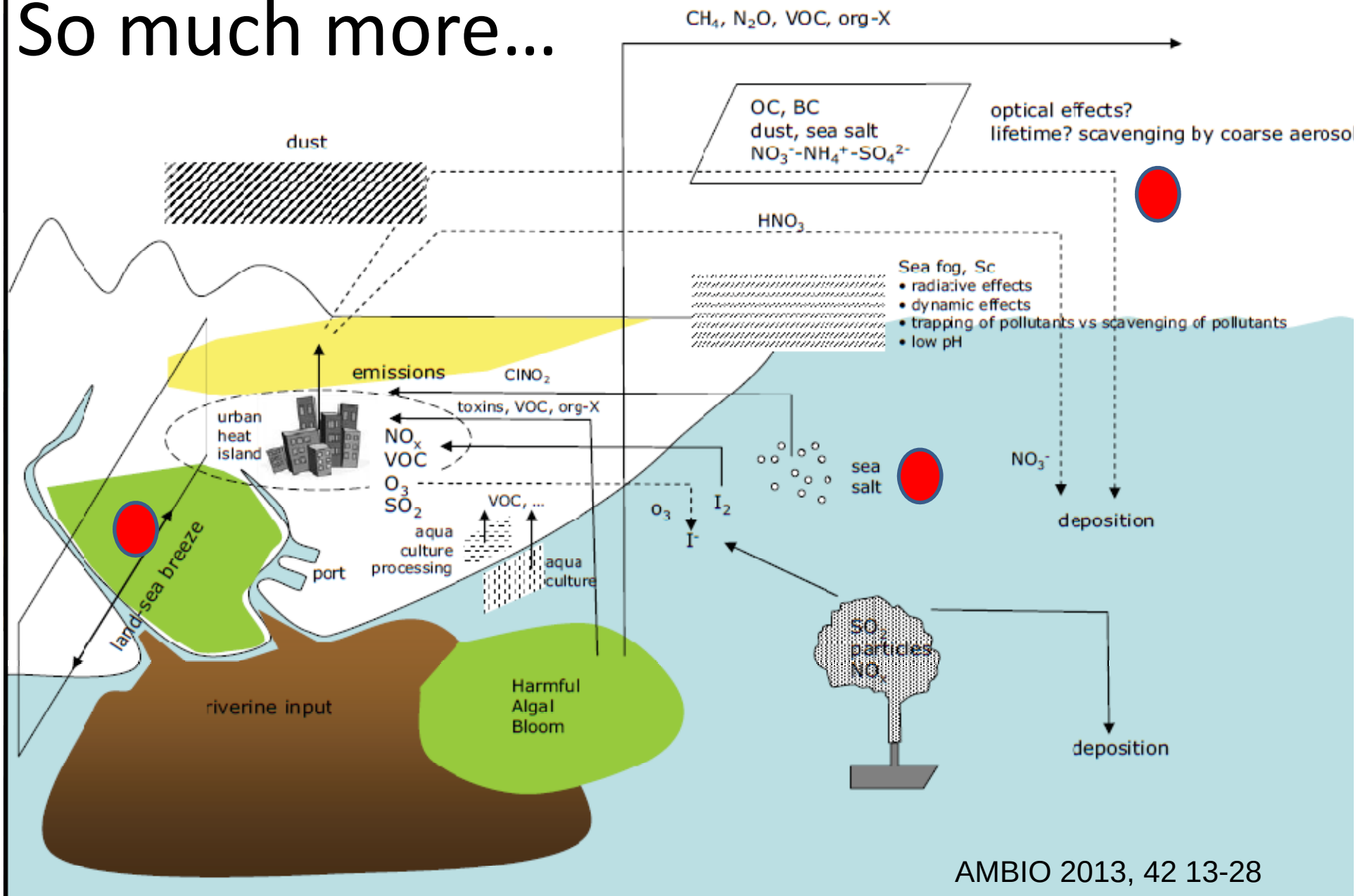
Halogen chemistry and ozone formation/destruction



Interactions in the **in**flow and the **out**flow from continental source regions

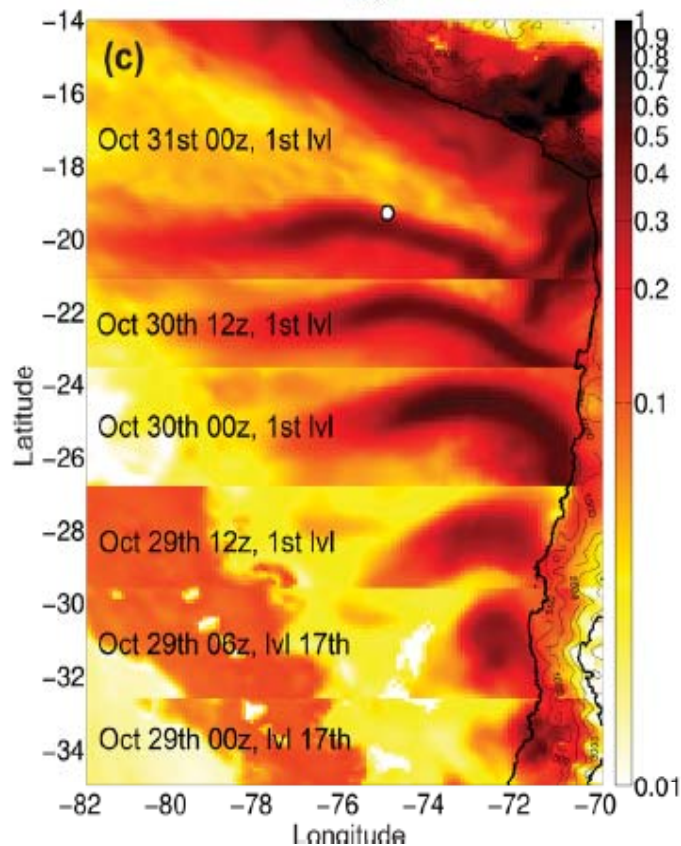
Subtle effects such halogen chemistry become important over time regarding O₃ pollution

So much more...



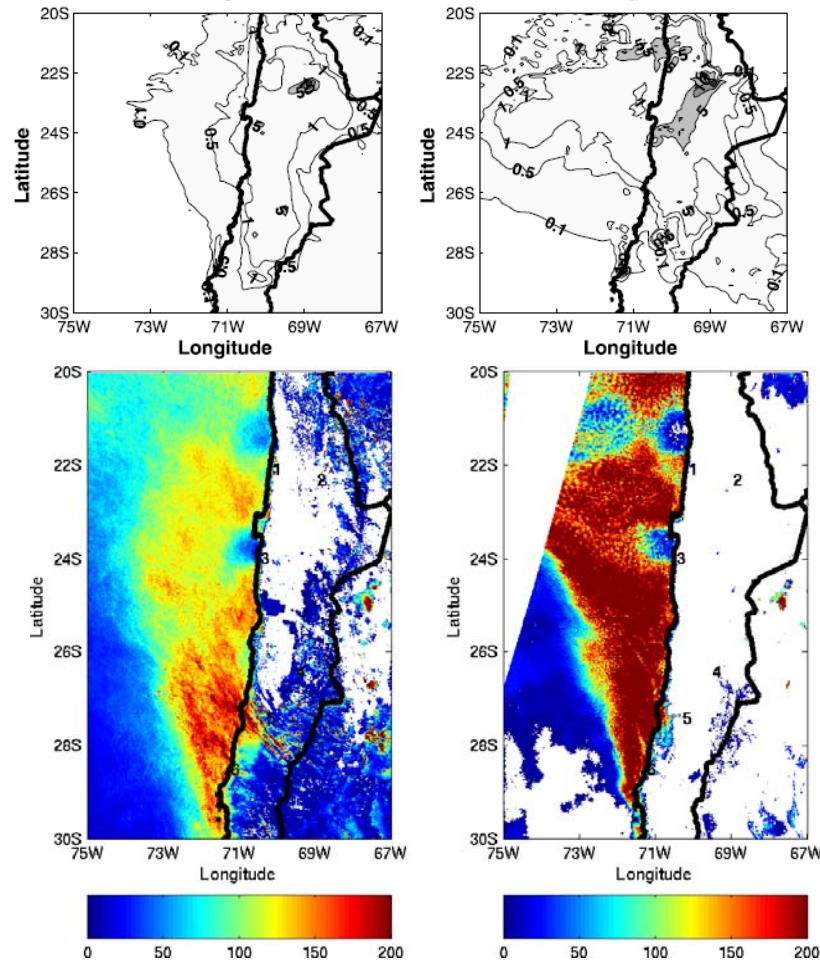
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Impacts on cloud properties



Saide et al, 2012 ACP

Sulfate plume from Central Chile
as «seen» during VOCALS REX



Huneus et al, 2006

Altogether now

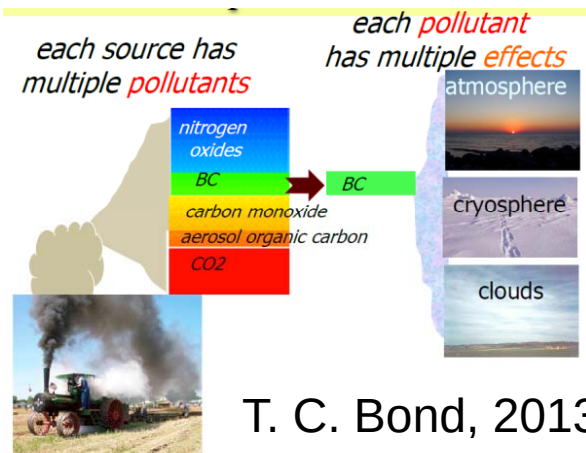
An integrated approach to addressing air pollution and climate change is essential if society desires to slow the rate of climate change and to protect human health, food/water security and ecosystems.

Simultaneously Mitigating Near-Term Climate Change and Improving Human Health and Food Security

Drew Shindell *et al.*

Science **335**, 183 (2012);

DOI: 10.1126/science.1210026



T. C. Bond, 2013

FOCUS ON SHORT-LIVED CLIMATE FORCERS (SLCFs)...

Black carbon, ozone, methane..., which in addition to radiative forcers, are air pollutants and pollutant precursors

Summary

- Urbanization is and will remain as a major global change driver in South America
- Worldwide and in SA urbanization is largely a coastal phenomenon
- Cities may have a wide range of impacts...from circulation to biogeochemistry...including health hazards
- Atmospheric pollution occurs in the framework of a changing climate: we shouldn't decouple these issues!!...**go for win-win !!!**
- **Cities go well beyond city borders!**

Invitations



Submit Now! 31/3

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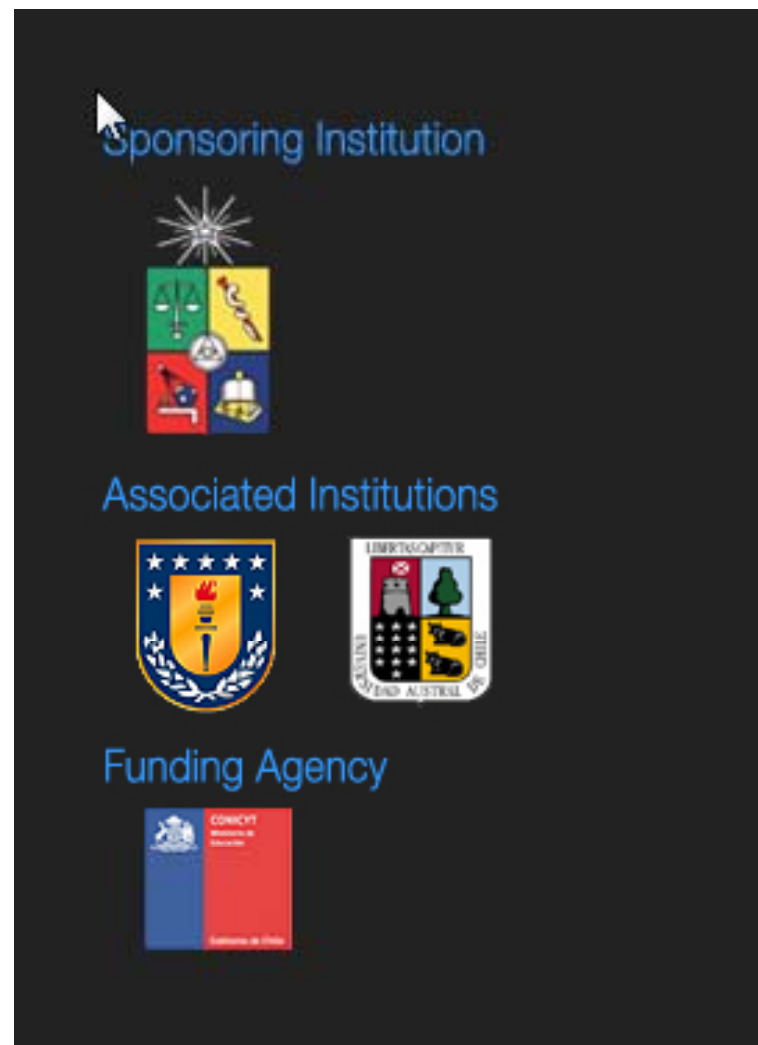
...que todo el mundo sepa que el Sur también existe

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Earth system science for Chile: a sound basis for building resilience in a changing climate

¡Gracias!
laura@dgf.uchile.cl
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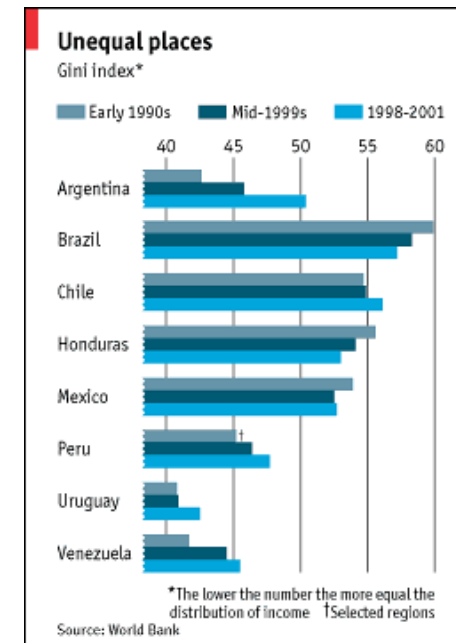
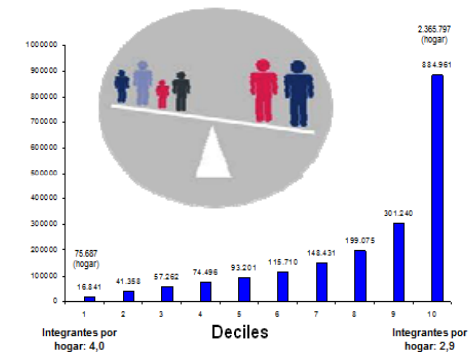
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We (=South Americans) have plenty of similarities ...



Mañana



But we also show plenty of gradients and differences among countries and within countries

<http://www.economist.com/node/2193852>

Corría Diciembre de 2011...



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Ministerio de Educación
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FONDAP
Fondo de Financiamiento de Centros de Investigación en Áreas Prioritarias

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CUARTO CONCURSO NACIONAL DE CENTROS DE EXCELENCIA EN INVESTIGACIÓN EN ÁREAS PRIORITARIAS FONDAP 2011

Presentación Público Objetivo Bitácora Resultados

Este concurso está orientado a fomentar en Chile el desarrollo de Centros de Investigación científica de excelencia y alto impacto enmarcado en áreas prioritarias que respondan a un problema de gran relevancia para el país y orientados a la formación o consolidación de equipos de investigación. Los proyectos deben abordarse en forma multidisciplinaria y contribuir con investigación básica de excelencia en el área prioritaria en la cual se enmarcan, a través de la asociación de investigadores(as) nacionales y extranjeros(as) en Centros de Excelencia en Investigación que se conviertan en un referente internacional. Los Centros que postulen deben lograr un alto nivel de desarrollo, insertarse en redes mundiales reconocidas, contar con un número significativo de investigadores(as) con productividad demostrada, y realizar una contribución científica significativa en alguna de las siguientes áreas prioritarias:

- Agricultura y/o Acuicultura Sustentable
- Cambio Climático
- Desarrollo Urbano Sustentable
- Desastres Naturales
- Energía Solar
- Pueblos Originarios

¡Cambio Climático!

¿Quién hace qué en cambio global en Chile?

s.a. visiones, trabajo previo, una institución patrocinante; proyectos en curso



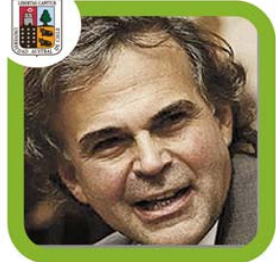
Pilar Moraga



René Garreaud



Laura Farías



Antonio Lara



Laura Gallardo

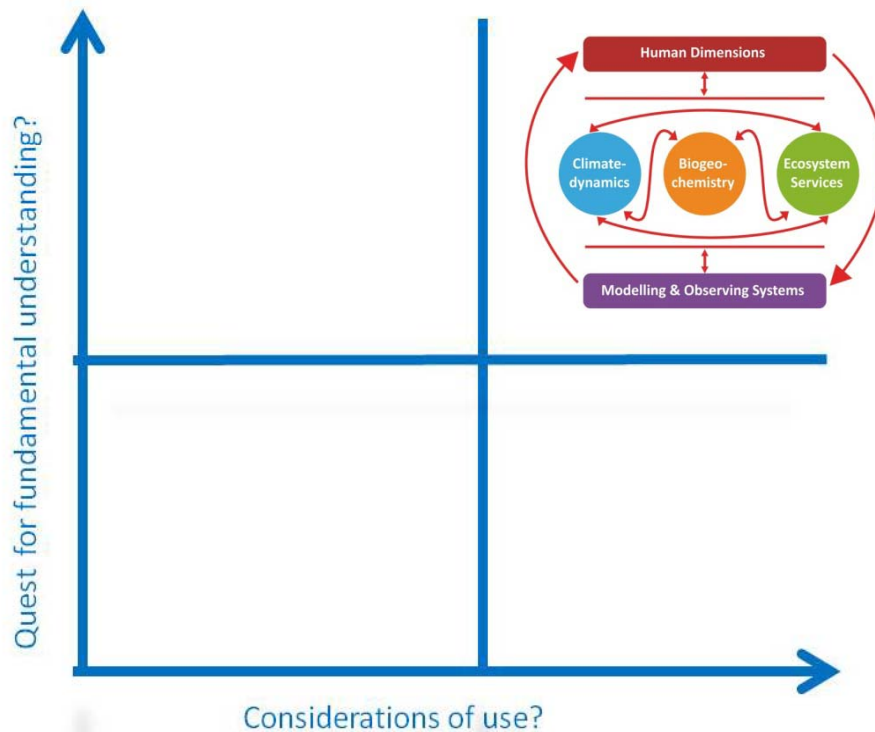
change

- 



¿Cómo?

Apostamos por la excelencia, la interdisciplina y la comunicación en el cuadrante de Pasteur



Adapted from Stokes, 1997

