TOWARDS A NEW SYSTEM FOR ANALYSIS OF ENVIRONMENTAL DISASTERS AND RISK ASSESSMENT

ANA M. B. NUNES[1], NELSON F. FERNANDES[1], GUTEMBERG B. FRANÇA[1], MARIA NAÍSE O. PEIXOTO[1], ISMAR S. CARVALHO[1], GERSON C. SILVA JÚNIOR[1], AND THE SANDRA PROJECT'S TEAM

[1]INSTITUTE OF GEOSCIENCES (IGEO), FEDERAL UNIVERSITY OF RIO DE JANEIRO, RIO DE JANEIRO, RJ, BRAZIL

Motivation

In response to catastrophic occurrences frequently observed in densely populated regions in Brazil, researchers from The Institute of Geosciences (IGEO) at The Federal University of Rio de Janeiro (Universidade Federal do Rio de Janeiro, UFRJ) are working towards an integrated system for the analysis of environmental disasters, and vulnerability and risk assessments (The SAnDRA Project).

General Mission

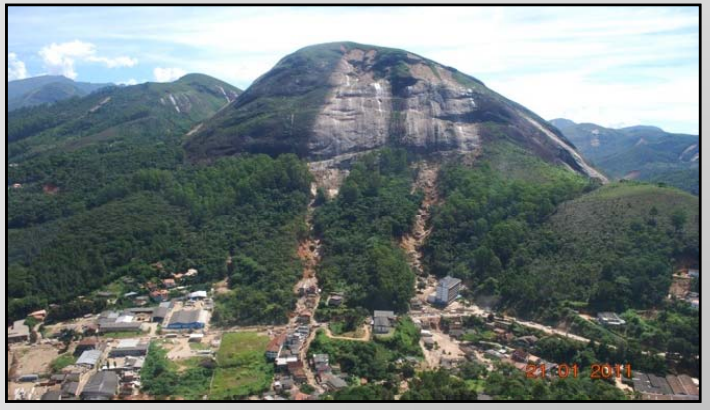
The integrated modeling approach aims the development of a system for decision-making regarding environmental disasters caused by extreme events via coordinated projects, research and activities of the Departments of Geography, Geology and Meteorology from IGEO-UFRJ.

LANDSLIDE OCCURRENCES ARE MOSTLY DRIVEN BY EXTREME METEOROLOGICAL EVENTS IN BRAZIL

Caraguatatuba, SP (1967)

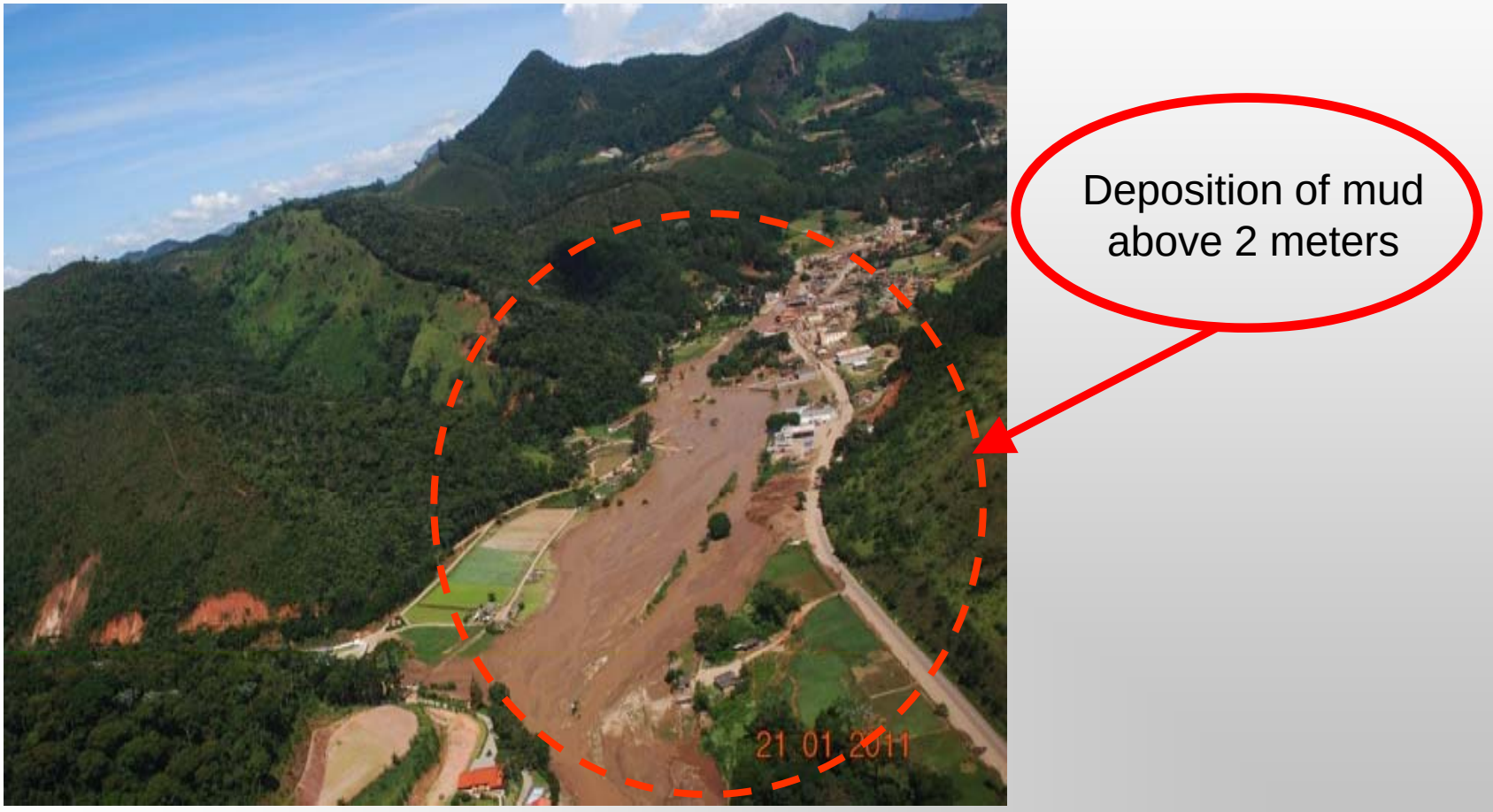
Cubatão, SP (1985)

Timbé do Sul, SC (1995)



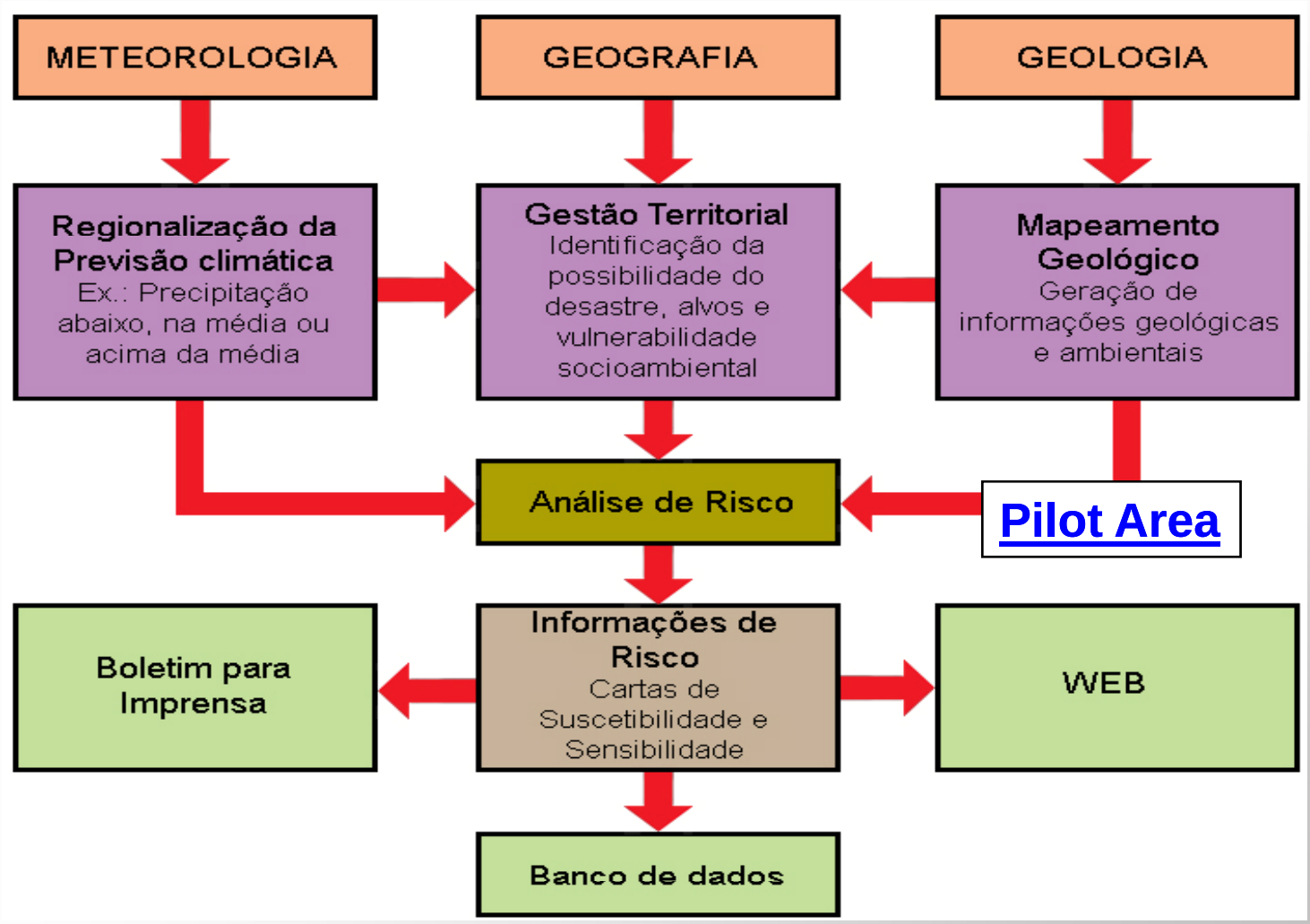
Nova Friburgo, RJ (2011)

LANDSLIDE OCCURRENCES ARE MOSTLY DRIVEN BY EXTREME METEOROLOGICAL EVENTS IN BRAZIL



Rio Vieira (Teresópolis), RJ (2011)

Flux of Information

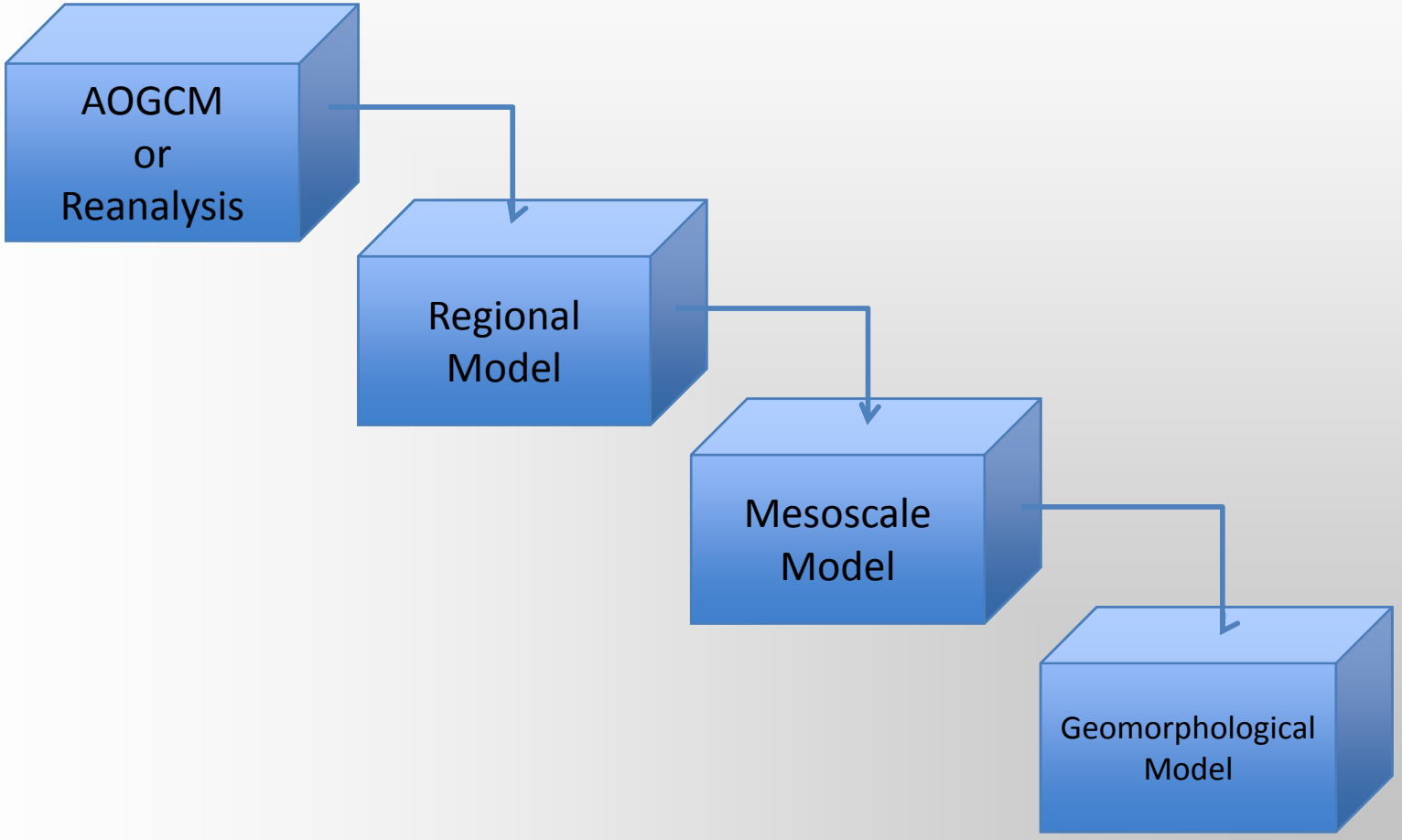


TEAM EXPERTISE

PhD: 31; MSc: 6

Weather and Climate Modeling, Geomorphology, Mesoscale Meteorology, Micrometeorology, Hydrometeorology, Geographic Information System (GIS), Cartography, Geography, Paleoecology, Paleoclimatology, Geotechnical Engineering, Geology and Environmental Engineering, Geophysics, Hydrogeology, Computational Intelligence, Oceanography.

Multiscale Approach
Deterministic Models



MODELING COMPONENT

FAPERJ 09/2011

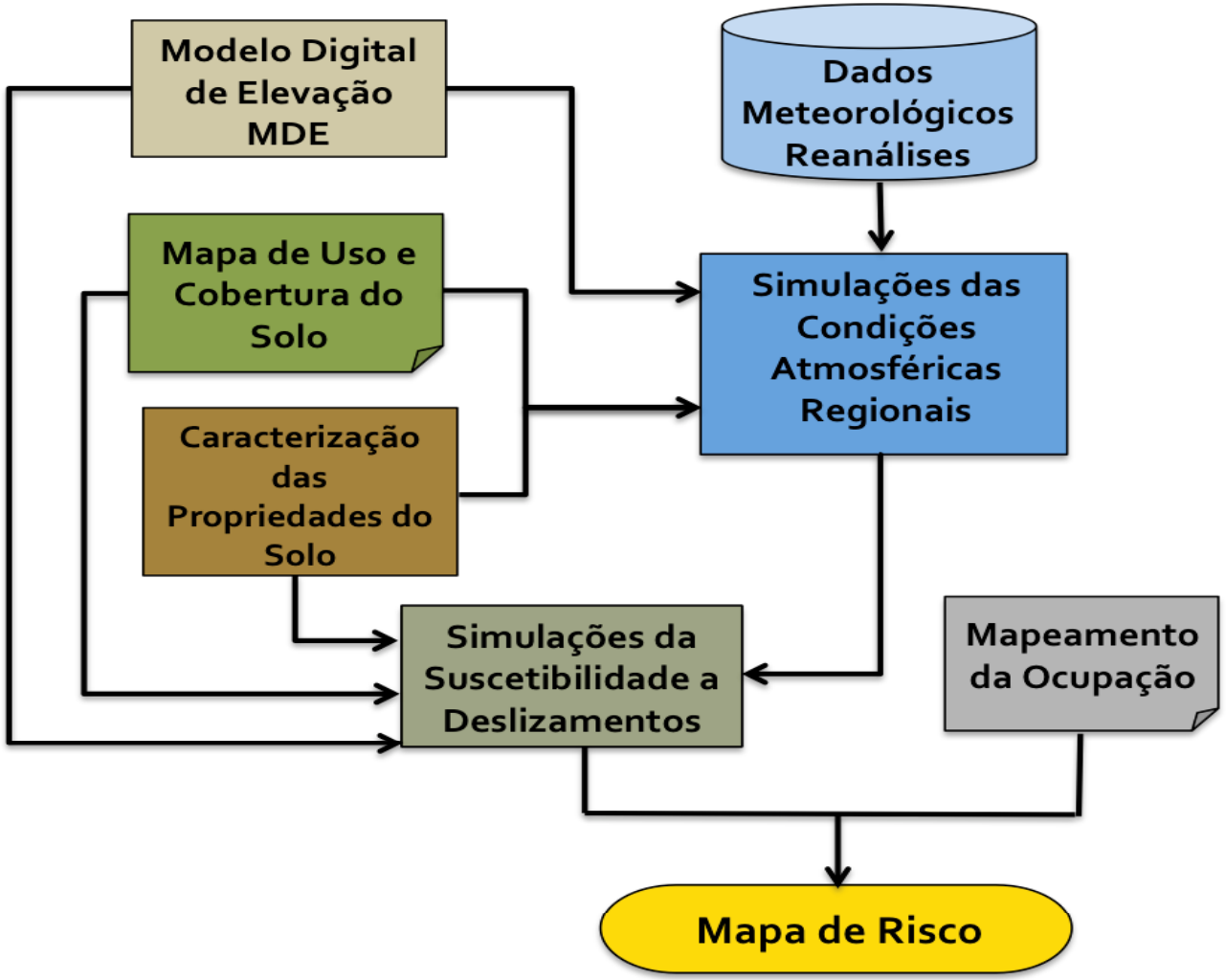
PREVER Project

- ✓ Mathematical Modeling Applied to Risk Assessment over Catastrophic Landslide Areas of the State of Rio de Janeiro

The Prever Project

Meteorological, geological and geographical datasets will be integrated into mathematical models in order to make predictions of natural disasters.

PREVER

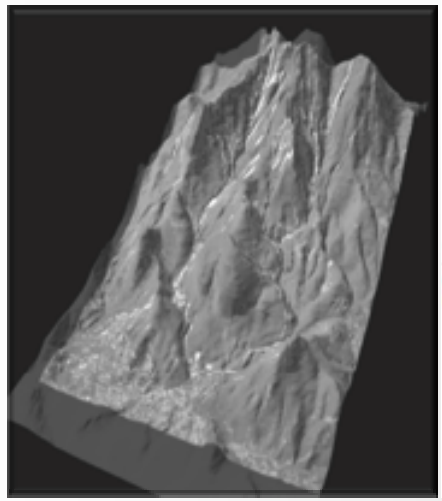

Modelo Digital de Elevação MDE
Dados Meteorológicos Reanálises
Mapa de Uso e Cobertura do Solo
Simulações das Condições Atmosféricas Regionais
Caracterização das Propriedades do Solo
Simulações da Suscetibilidade a Deslizamentos
Mapeamento da Ocupação
Mapa de Risco

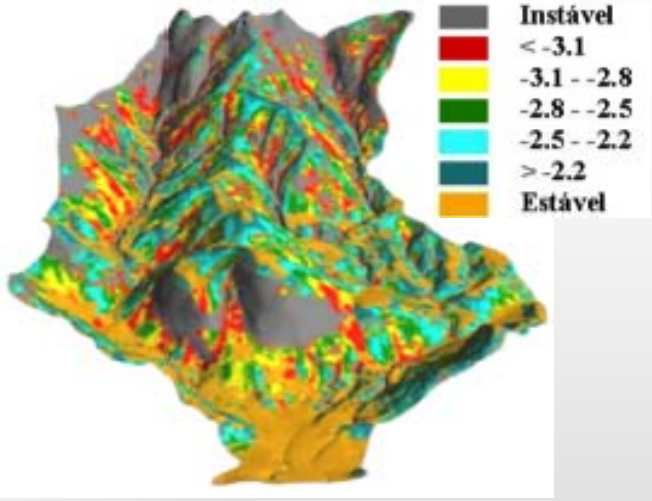
Modeling Systems

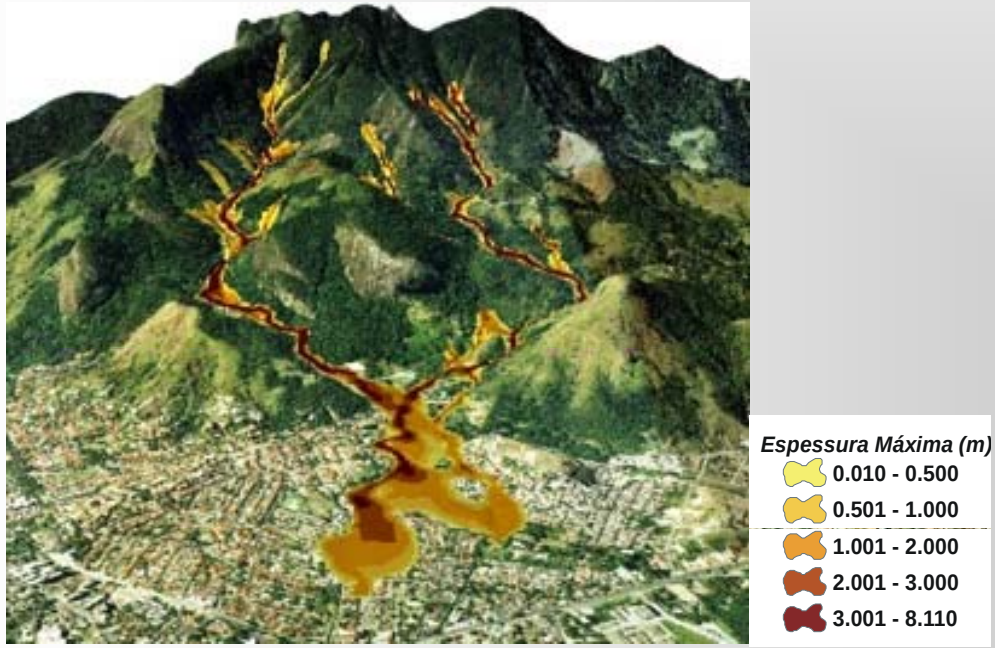
The landslide modeling will apply physically based numerical models that include advanced hydrology and slope stability, among other combinations.

Predictions of areas susceptible to mass movements will be made through the combination of prediction models of mass movements (*e.g.*, SHALSTAB and TRIGRS models for shallow landslides) with a propagation model for debris flow (model FLO-2D).

Modeling Systems

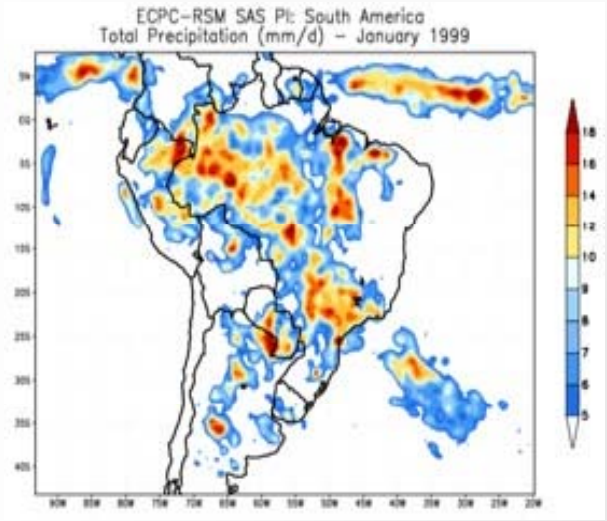






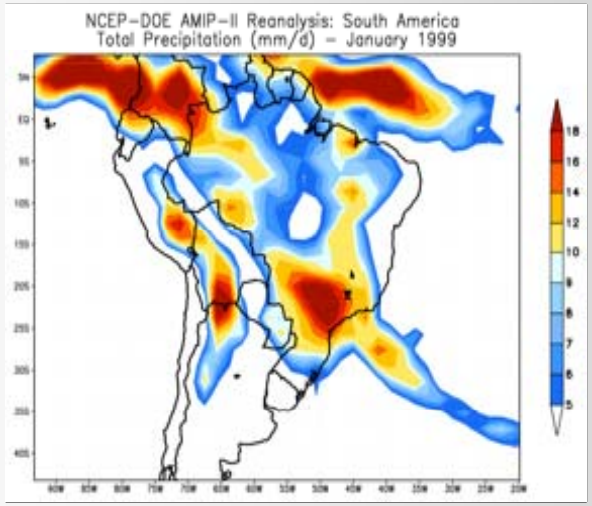
Forecasts of occurrence of landslides, and extent and thickness of the deposits of debris flow.

Modeling Systems



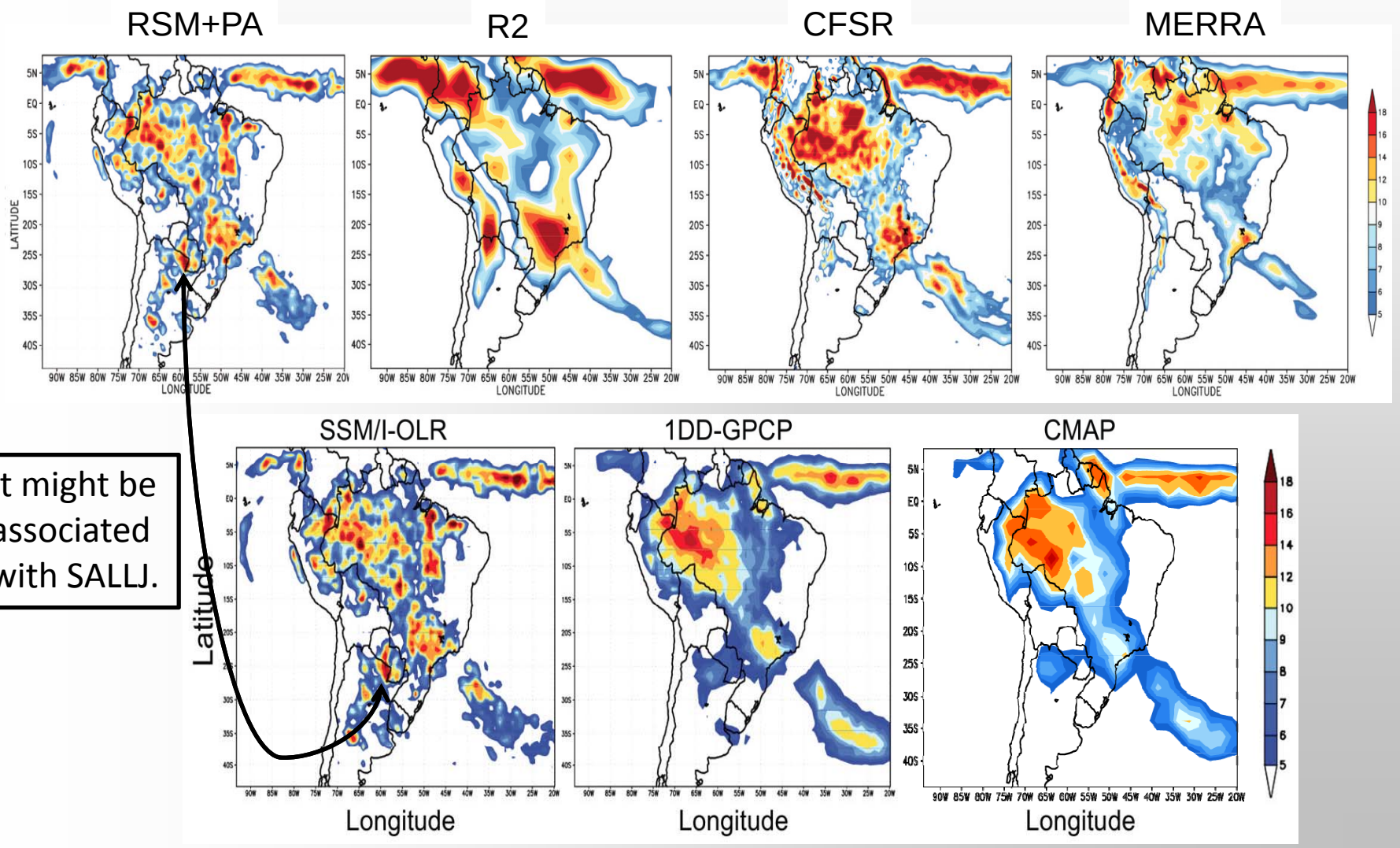
Regional Spectral Model (RSM+PA) ~ 60 km.

NCEP-R2 ~ 200 km



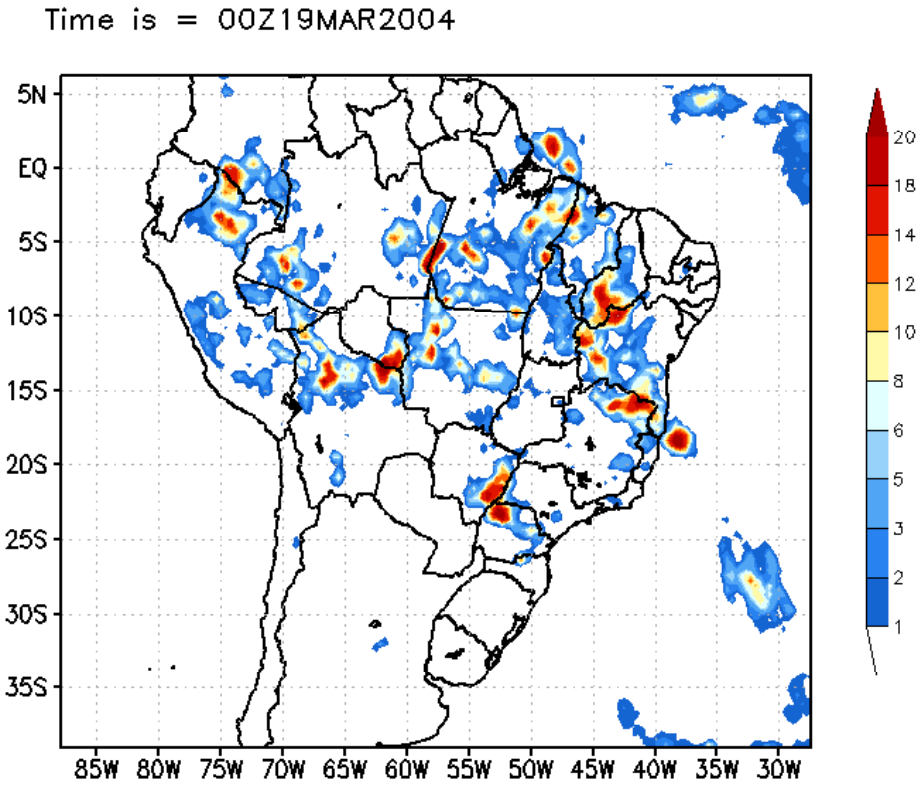
Dynamical downscaling (upper panel), assimilating satellite-based data into a numerical modeling system (RSM+PA); the coarser resolution NCEP R2 global reanalysis provided initial end boundary conditions. (lower panel).

Precipitation (mm/day)
LBA Wet Season Campaign: January 1999



Extreme Events
Precipitation (mm/day)
Catarina: March 2004

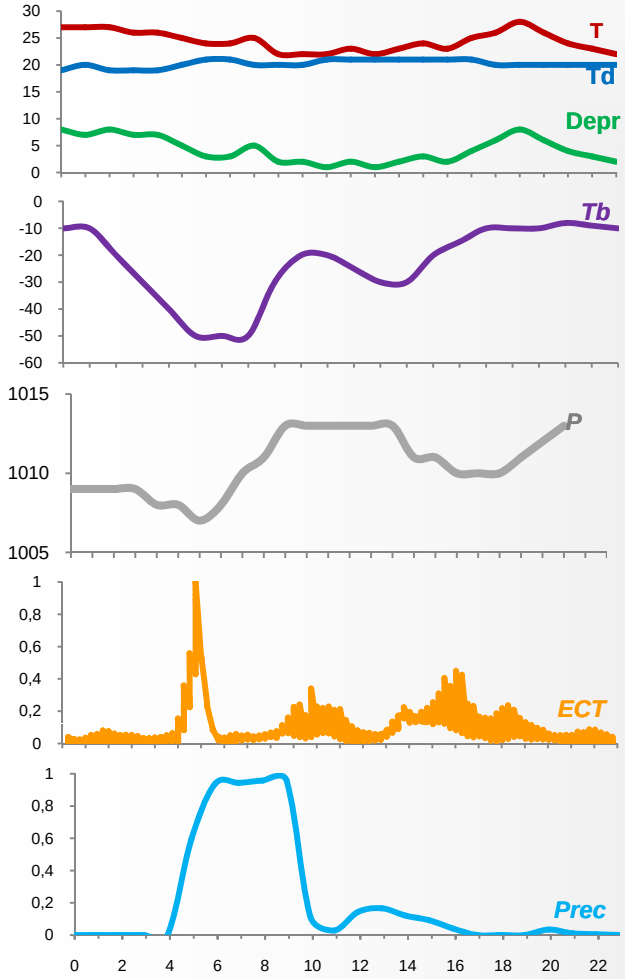
Regional Spectral Model (RSM) ~ 40 km

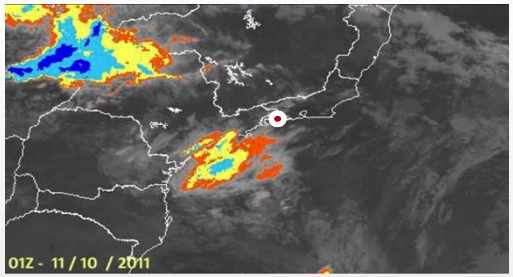


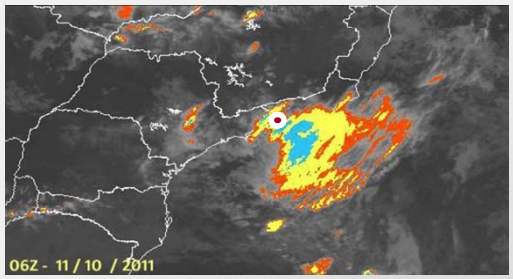
Increase of the capability of RCMs to simulate extreme precipitation events

Modified Scale-Selective Bias Correction (Yoshimura and Kanamitsu, MWR 2008) & Precipitation Assimilation (PA; Nunes and Roads, JHM 2007)

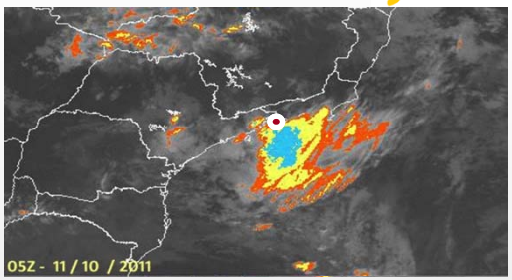
Severe Weather Event : Oct. 11th, 2011

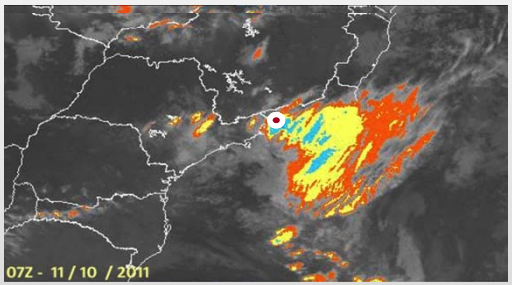


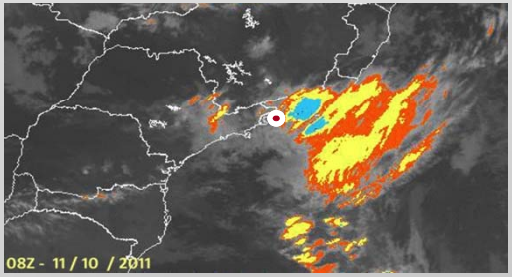


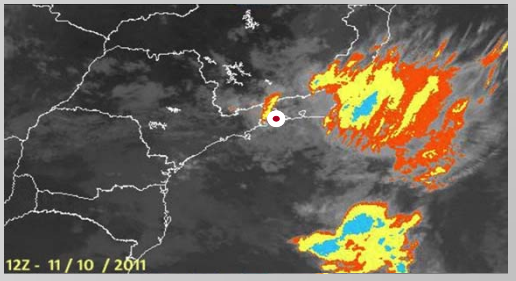


Adaptive modeling based on neural network methodology for the nowcasting of severe weather events.



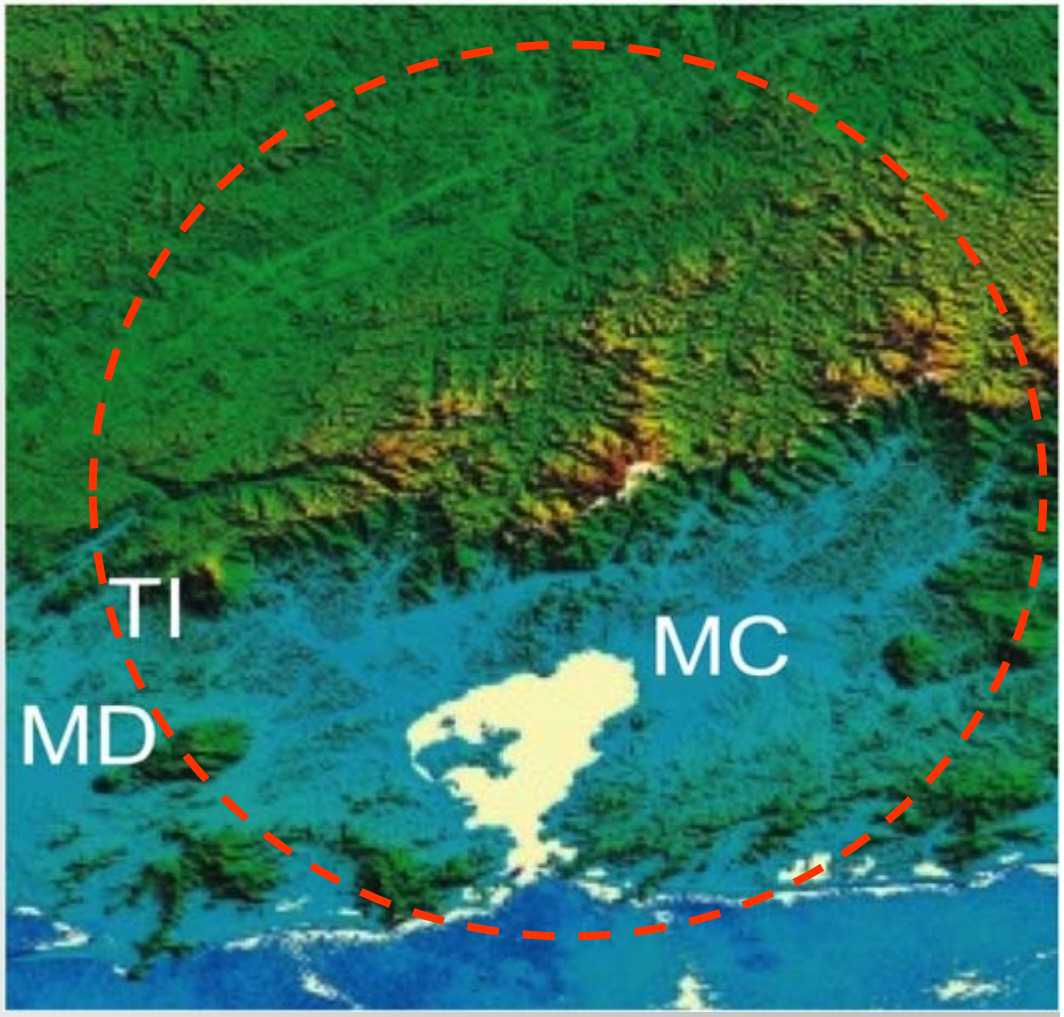




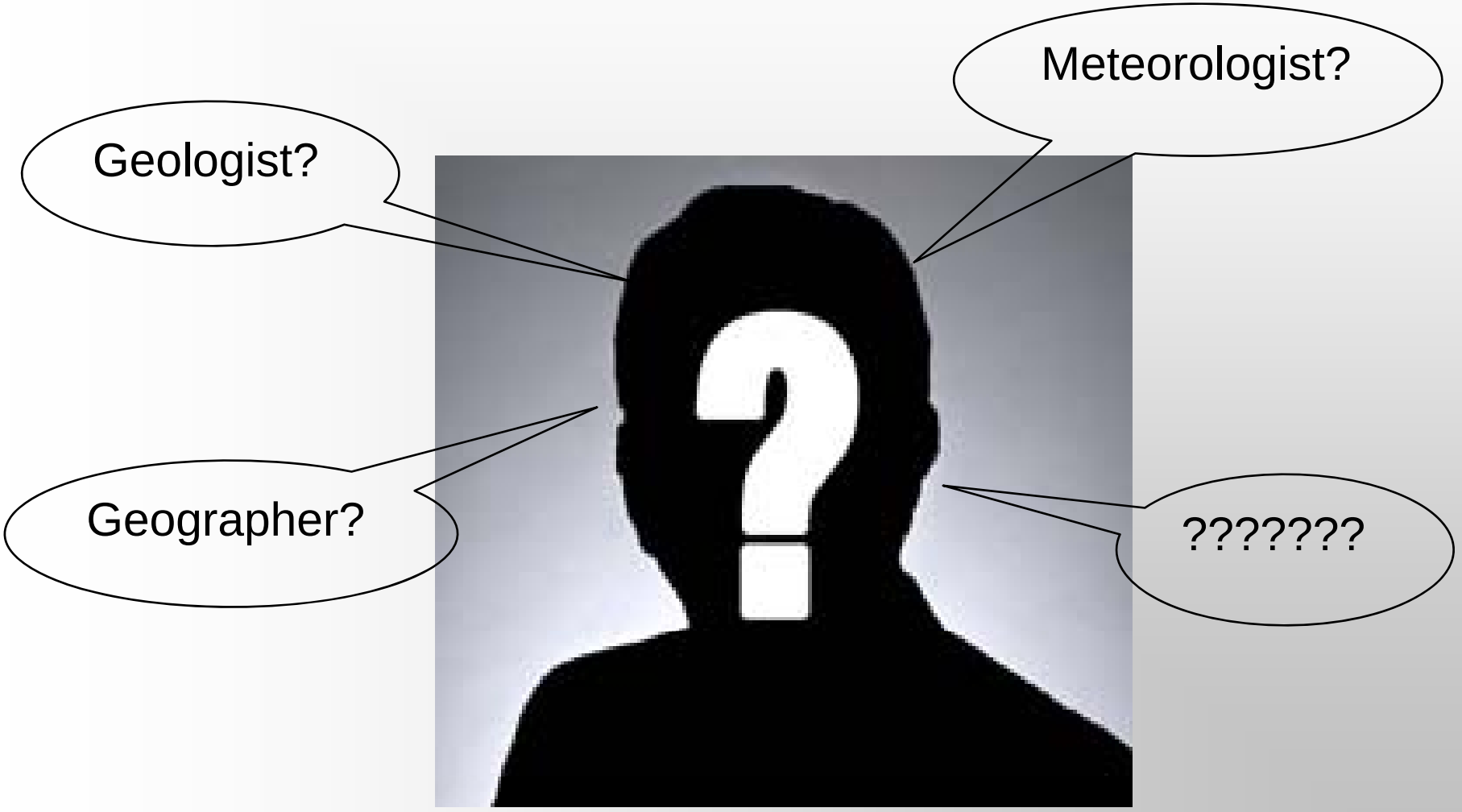


PILOT AREA

The State of Rio de Janeiro's mountain region (slopes) and surroundings.



HYBRID PROFESSIONALS???



Concluding Remarks

All proposed modeling experiments, as well as essential datasets, will be used in the refinement of the modeling systems, providing better predictions and projections to model areas susceptible to landslides.

This combined modeling effort will also contribute to the understanding of regional climate variability and change; and will support better mitigation and adaptation decisions at local scales.

An interdisciplinary approach will emerge together with new research initiatives and trained specialists.

Acknowledgments

- CMAP data were provided by the NOAA Office of Oceanic and Atmospheric Research Earth System Research Laboratory Physical Sciences Division at: *http://www.esrl.noaa.gov/psd/*;
- 1DD data were provided by the NASA/Goddard Space Flight Center's Laboratory for Atmospheres, which develops and computes the 1DD as a contribution to the Global Precipitation Climatology Project (GPCP) - GEWEX;

- NOAA/NCEP/National Weather Service provided the R2 and CFSR data sets;
- MERRA data sets were obtained from the Modeling and Assimilation Data and Information Services Center (MDISC), managed by the NASA Goddard Earth Sciences (GES) Data and Information Services Center (DISC).

We thank to all those who contributed to make the “**S**istema de **An**álise de **D**esastres e **R**iscos **A**mbientais” (**SAnDRA**) project possible.

Projeto SANDRA - CCMN

Laboratórios – Sala de Situação -Auditórios

arqui.lab
atelier universitário fau ufrj

Projeto SANDRA - CCMN

Legenda:

CCMN

Área de intervenção

Planta aérea aproximada de Localização

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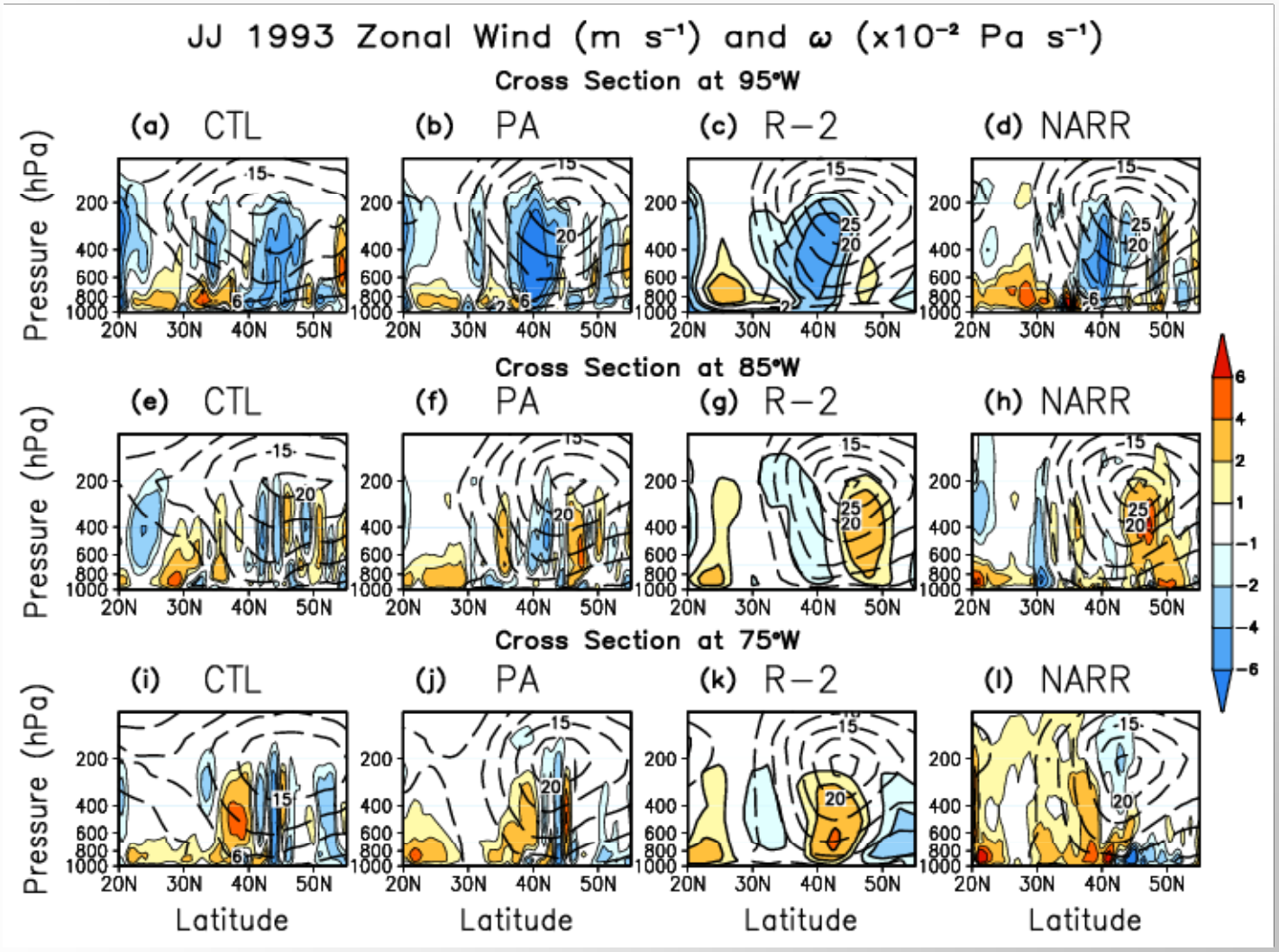
Regional Spectral Model
North American Experiments
1993 Upper Mississippi River Basin Flood



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