CLIMAX

FAPESP-Belmont

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and collaborators

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Collaborators

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	WP1 and WP2	Cecilia-TI	

WP3

Renzo

students

ONS (electric energy): Vinicius F. Rocha

Agriculture (CEPAGRI): Ana Avila

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ONS : National Operator of Electric System (dependence on water resource)

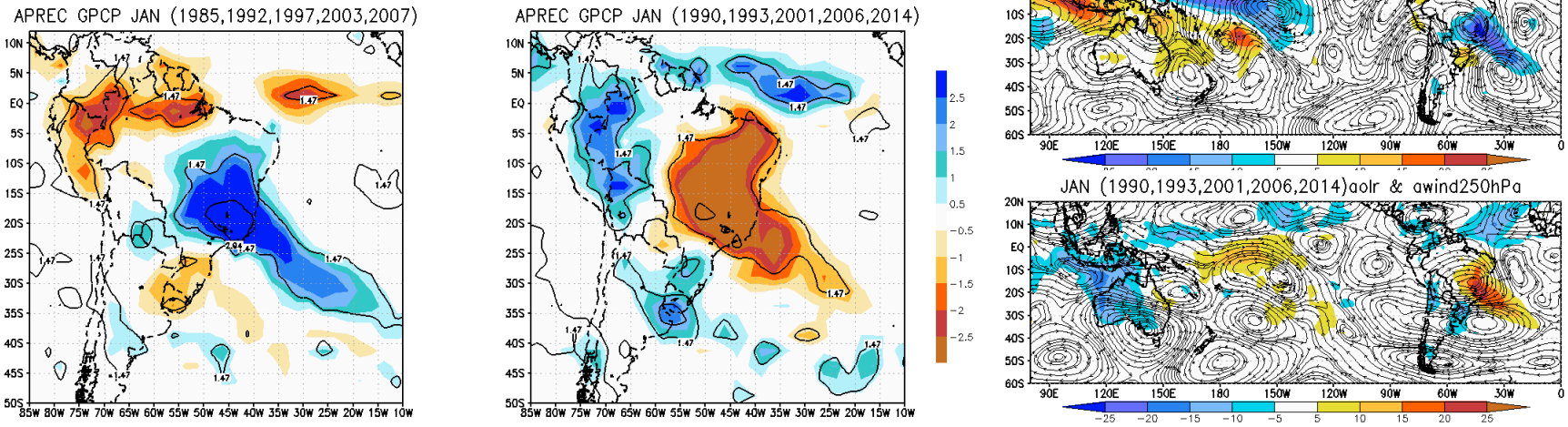
WP1

Physical processes explaining climate variability in SA

Task 1- WP1

Analyses of precipitation variability and associated climate conditions at both large and regional spatial scales and from sub-seasonal, seasonal, inter-annual and decadal timescales.

EXTREMES IN SE BRAZIL



For aplications in agriculture and water resources what are the target areas to do the analyses ? Interaction with WP3 and sectors : co-production

Climate diagnostics and statistical analysis of selected extreme precipitation events. Investigate ENSO/MJO influence on these selected extreme precipitation events, particularly the possible combined effect of these two drivers

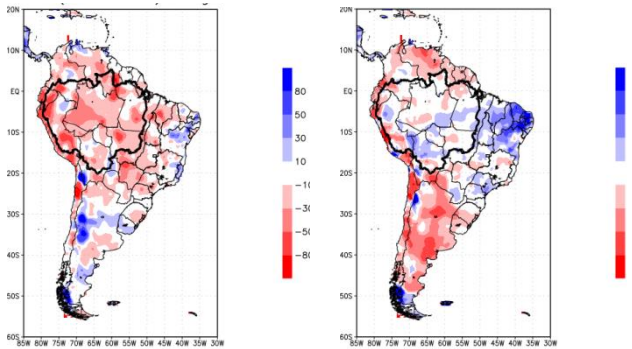
Task 2- WP1

Analyses of the variability of soil moisture at the surface and in the rooting zone in SSA using the Global Land Data Assimilation System (GLDAS) and climate model outputs (CHFP, CFSv2, ENSEMBLES), from subseasonal to decadal time scales. Explore their links with the climate patterns analyzed in WP1.T1.

Observed Soil moisture anomaly

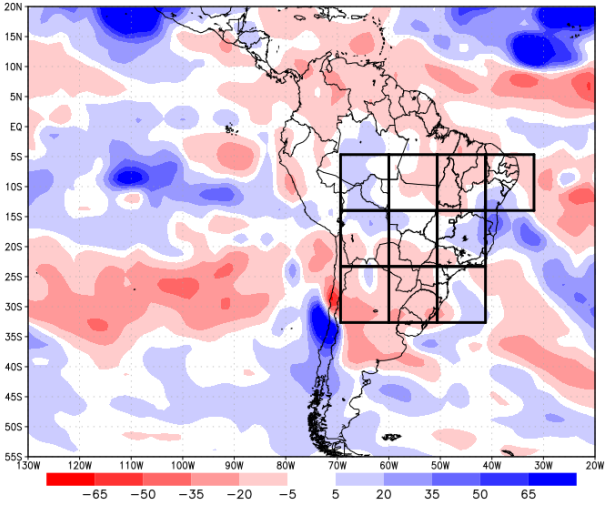
CPC-NOAA

AUG 2005 AUG 2009

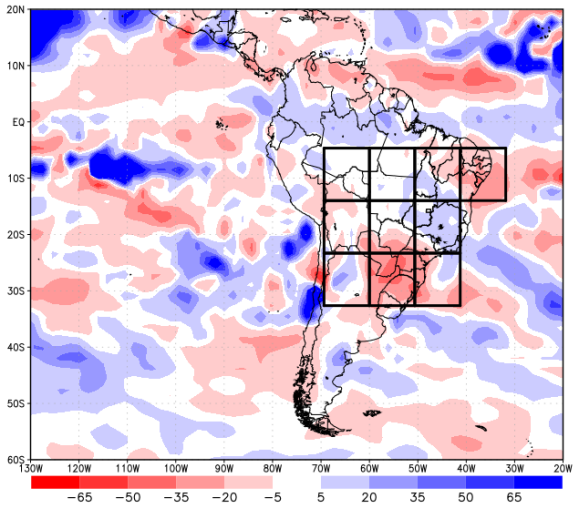


CPTEC/INPE AGCM

Precipitation diff (%)DJF 2005



Precipitation diff (%)DJF 2009



2 experiments: control: s.m. climat.

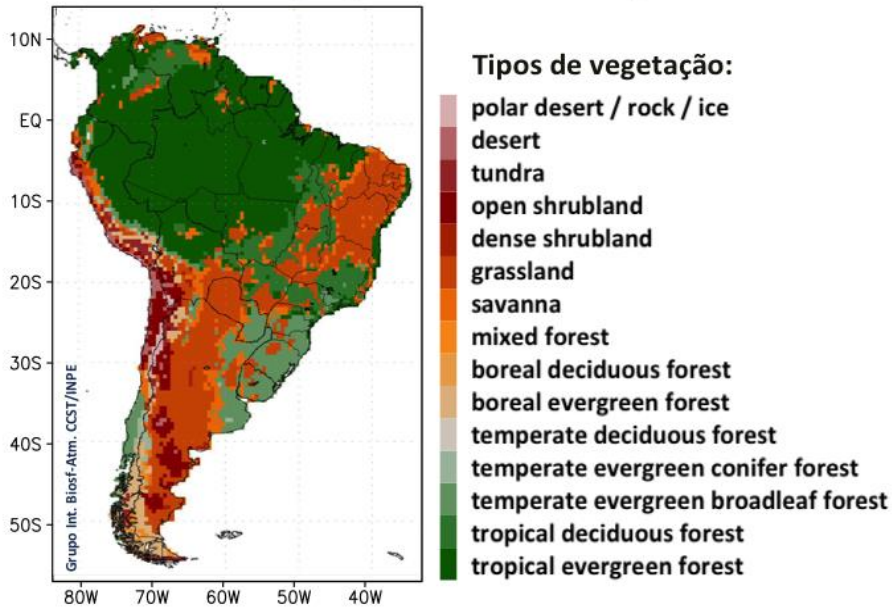
: observed 2005 and 2009

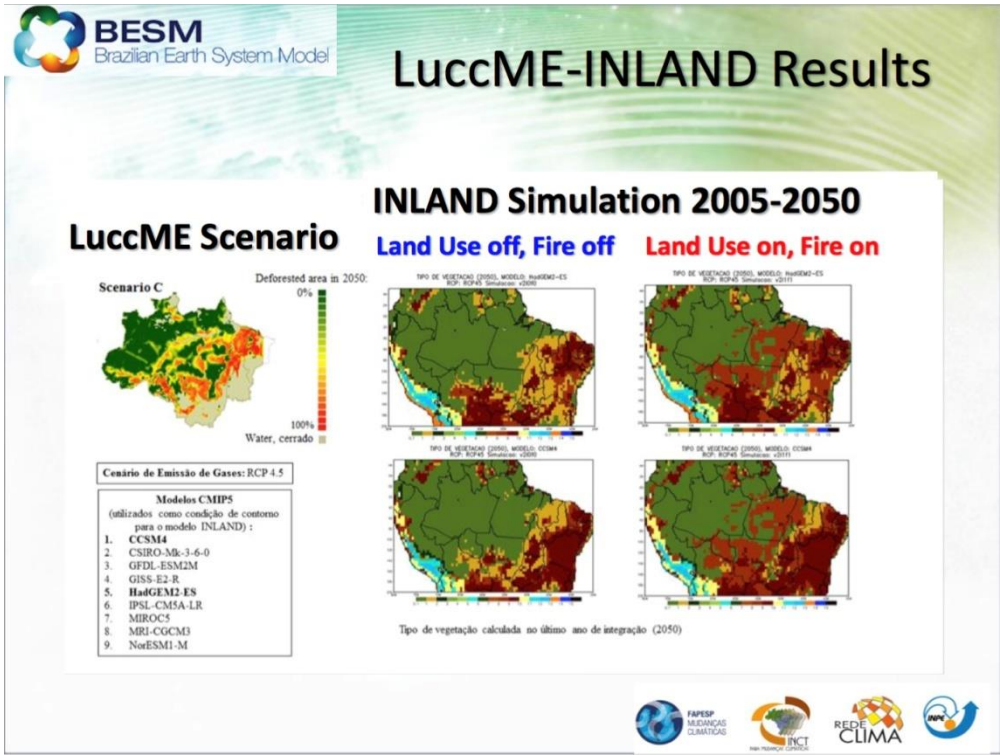
Impact on precipitation

Task 3- WP1

Analysis of the role of forest disturbance and land-use change on forest fragmentation and degradation using moisture recycling network model, the LPJmLand and INLAND dynamic vegetation models.

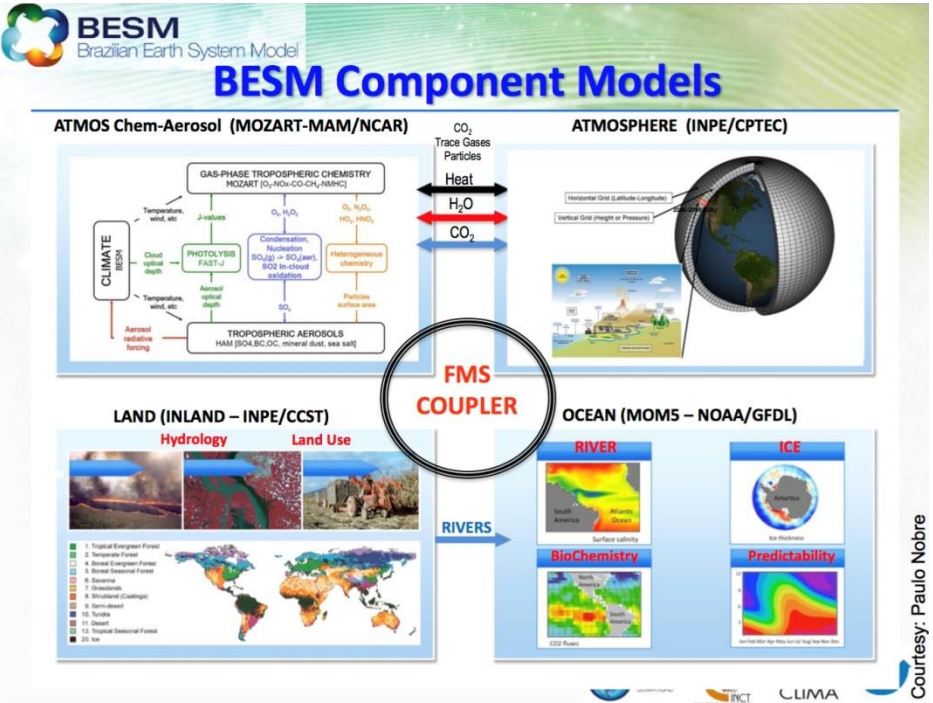
Distribuicão da vegetação natural estimada pelo modelo INLAND

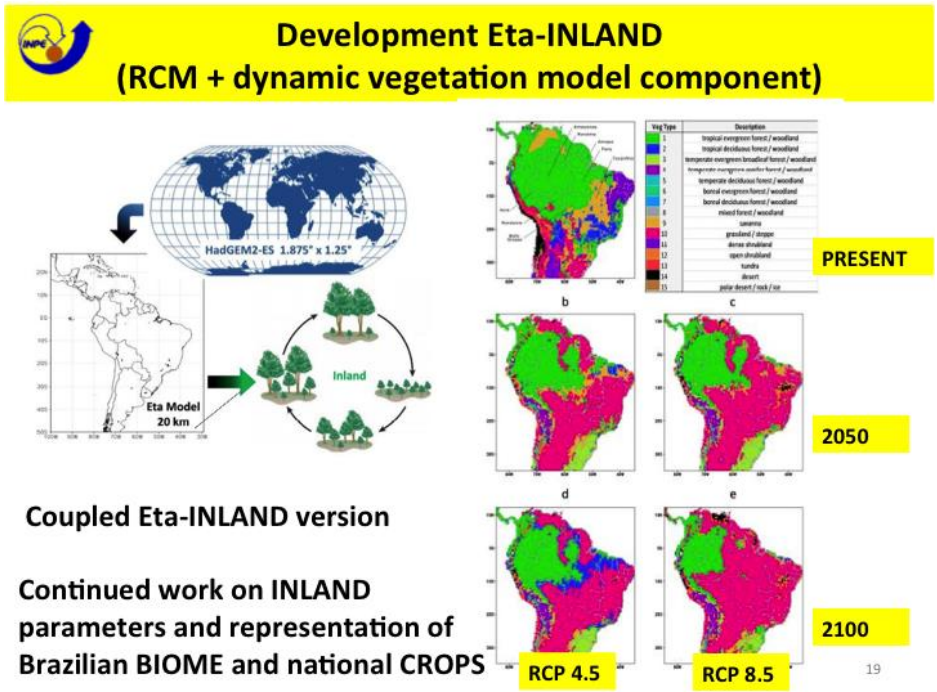




Task 4-WP1

Assessment of seasonal to decadal precipitation variability associated with the amount and direction of moisture transport and recycling in South America by applying the CPTEC climate model and the moisture recycling network model which integrates drivers of climate and land-use change. Investigate impacts of changes in Amazon land surface characteristics on rainfall variability in SSA using the CPTEC/INPE AGCM and INLAND dynamic vegetation model.

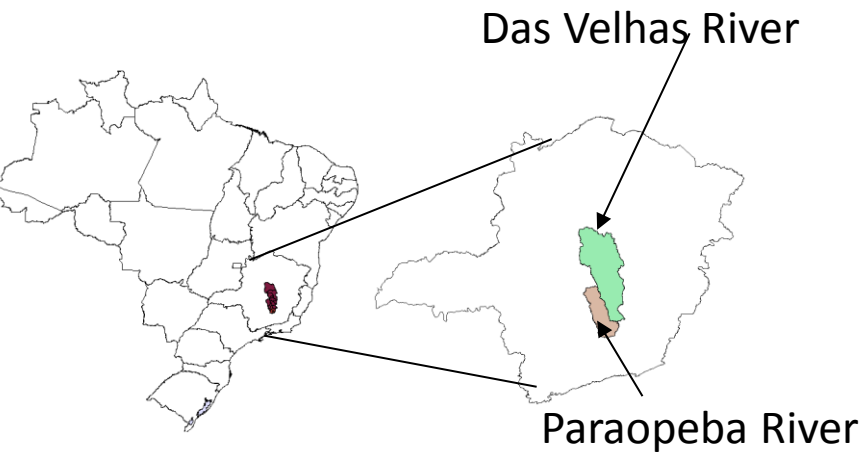




Task 5- WP1

Evaluation of the relationship between local land use change and hydrological change in SSA. Study of the potential effects of agroforestry on severe drought events. Historical series of hydroclimatic variables will be correlated with climate variability indexes, land surface and vegetation properties to explore the hydrologic response through numerical experiments.

Impacts of Land Use and Land Cover Changes in water availability in Basins of Southeastern Brazil



Methods

- **Analyses of hidrometeorological measured series: Precipitation, Temperature, Streamflows, etc.**
- **Land use maps from IBGE**
- **Hydrological simulation of past extreme events under different land use conditions**

Task 6- WP1

Development of regional climate indices to monitor climate variability in SSA at subseasonal and seasonal timescales by applying combined EOFs to sets of key variables identified in WP1.T1 and T2. Moreover, an index illustrating the importance of source and intermediate moisture transport regions and their influence on SSA will be developed, based on WP1.T3 results. Variables that can be used as an early warning signal of critical climatic conditions will be co-designed and co-produced with the other WPs and coordinated by WP0.

To be discussed

WP2

Predictability and Prediction tools

Task 1-WP2

To apply relevant metrics (error quantifications, anomaly correlations and probabilistic verification scores) as well as traditional potential predictability definitions on existing hindcasts from S2S, CHFP projects, and other global centres (ECMWF-S4), and the hindcasts of global and regional models available at CPTEC/INPE. The assessment will focus on precipitation and temperature, and later extended to other variables.

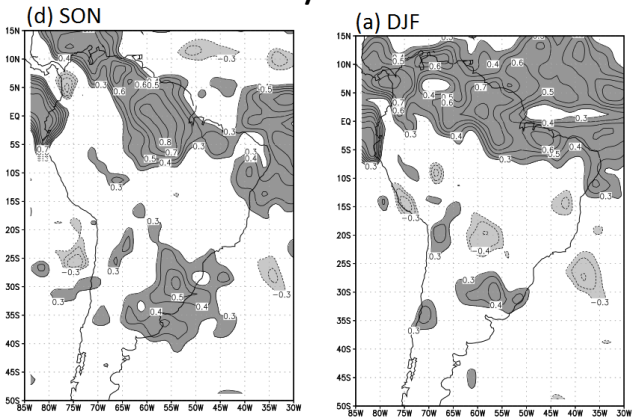
Traditional Potential Predictability

outputs of models

Need to be coordinated: models and groups

Anomaly correlation

CPTEC/INPE AGCM



Which are the seasons and regions with potential predictability ?

Other sources of predictability

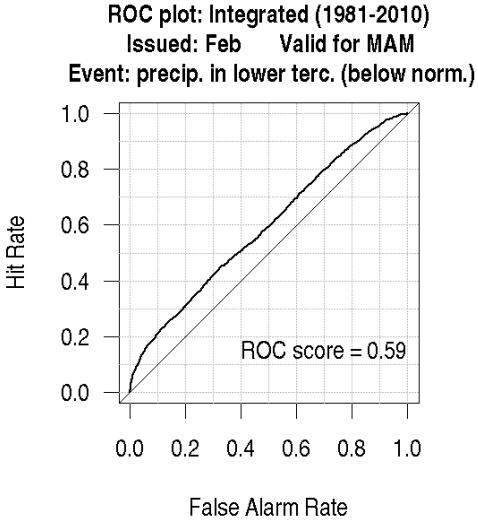
Identification of indices associated with typical conditions of extremes

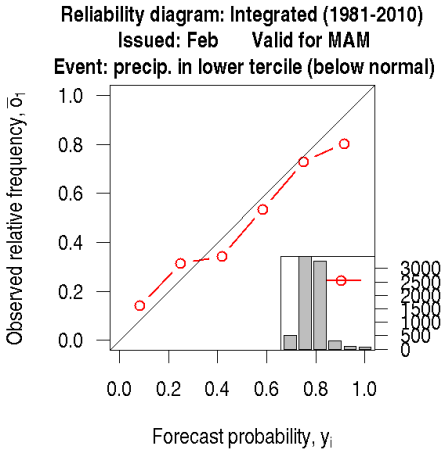
Observations and predictions

Task 1-WP2

- **Assess skill of sub-seasonal and seasonal predictions over S. America**
- **Investigate procedures for combining predictions from different models**

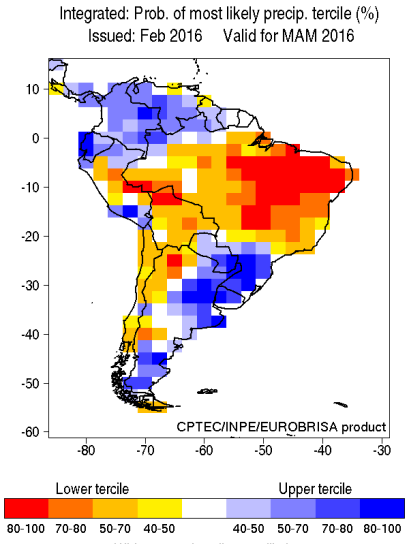
Methods for assessing prediction skill

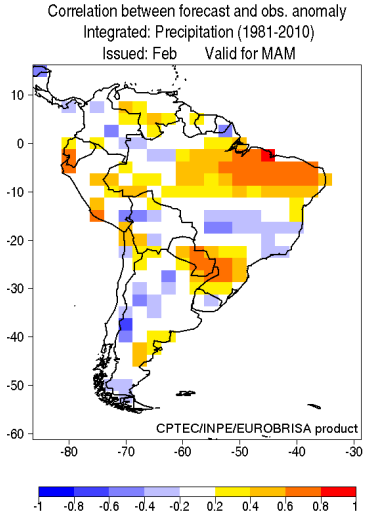




Candidate probabilistic scores for assessing different forecast quality attributes: ROC to assess discrimination and reliability diagram to assess reliability and resolution

Procedures for combining and calibrating climate predictions





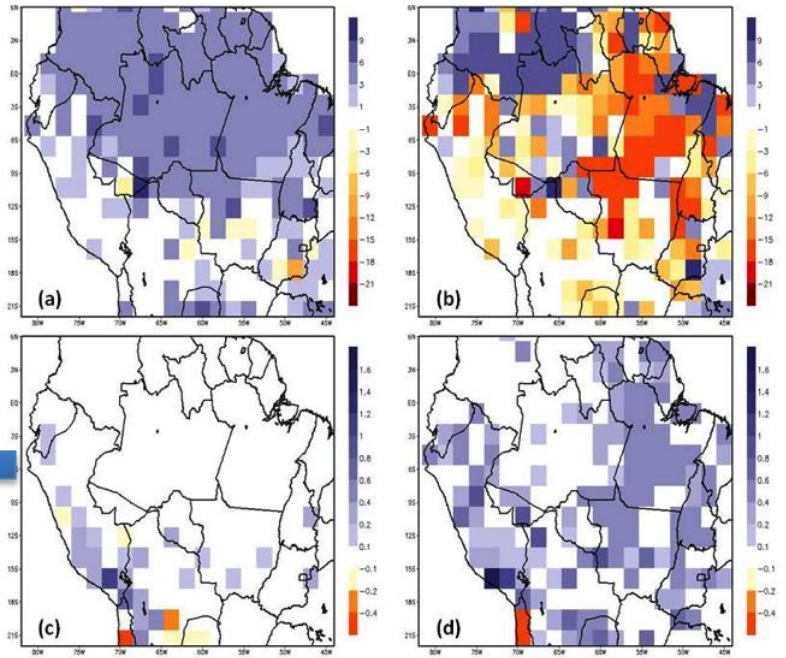
Candidate methods: Maximum covariance analysis for spatial calibration, Linear regression for local calibration and combination at grid point level

Task 2- WP2

Analysis of land cover change impacts on the regional climate, especially on the occurrence and intensity of extreme events in the near-future and their effects on the hydrology and carbon cycles. Conduct offline simulations with the land surface model ORCHIDEE and the dynamic vegetation model LPJmL forced by historical reanalysis and near-future multi-model climate projections (e.g. CMIP5). Changes in moisture transport from the tropics to SSA will be assessed under historic and future climate to attribute changes to deforestation and degradation.

Simulations of biomass change (kgC/m^2) in upper canopy (a and b) and lower canopy (c e d) from the present period until 2065-2070. In (a) and (c) simulations with CO2 rise as projected following RCP4.5; in (b) and (d) same as (a) and (c) but also including effects of deforestation and fires.

How this might affect moisture transport and rainfall variability?



Task 3- WP2

Development of products based on seasonal ensemble streamflow and crop yield forecasts in basins and regions of SSA (Paraíba do Sul and Iguazú Basins, the Argentinean Pampas and other areas to be selected with WP0). **Assessment of seasonal ensemble streamflow forecast for drought and flood made by different hydrological models (MHD-INPE, ORCHIDEE, VIC). The ORCHIDEE model will also be used to predict forests, agricultural and pastures productivity in selected regions of SSA.**

The CASANDRA platform based on the DSSAT crop model will forecast crop yield in the Pampas of Argentina. Both potential skill (compared to reanalysis with same impact model) and actual skill (compared to observed values of discharge or crop yields) will be assessed. The relative contribution to the total skill originating from correct specification of initial conditions (e.g. soil moisture, vegetation status, snow, etc.) versus climate forcing quality respectively will be assessed. **The sensitivity of crop yields to the activity of the leading patterns of climate variability on subseasonal (e.g. MJO) and seasonal (e.g. ENSO, SAM, IOD) timescales will be assessed. Techniques for bias correction and calibration-downscaling of the information provided by climate prediction for its incorporation in impact models will be analyzed.**

To be discussed

Task 4- WP2

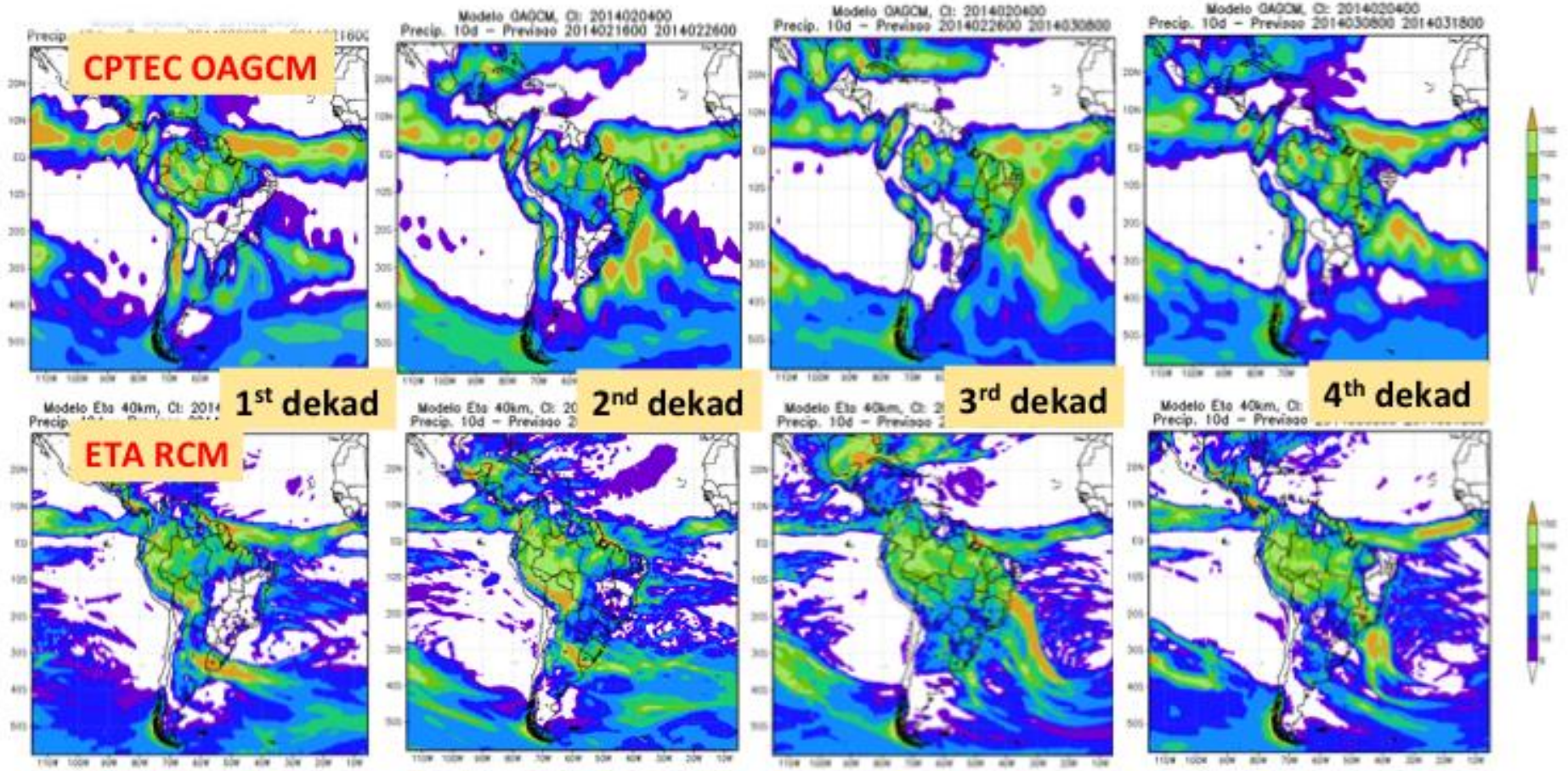
Co-development of a regional prediction framework for the two WP0 case studies based on the outcomes of the WP2 objectives and on WP0 co-design workshop discussions.

To be discussed

NEW PRODUCT, SOON OPERATIONAL, SUB-SEASONAL FORECASTS

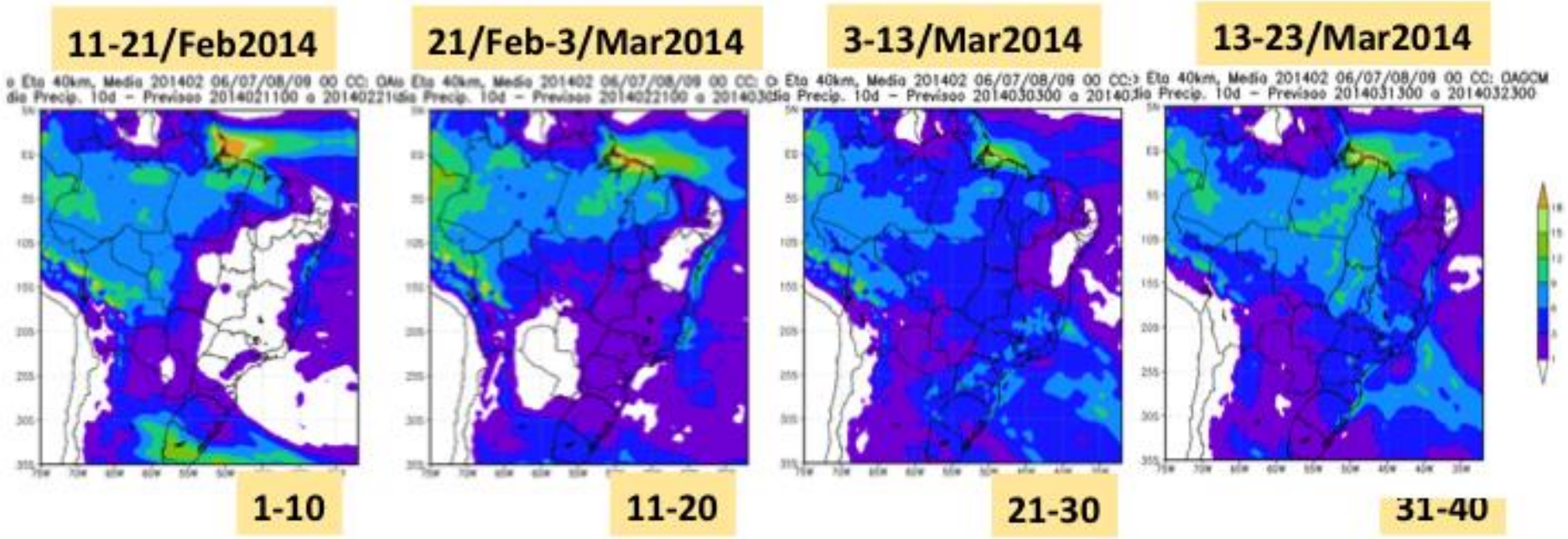
- Eta RCM 40km nested to CPTEC Coupled OAGCM,
60-day forecasts,
Initial conditions at 12Z,

except on dates 13, 14, 15, 16, and 17 of each month for a long integration (about 4.5 months)
Hindcasts being prepared.



SUB-SEASONAL FORECASTS

4-member mean



Regional ETA model

WP3

Social processes explaining climate information appropriation

Renzo- co- production with ONS

Discussions on Collaborations

Exchange techniques of analyses
Discussions about results
Collaborations : providing products
Collaborations : disseminating results through papers
Collaborations : annual project reports