

## Science Update by Global Change Research Programmes

Regional Climate Information for Decision Makers

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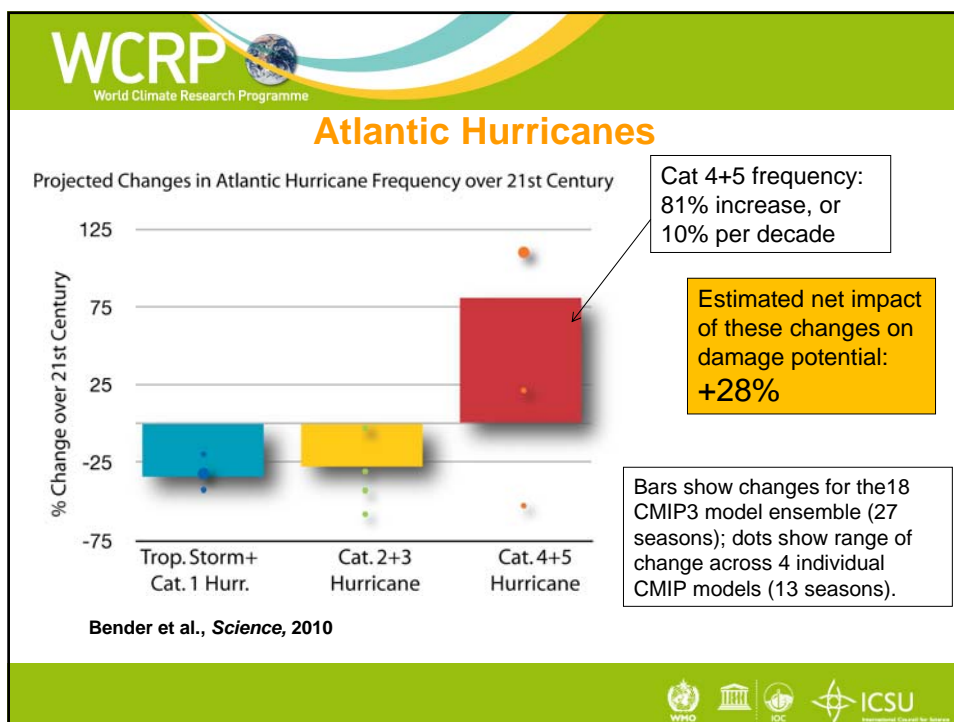
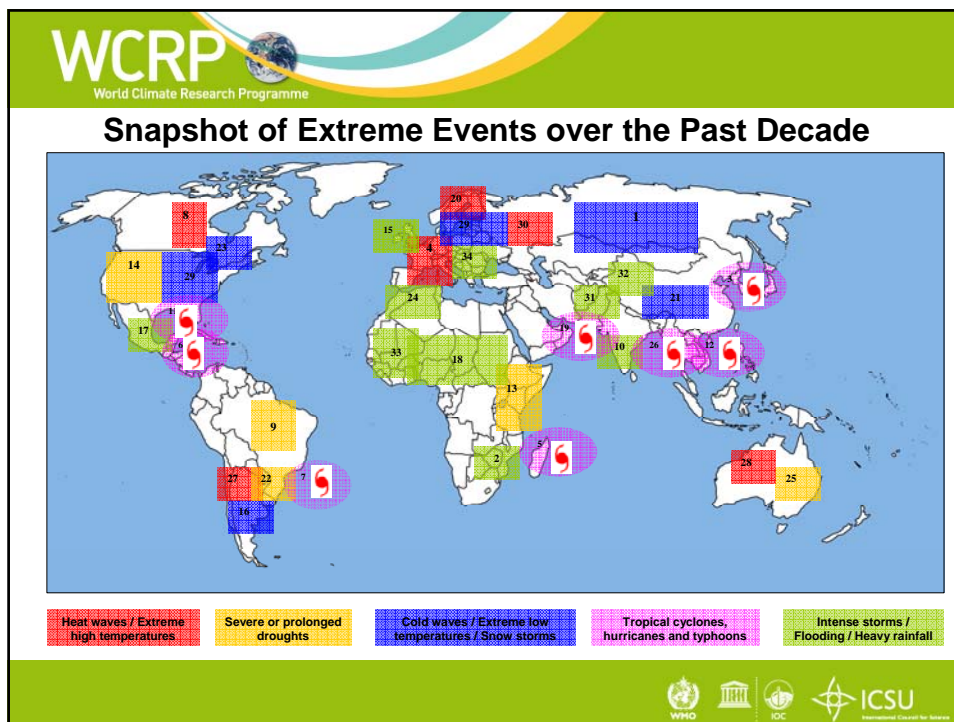


**A major theme in our research coordination is detection and attribution of the causes and impacts of climate variability and change, especially at the regional level.**



**This research includes for example, study of extreme events such as those observed during the past decade, including ones in 2010.**

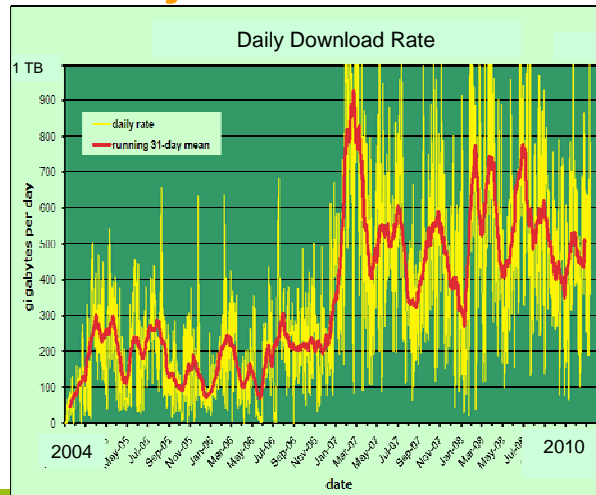




## Climate Projections

### Interest in CMIP3 results continues unabated!

- More than 550 peer-reviewed publications.
- ~1 Pbyte of data downloaded.
- More than 3,000 registered users.



## Climate Change & ENSO

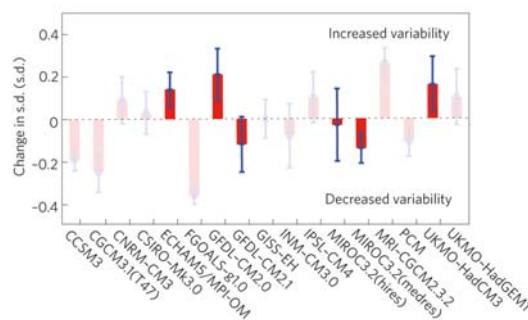
**REVIEW ARTICLE**

### The impact of global warming on the tropical Pacific Ocean and El Niño

Mat Colloff<sup>1</sup>, Susan R. Aul<sup>2</sup>, Wensu Cai<sup>3</sup>, Alexandre Gnanadesou<sup>4</sup>, Eric Guilyardi<sup>5</sup>, Kai Han<sup>6</sup>, Markus Jochum<sup>7</sup>, Matthew Langehaug<sup>8</sup>, Scott Power<sup>9</sup>, Axel Timmermann<sup>10</sup>, Gidon Wroble<sup>11</sup> and Andrew Wittenberg<sup>12</sup>

The El Niño Southern Oscillation (ENSO) is a naturally occurring fluctuation that originates in the tropical Pacific region and affects weather, agriculture, fisheries, and other aspects of human and natural systems. Understanding the impact of global warming on ENSO is a major challenge for climate scientists. This review article synthesizes the current state of knowledge on ENSO and its potential response to global warming. It discusses the physical mechanisms underlying ENSO and the various climate models that have been used to simulate its future behavior. The article also highlights the uncertainties in these simulations and the need for further research to improve our understanding of ENSO and its role in the Earth's climate system.

As the frequency of extreme weather events increases, understanding the impact of global warming on the tropical Pacific Ocean and El Niño becomes increasingly important. This review article provides a comprehensive overview of the current state of knowledge on ENSO and its potential response to global warming. It discusses the physical mechanisms underlying ENSO and the various climate models that have been used to simulate its future behavior. The article also highlights the uncertainties in these simulations and the need for further research to improve our understanding of ENSO and its role in the Earth's climate system.



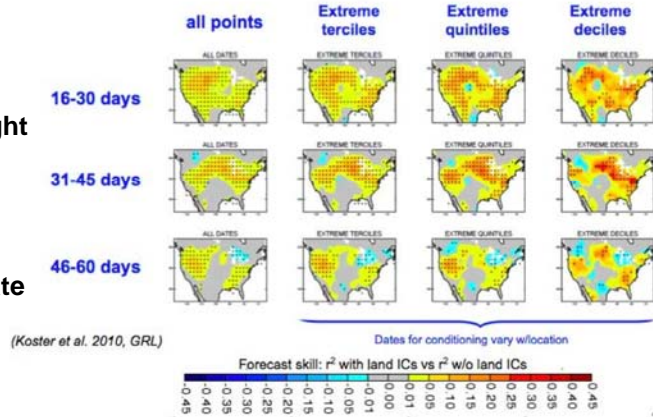
**It is not yet possible to say whether ENSO activity will be enhanced or dampened, or if its frequency will change, despite considerable progress in understanding of climate change on many processes that contribute to El Niño variability.**

Collins et al., Nature Geosciences, 2010

## Seasonal Climate Prediction

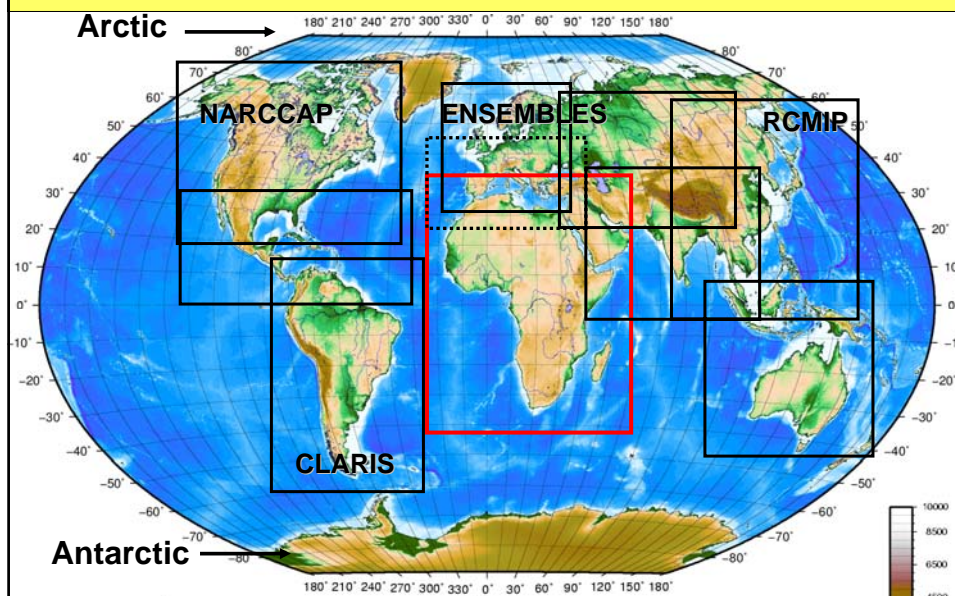
Temperature forecasts: Increase in skill due to land initialization (JJA)  
(conditioned on strength of local initial soil moisture anomaly)

The results highlight the potential usefulness of improved observational networks for climate prediction.



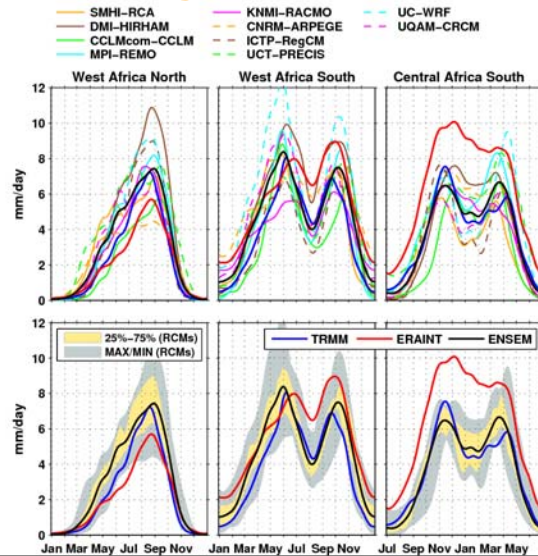
18

## WCRP Regional Climate Project: CORDEX





## Regional Climate Prediction

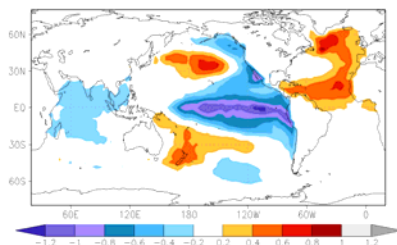


Annual cycle of precipitation simulated by 10 Regional Climate Models (RCMs) for three African regions compare very well with satellite observations (TRMM) and reanalysis.

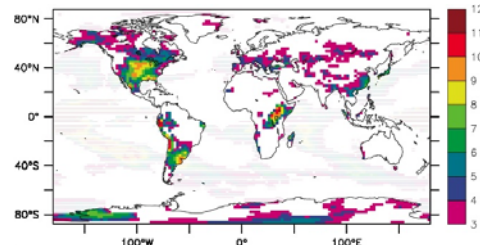
Courtesy of C. Jones, Sweden Met. Center

## Droughts in a Changing Climate

Climate Model Evaluation Project (DRICOMP)



SSTA patterns

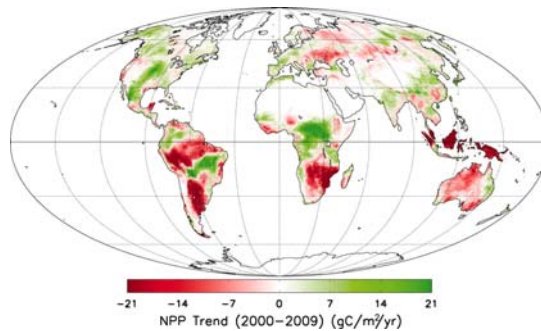


Implications for future global droughts.

Courtesy of Kirsten Findell (GFDL-NOAA-USA)

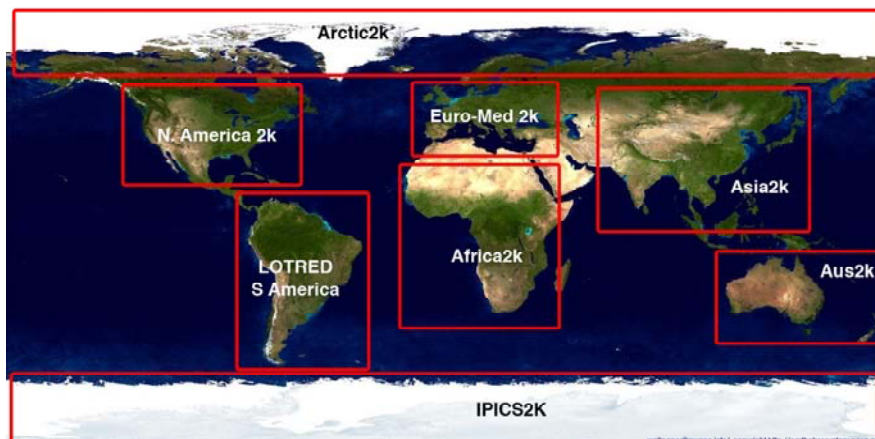
## Regional and Decadal Trends in Terrestrial Ecosystems Net Primary Production

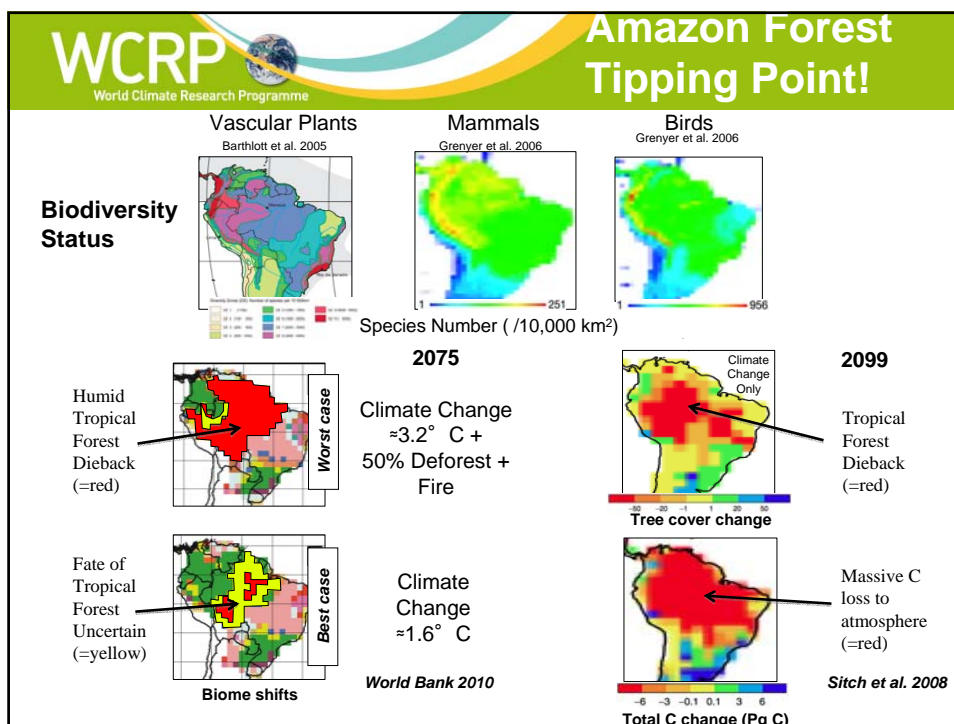
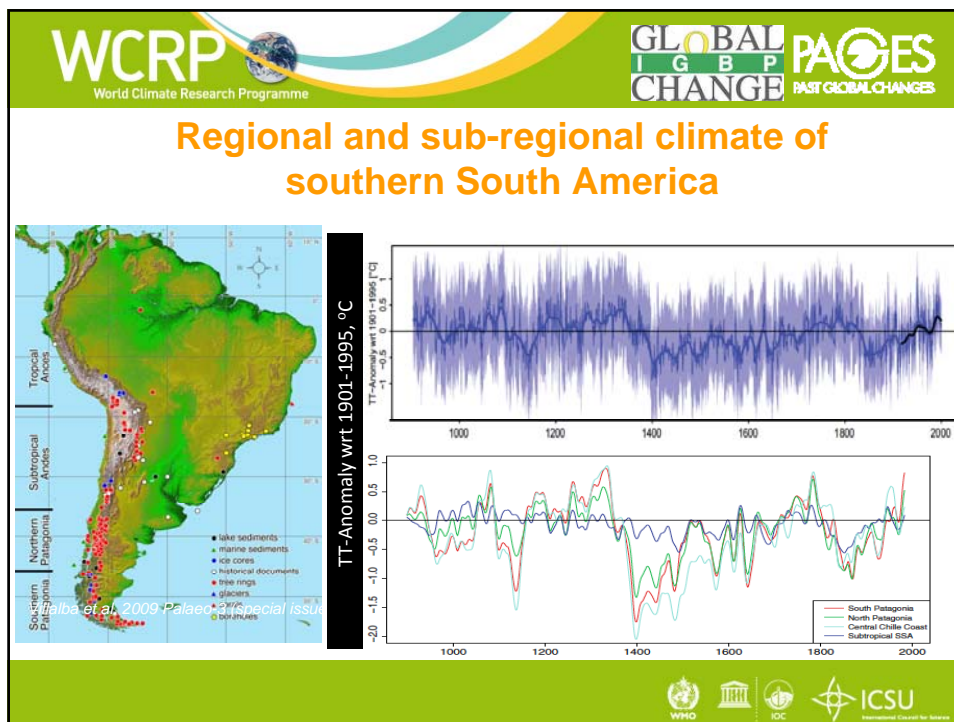
- Global NPP decrease
- SH decrease - drought
- Impact on terrestrial Carbon sink

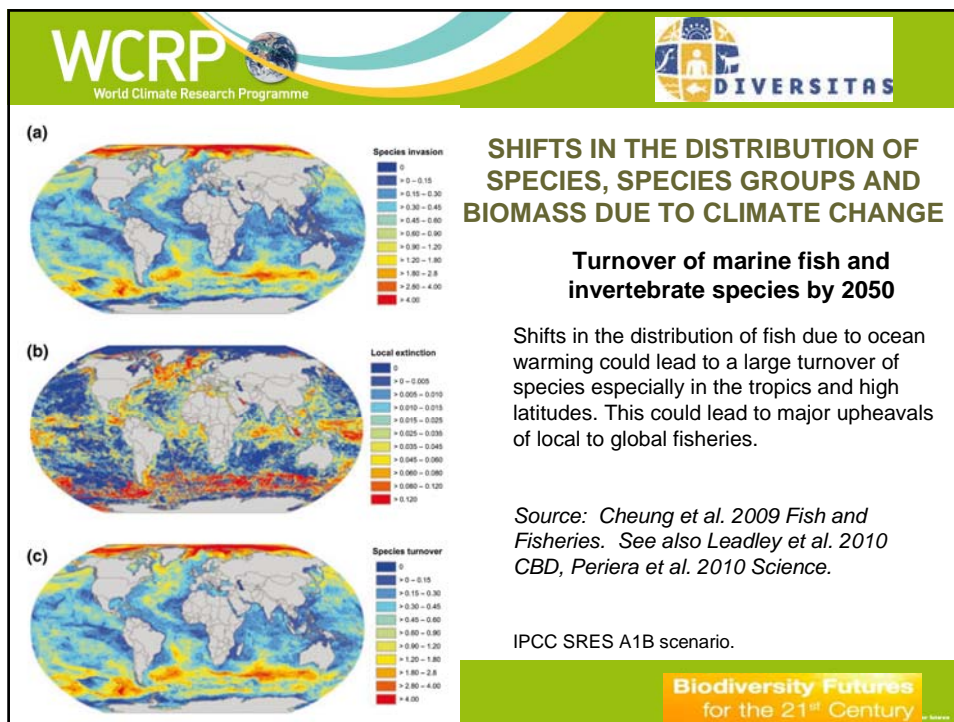



**Terrestrial NPP Trends  
(2000 – 2009)**

## Regional & Decadal Paleo-Records













**WCRP**  
World Climate Research Programme

Summary

### Research Priorities Include:

- Quantify and communicate uncertainties** in climate change information/knowledge;
- A major focus on **regional and intera-seasonal to inter-annual, and decadal** climate prediction/projection;
- Promote and enable **timely, reliable, and easy to access** climate information and knowledge for adaptation planning, mitigation strategies, and assessing risks of climate variability and change; and
- Support education, training and development of **next generation of climate experts**.

Essential Pillar of **Global Framework for Climate Services**

**ICSU**  
International Council for Science