

WISE and CEOP

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WISE

- WISE: Worldwide Integrated Study of Extremes
- Objective: To advance our understanding of extremes including their distributions, trends, and inter-connections and to contribute to their better prediction

DEFINITIONS AND SCOPE...

Extended wet period: prolonged, substantial precipitation for 24 h to several days that affects basins on scales of at least 10^5 km^2 .

Drought: ... utilize standard definition(s)

As well as:

Drought-Precipitation Combination: Long periods of dry conditions interspersed with heavy rain

Flood Focus: Those initiated by extensive precipitation rather than very localized flash floods

CEOP

1. Objectives:

Water and Energy Theme: Use enhanced observations to better document and simulate water and energy fluxes and reservoirs over land on diurnal to annual temporal scales and to better predict these on temporal scales up to seasonal for water resource applications.

2. Time Period: 2001-04

3. Datasets: unprecedented satellite, surface, model

WISE and CEOP

Focus in a collective manner on extremes during a particular period

Period:

- **CEOP**

Approach:

- **Focus on a particular period**
- **Examine extremes individually**
- **Relate to each other as well as the overall climate system**

Benefits:

- **Efficient progress**
- **Hands-on experience with such studies**

Actions:

- **(Continue to) carry out individual research projects and update others**
- **Eventually carry out joint research projects**

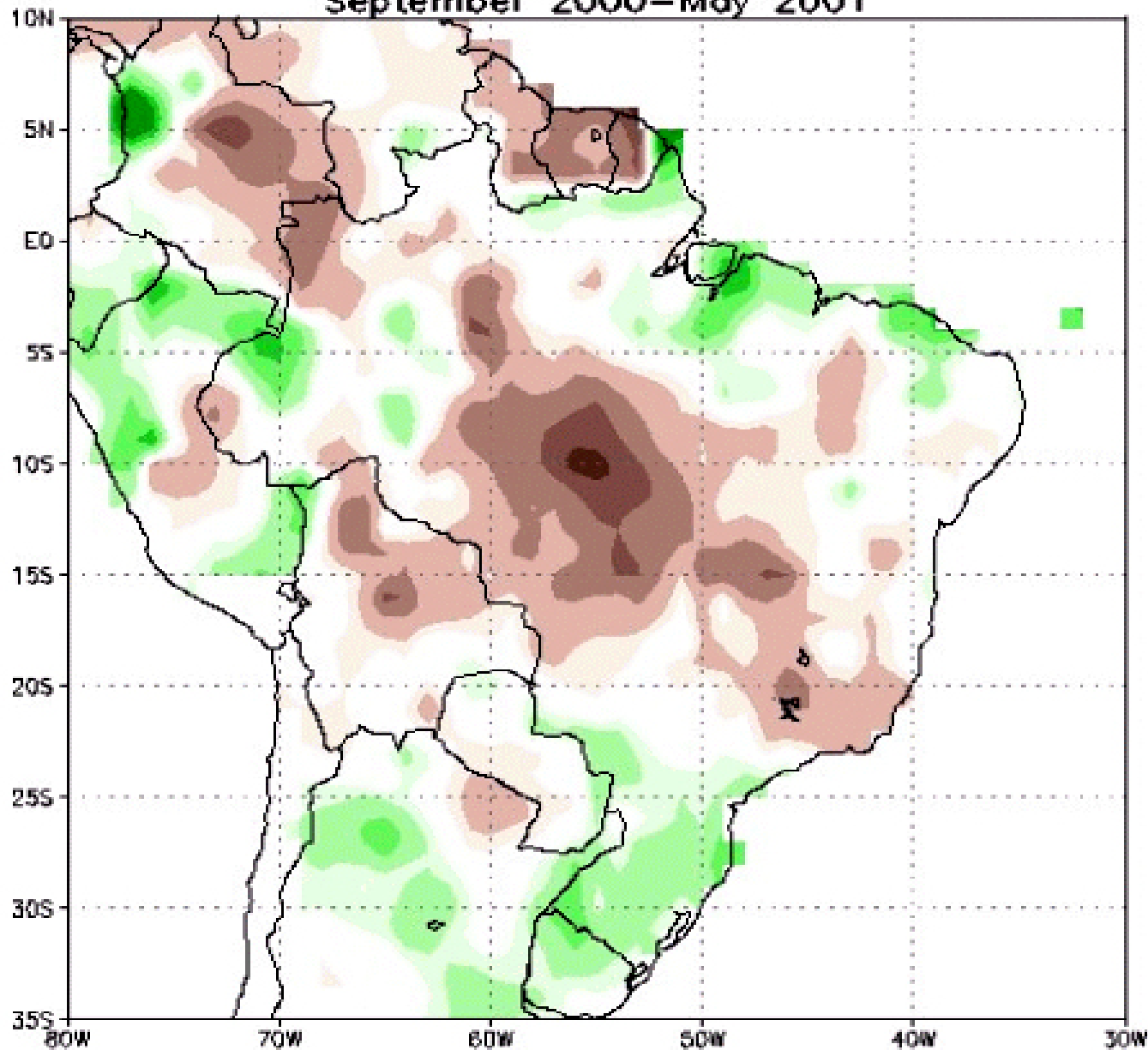
Outcome:

- **Individual and synthesis articles on individual extremes and their connections**

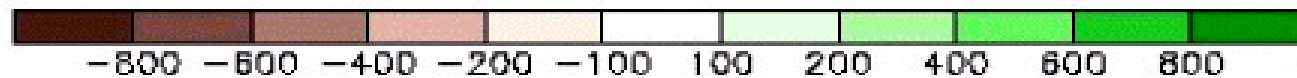
RECENT EXTREMES

A Few Illustrations

Precipitation Anomalies (mm)
September 2000–May 2001



Rainfall
anomalies
Sept 2000-May
2001)



ENERGY HYDROELECTRIC CRISIS IN Southeast BRAZIL

95% of Brazilian Energy is Hydropower

Consecutive Dry Summers 2001-2002

Power Shortage

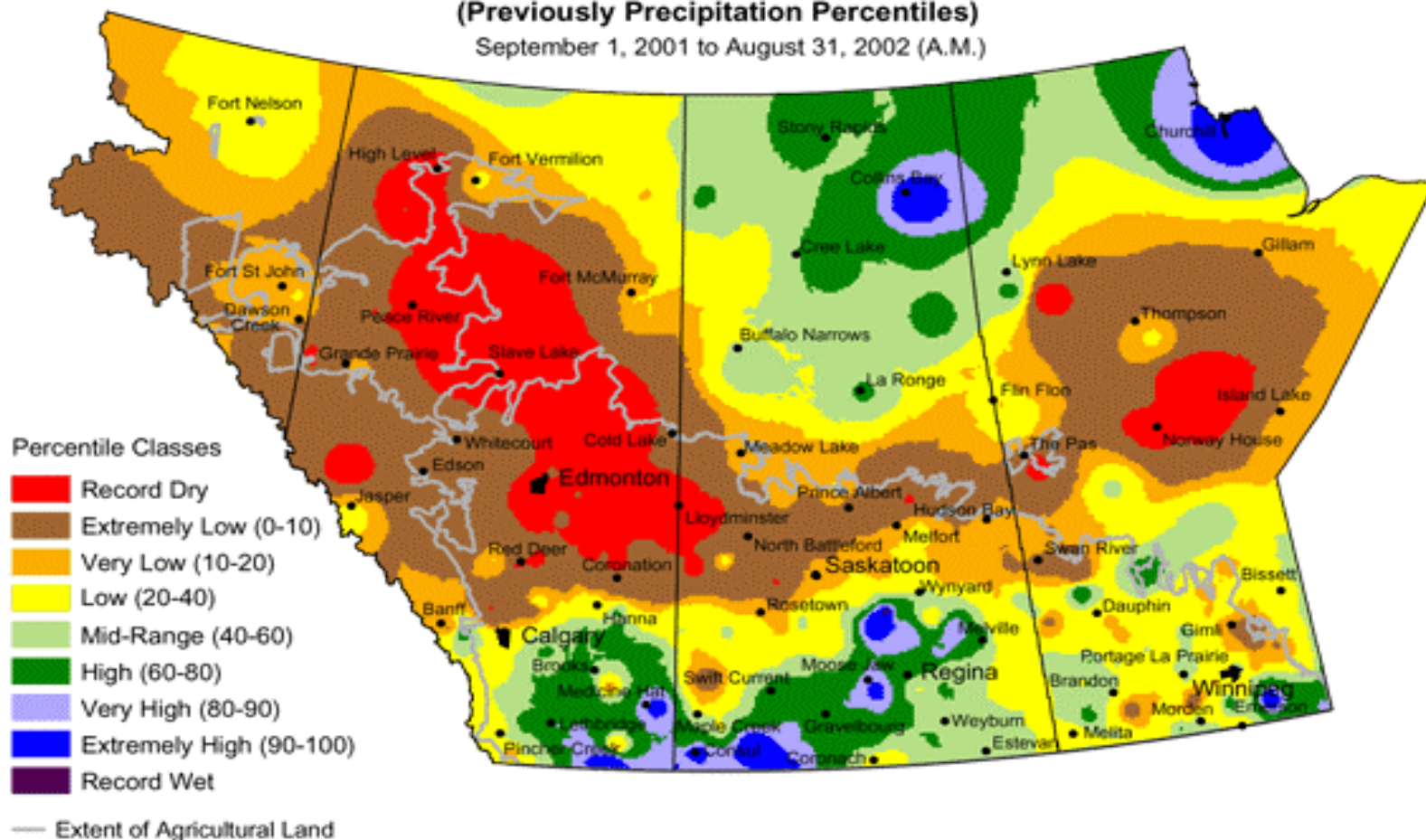
CANADIAN PRAIRIES

2002

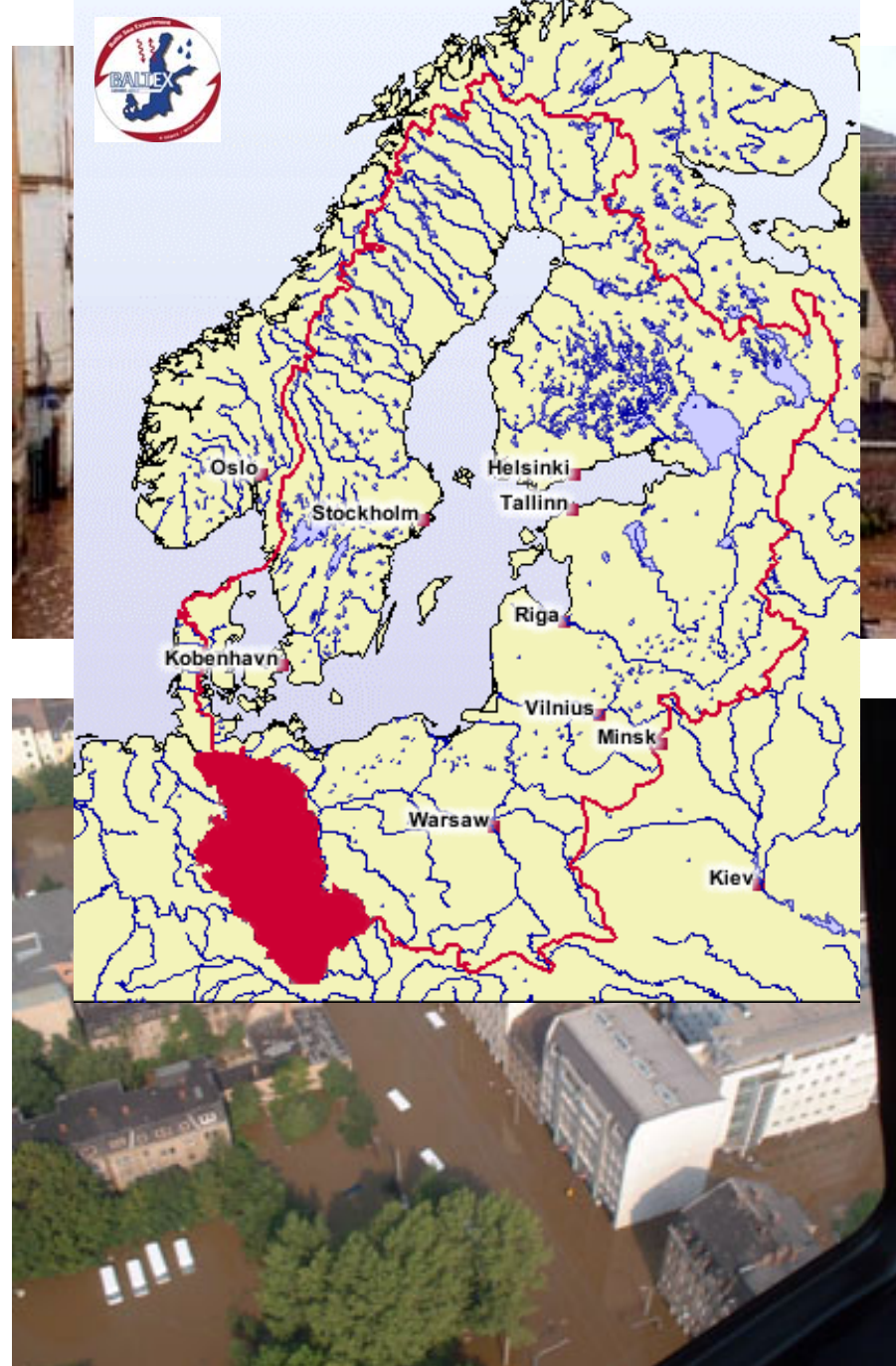
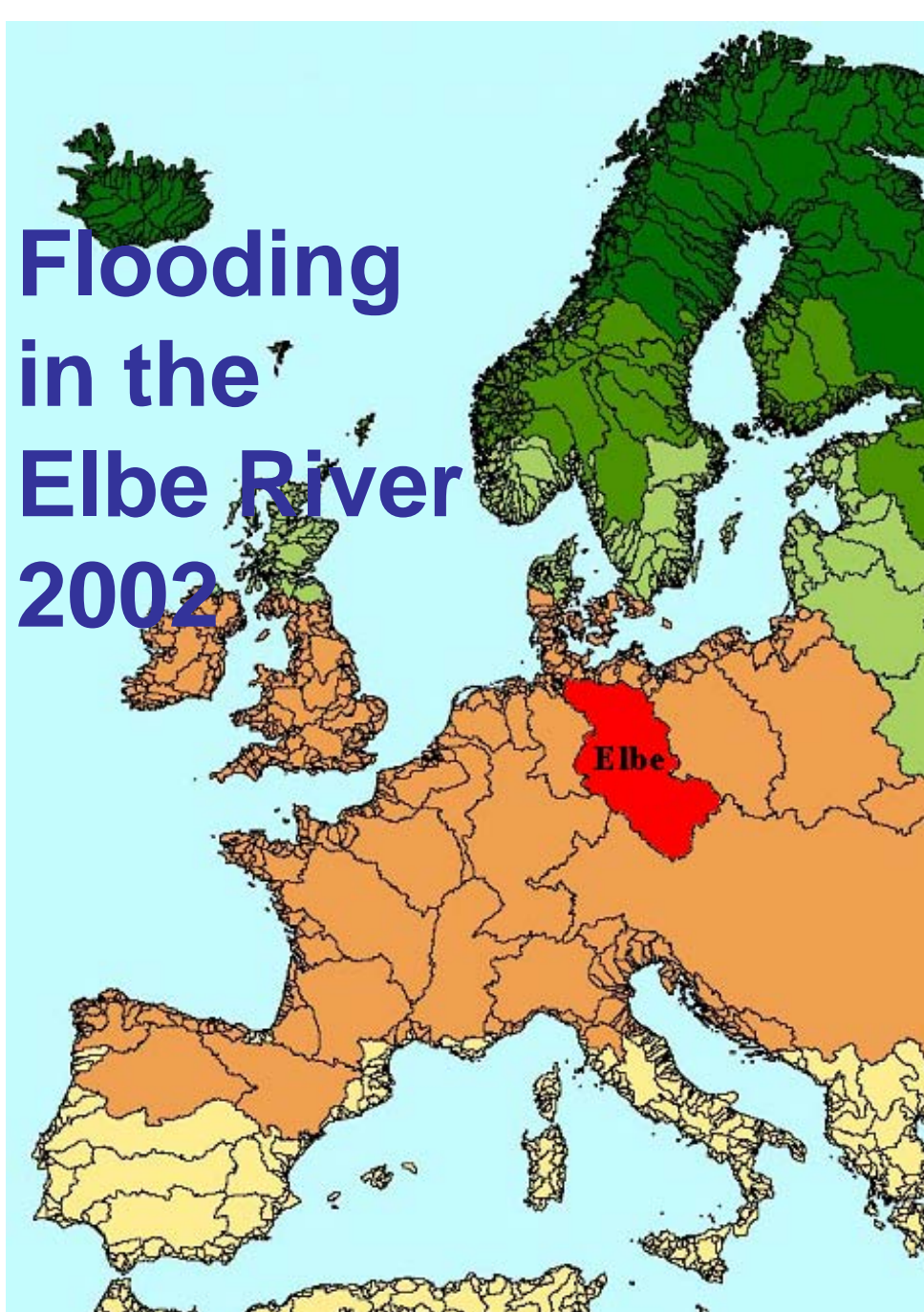
Current Precipitation Compared to Historical Distribution

(Previously Precipitation Percentiles)

September 1, 2001 to August 31, 2002 (A.M.)



Flooding in the Elbe River 2002

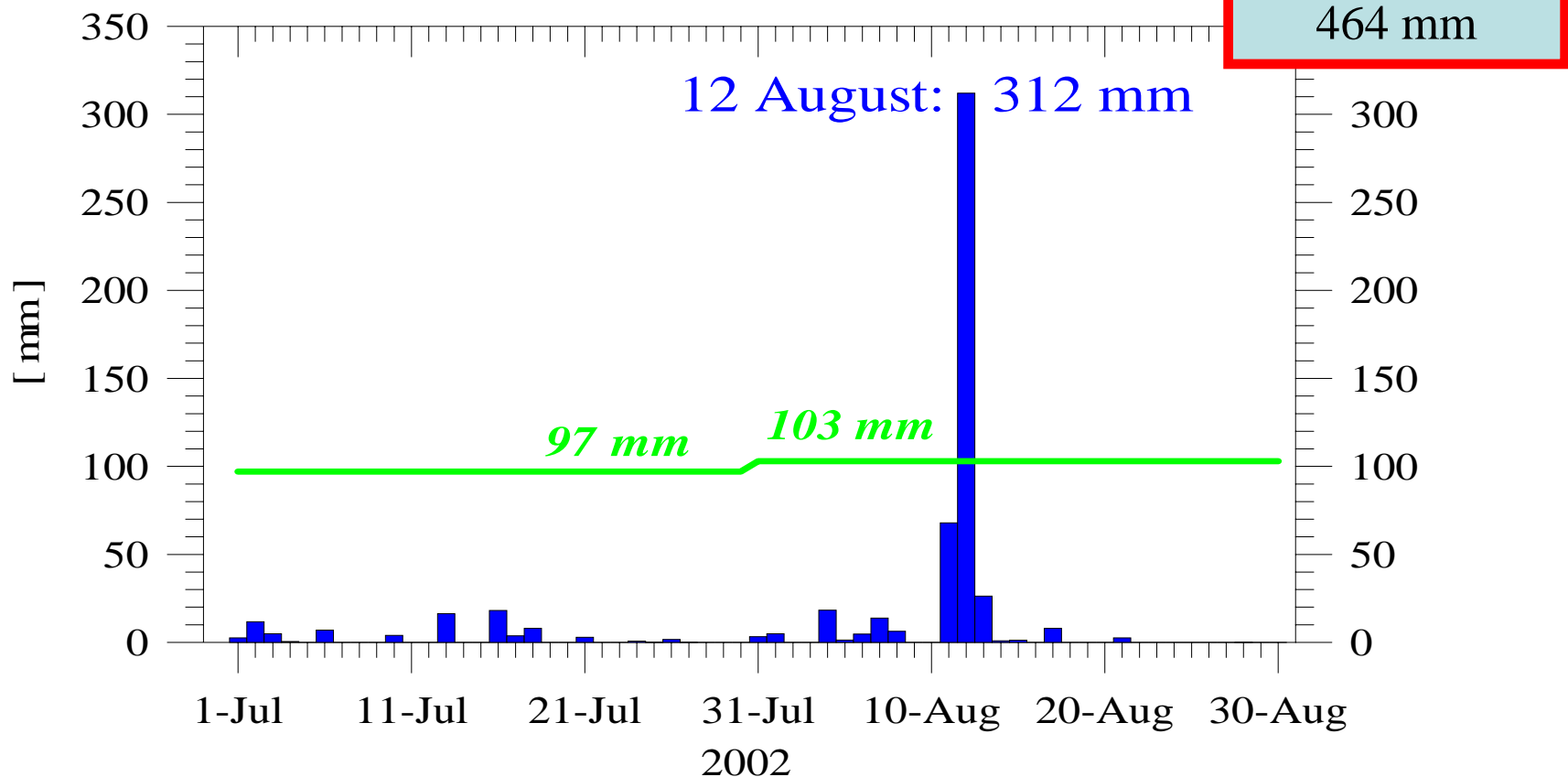


Recent Elbe flooding event in central Europe:

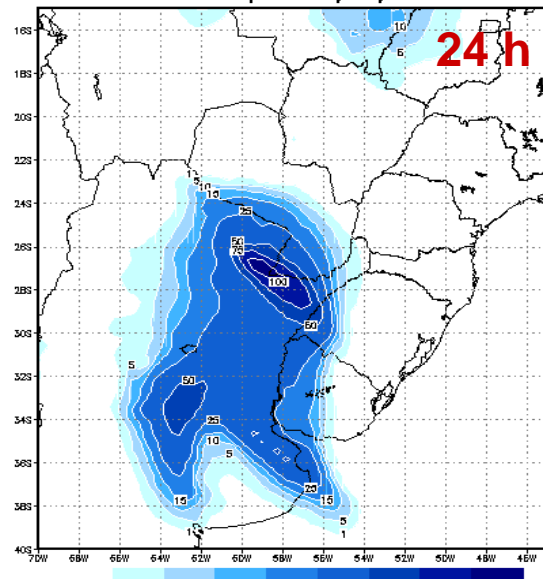
More than 300% of the mean *monthly* August precipitation measured at some stations within **24 hours** !

Daily Precipitation July/August 2002 Station Zinnwald, Germany

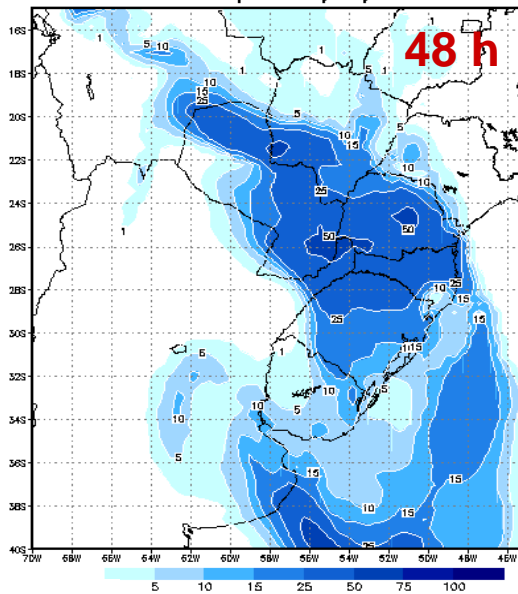
Climate means 2002



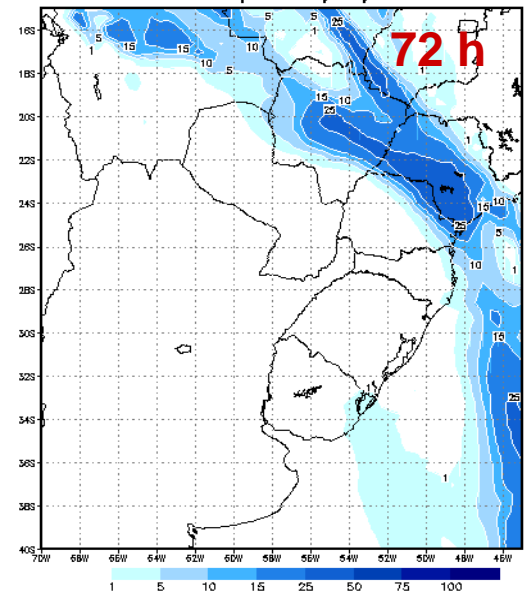
FCT +24h valida para 18/04/2003 12UTC



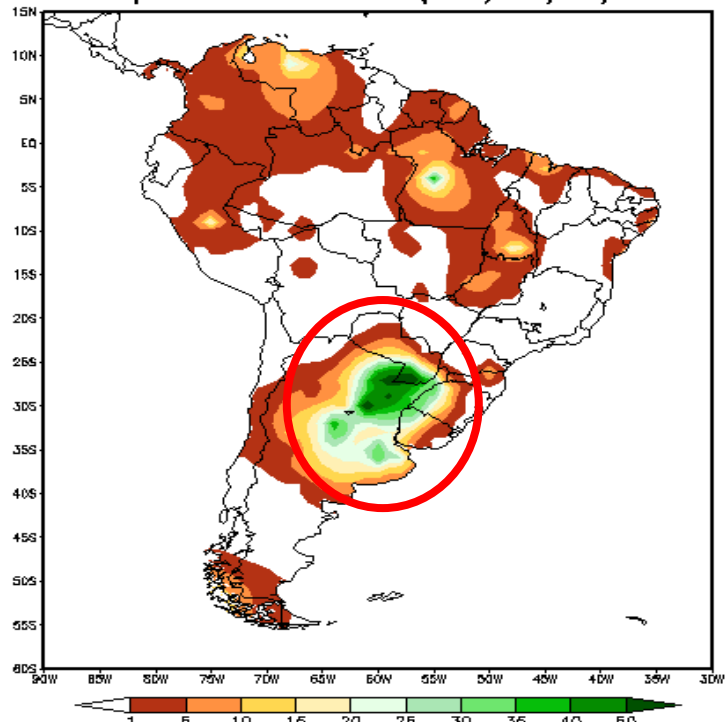
FCT +48h valida para 18/04/2003 12UTC



FCT +72h valida para 18/04/2003 12UTC



Precipitacao Acumulada (mm) 18/04/2003



**Forecast of extreme rainfall and floods in
Santa Fe-Argentina**

**Eta/CPTEC 40 km
Case of April 15 2003**

Fontes de dados: CMOD/INPE-INMET-FUNCME/CE-LWRS/PB-EWPAR/RN-DMRH/PE-FUNCME/CE
DHME/PI-CEPES/SE-NMRH/AL-SRH/BA-CEMIG/SIMGE-MG-SEAG/ES-SIMEPAR/PR-CUMERH/SC



Children Hospital in the city of Santa Fe during the flood of the Rio Salado in April 2003



Even graveyards are under water in Santa Fe

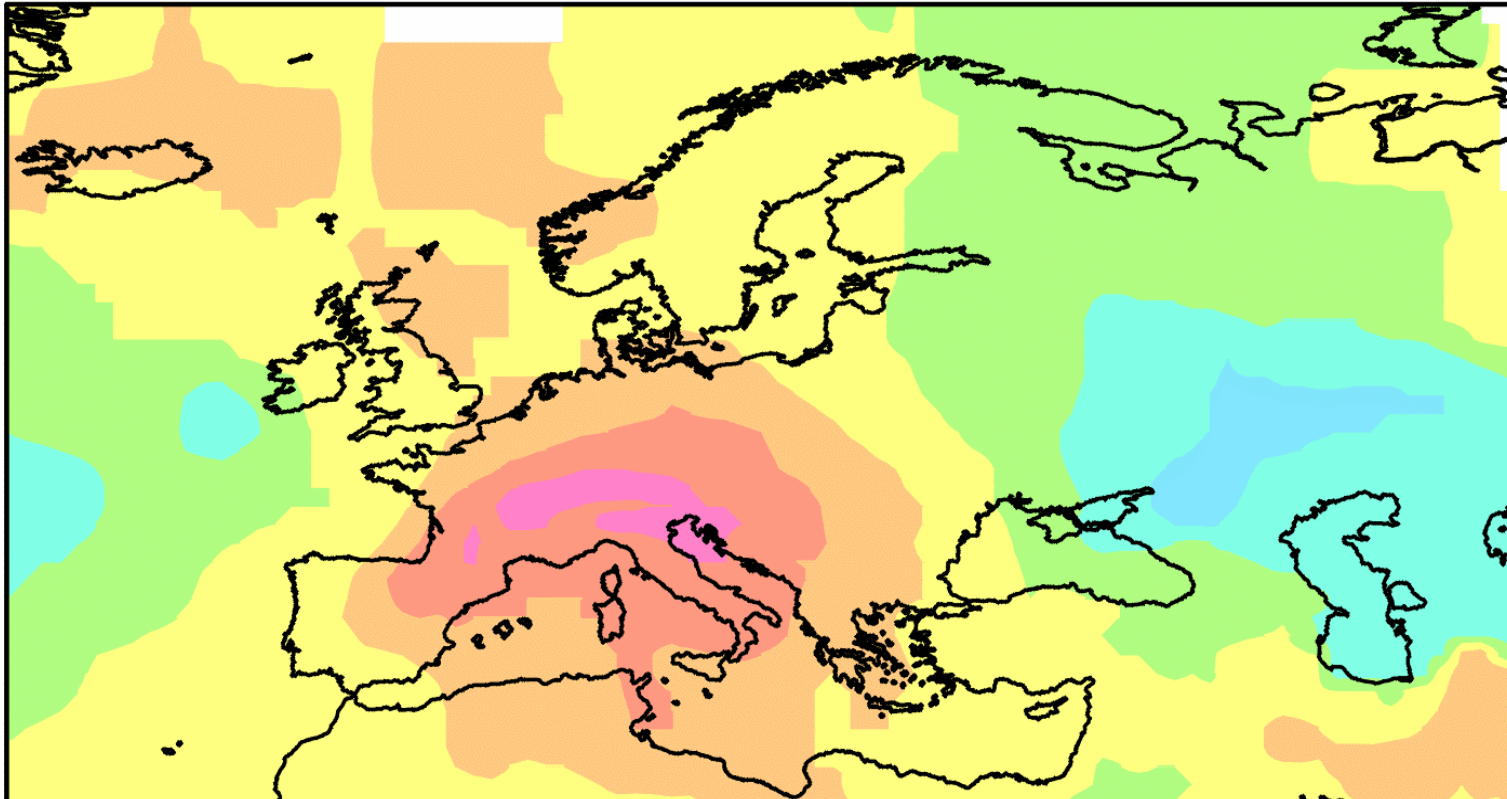


Barranquitas town in Santa Fe during the flood of the Rio Salado in April 2003

.. BBC's Peter Greste reports that nobody, not even the weather forecasters, had predicted the floods which occurred after heavy storms on Monday.

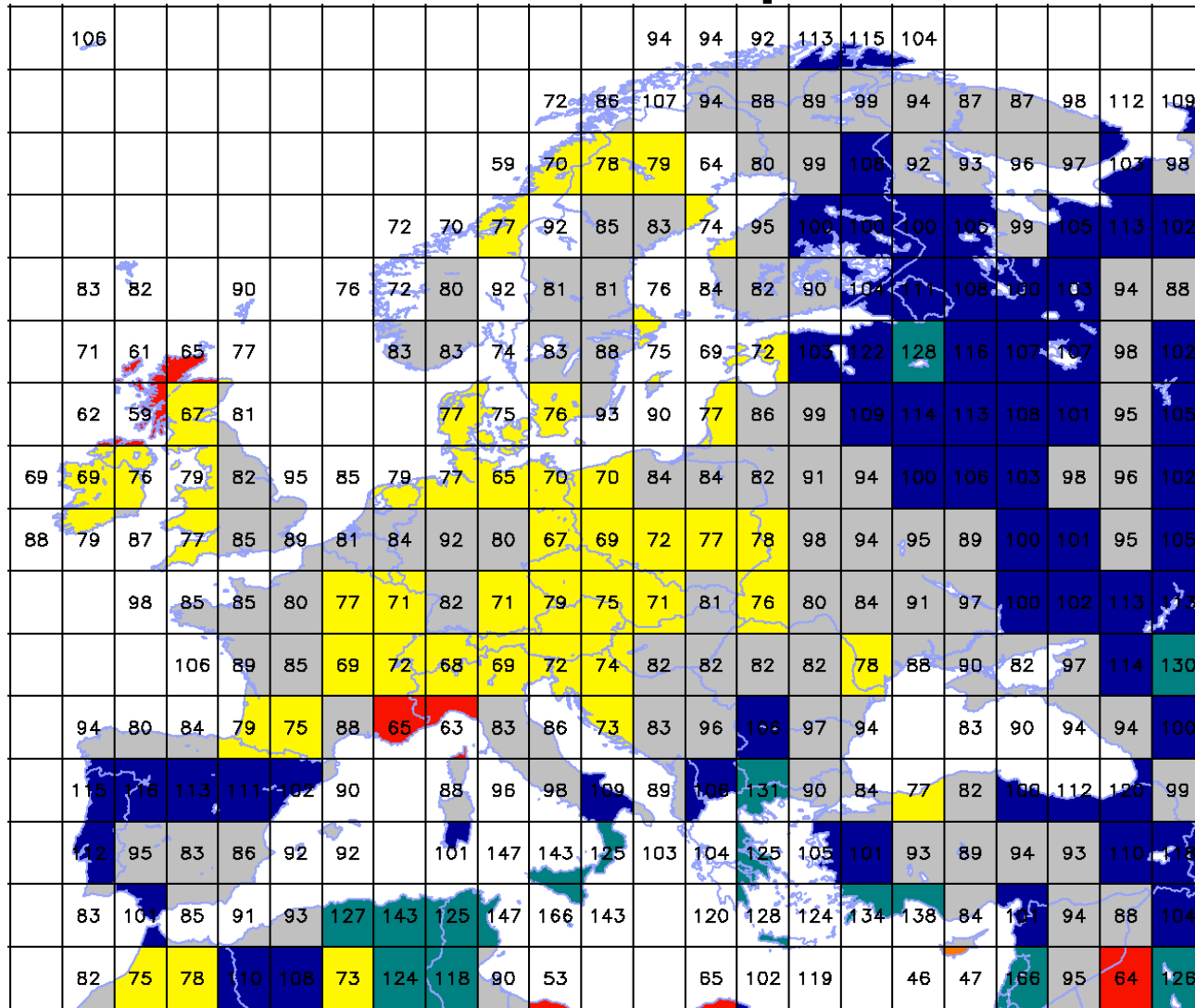
..President Duhalde said that "there is no system that can anticipate events that happen every 400 years".

Temperature Perturbation (June – August 2003)

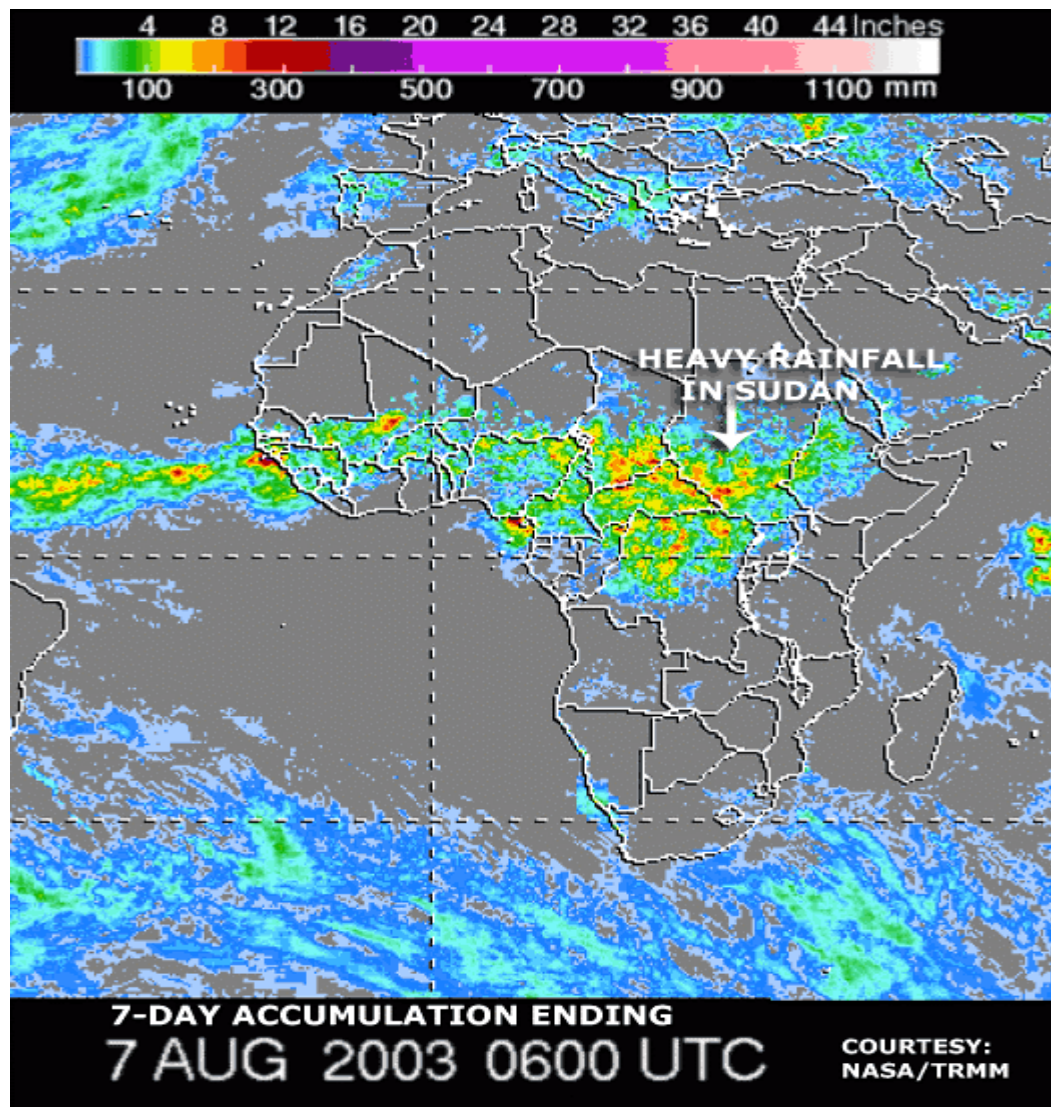


EUROPE

2003 Precipitation



AFRICAN FLOODS 2003



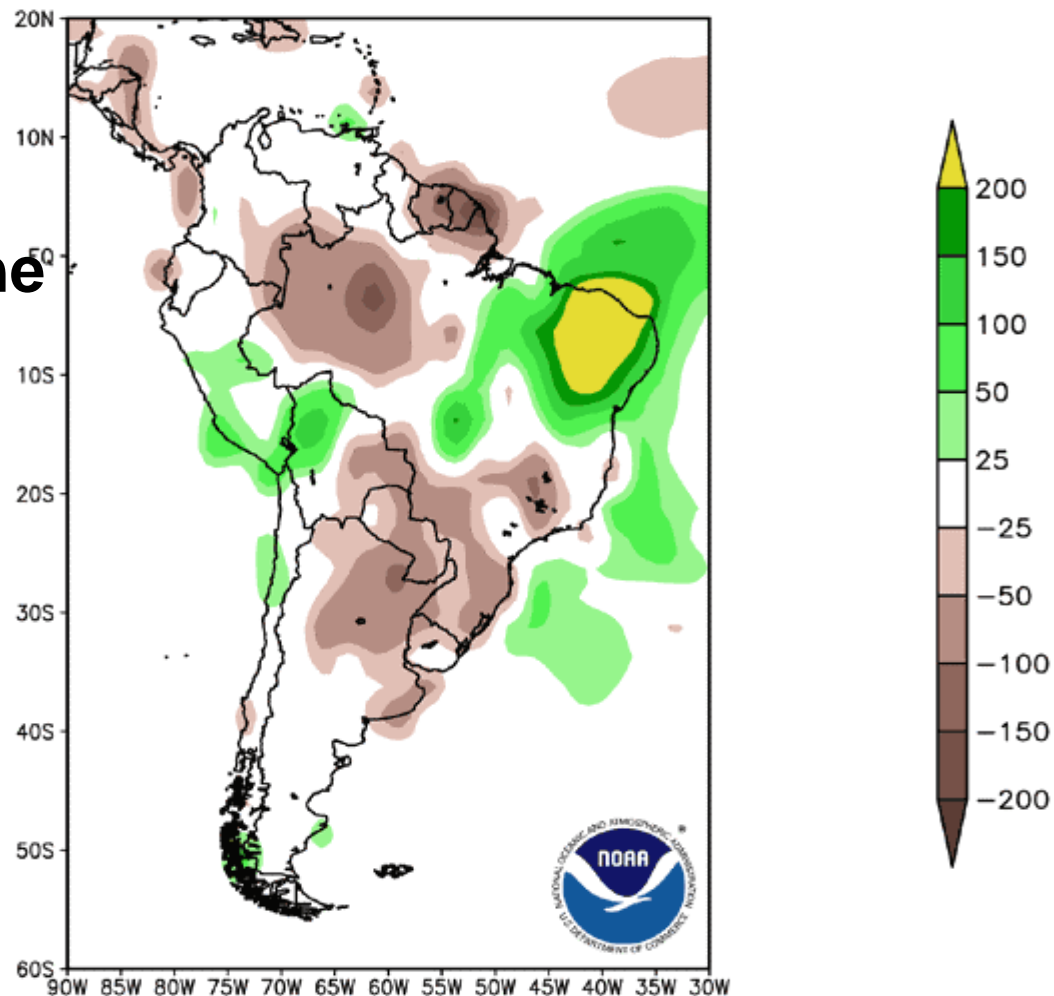
**Worst flooding
in 70 years in some
regions**

BRAZIL

January 2004

CAMS Precipitation Anomalies (millimeters) for Jan 2004
Base Period is 1979–1995

**Some regions
experienced the
heaviest rains
since 1910**



How to guarantee accurate forecasts for the society, for regions where seasonal climate predictability is lower?, after all what we have learned from new model developments, supercomputers, and satellites?.

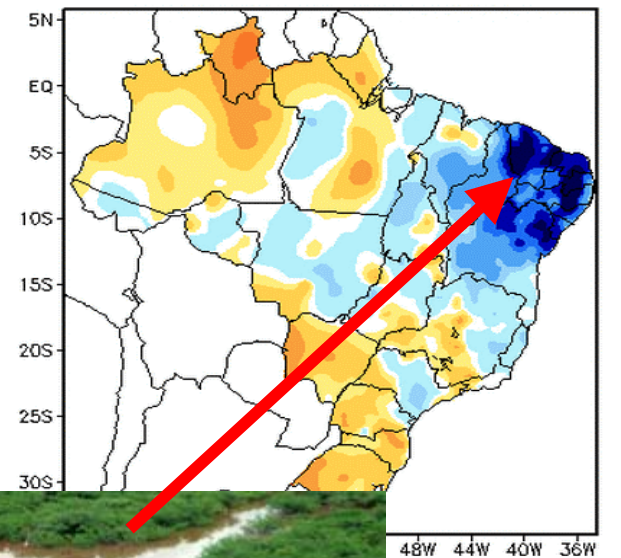
Dry summer 2001 in NE Brazil

600% of rainfall above the normal in NE Brazil during January 2004



01/01/2004 a 31/01/2004

Anomalia (%)



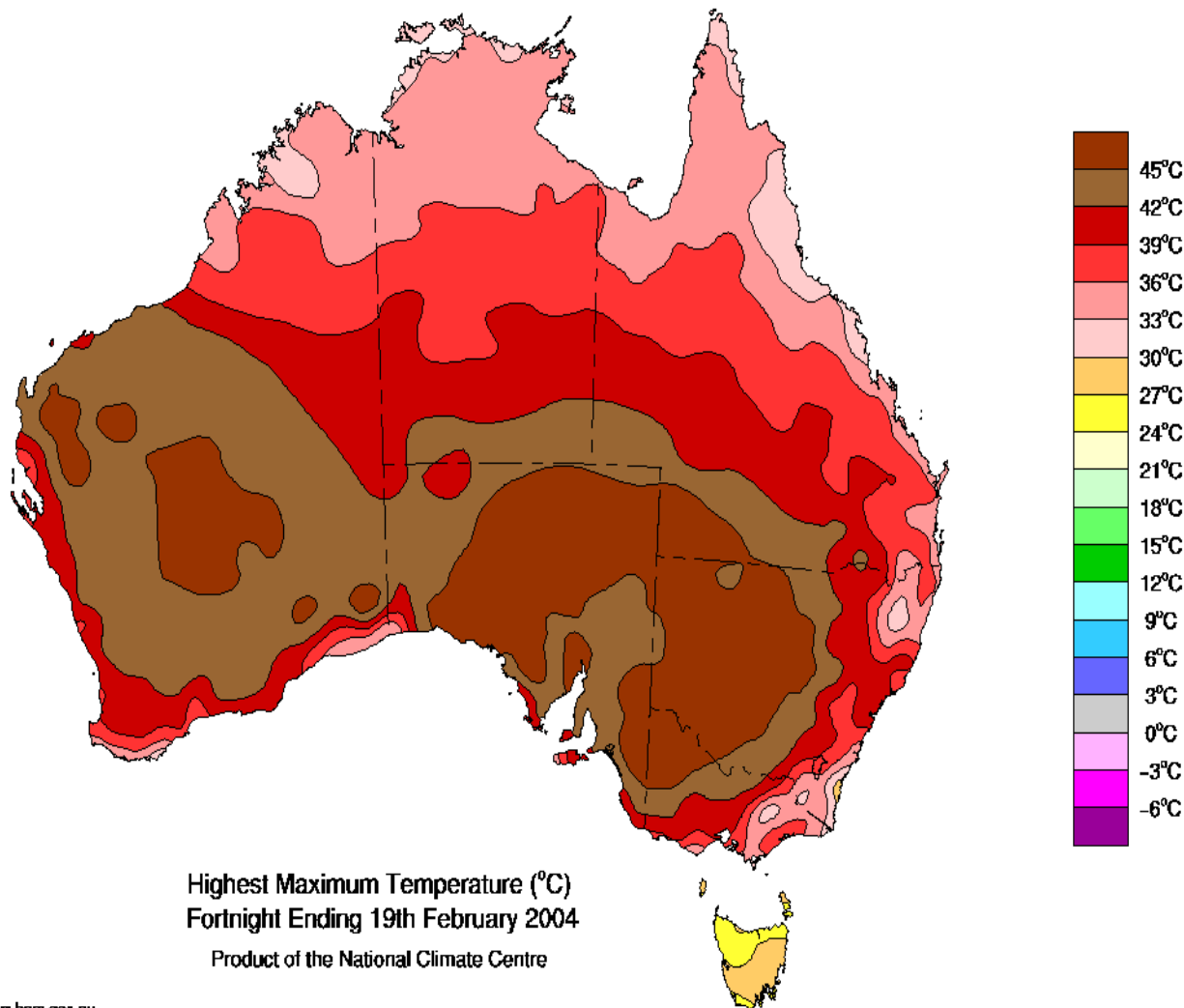
60 120 240 360 480

JNCME-LMRS/PB
RH/AL,SIMGE-MG



AUSTRALIAN DROUGHT

February 2004

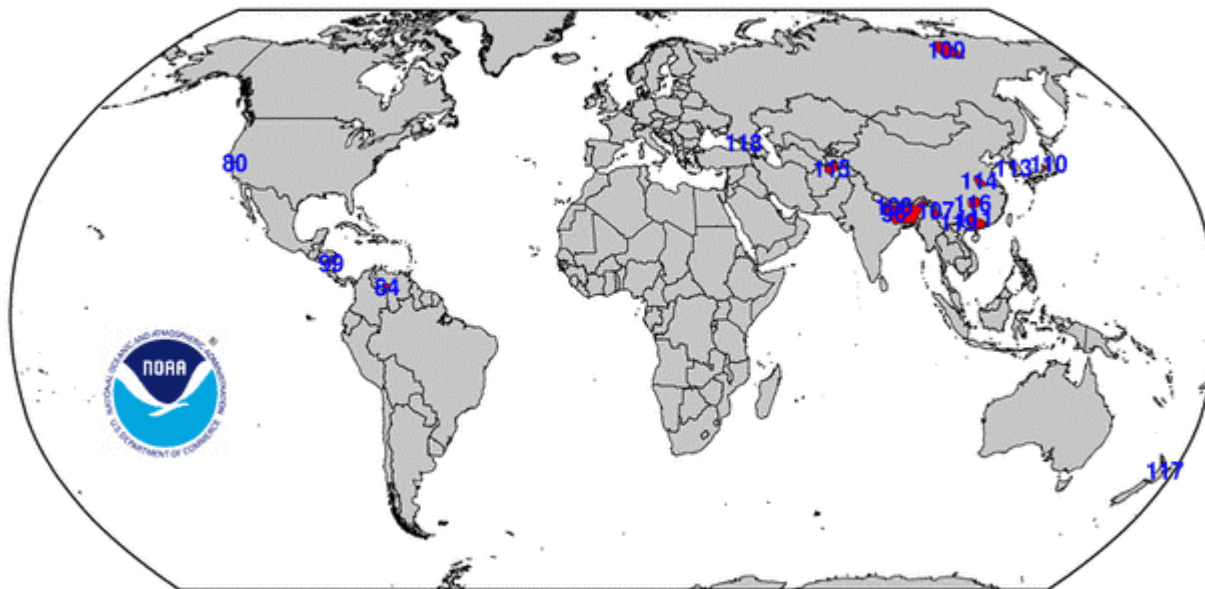


One of the most
Intense heat waves
In a century

ASIAN FLOODS

July 2004

Areas Affected by Flooding
For The Week Ending July 24, 2004



Data provided by Dartmouth Flood Observatory

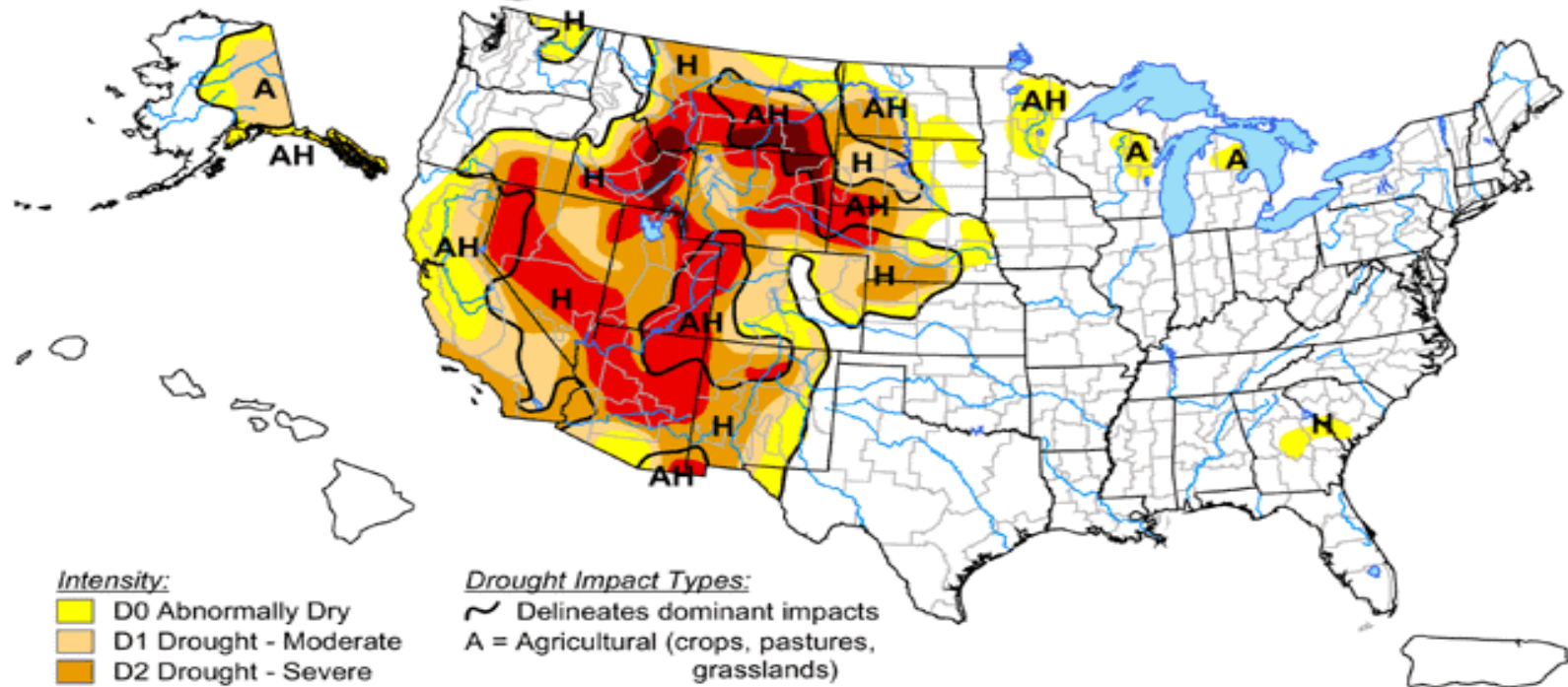
See <http://www.dartmouth.edu/~floods/Archives>
for a description of numbered flood events

US DROUGHT

August 2004

U.S. Drought Monitor

August 31, 2004
Valid 8 a.m. EDT



Intensity:

- D0 Abnormally Dry
- D1 Drought - Moderate
- D2 Drought - Severe
- D3 Drought - Extreme
- D4 Drought - Exceptional

Drought Impact Types:

- Delineates dominant impacts
- A = Agricultural (crops, pastures, grasslands)
- H = Hydrological (water)
- (No type = Both impacts)

The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.

<http://drought.unl.edu/dm>



Released Thursday, September 2, 2004

Author: David Miskus, JAWF/CPC/NOAA



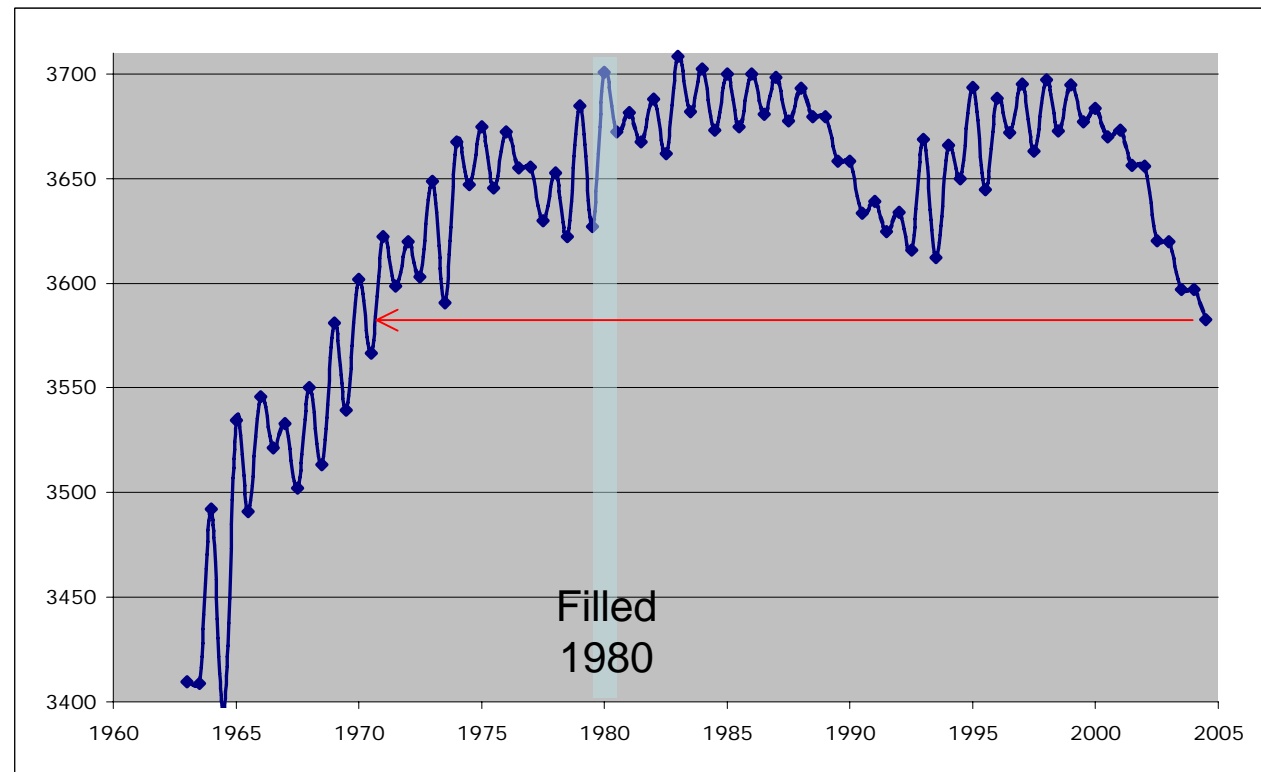
Severe Hydrological deficits

- *Lake Powell is at 40% capacity*
- *Lake levels have dropped ~ 120 feet*
- *Reservoirs above Lake Powell are currently at 60% of capacity*
- *Net flow of water for WY 2004 to date is 58% of average.*

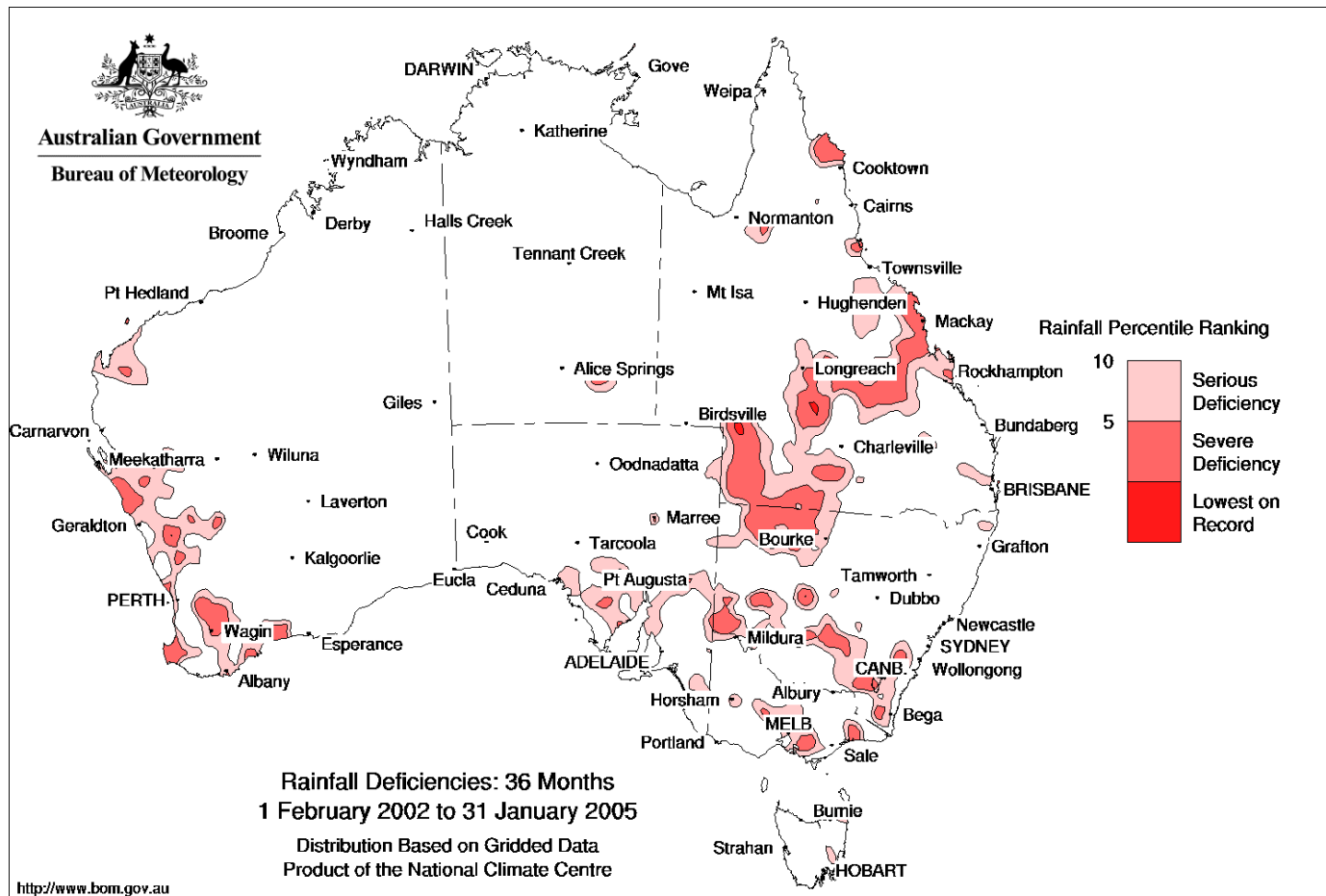
Glen Canyon Dam



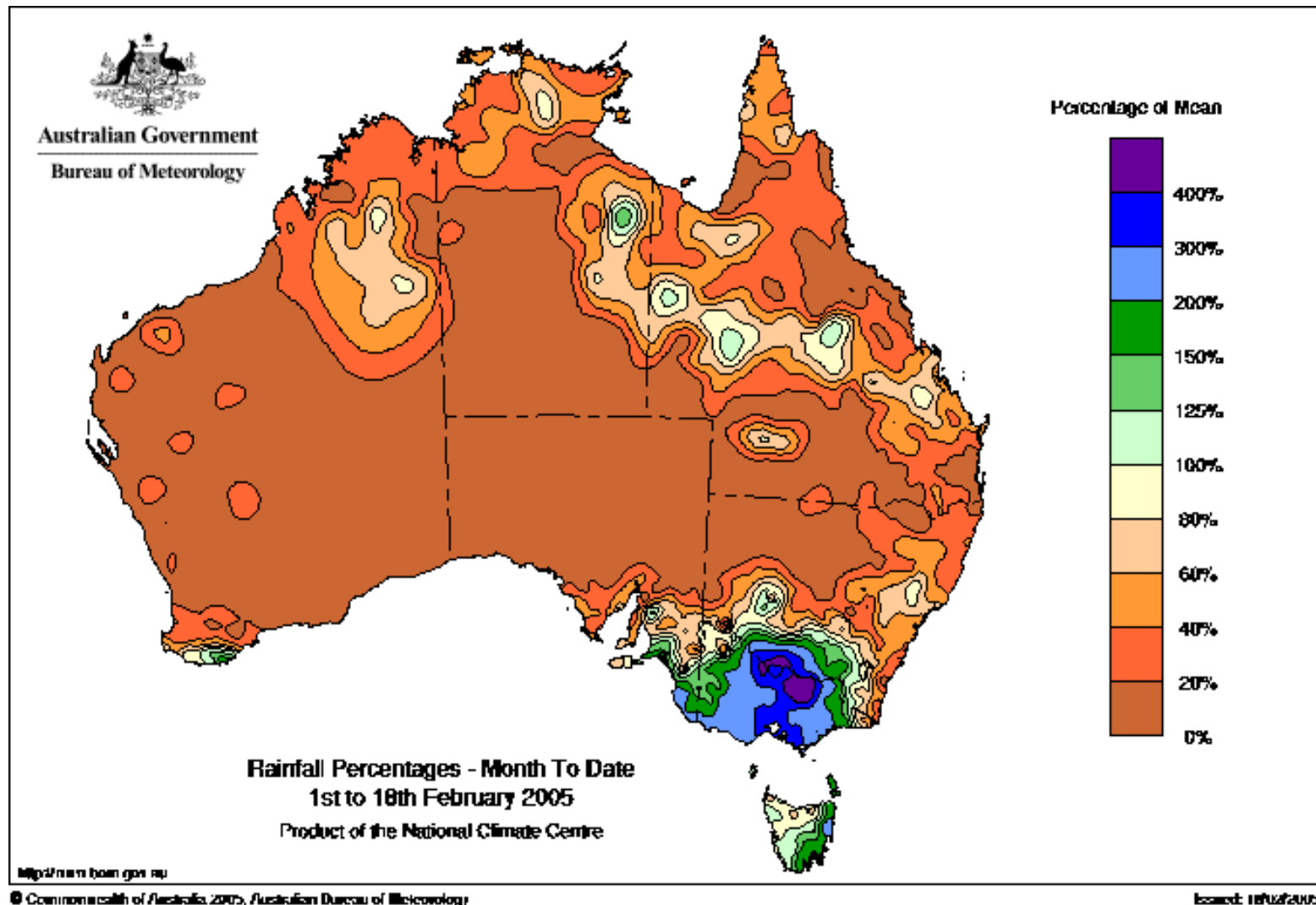
Lake Powell Water Level (ft)



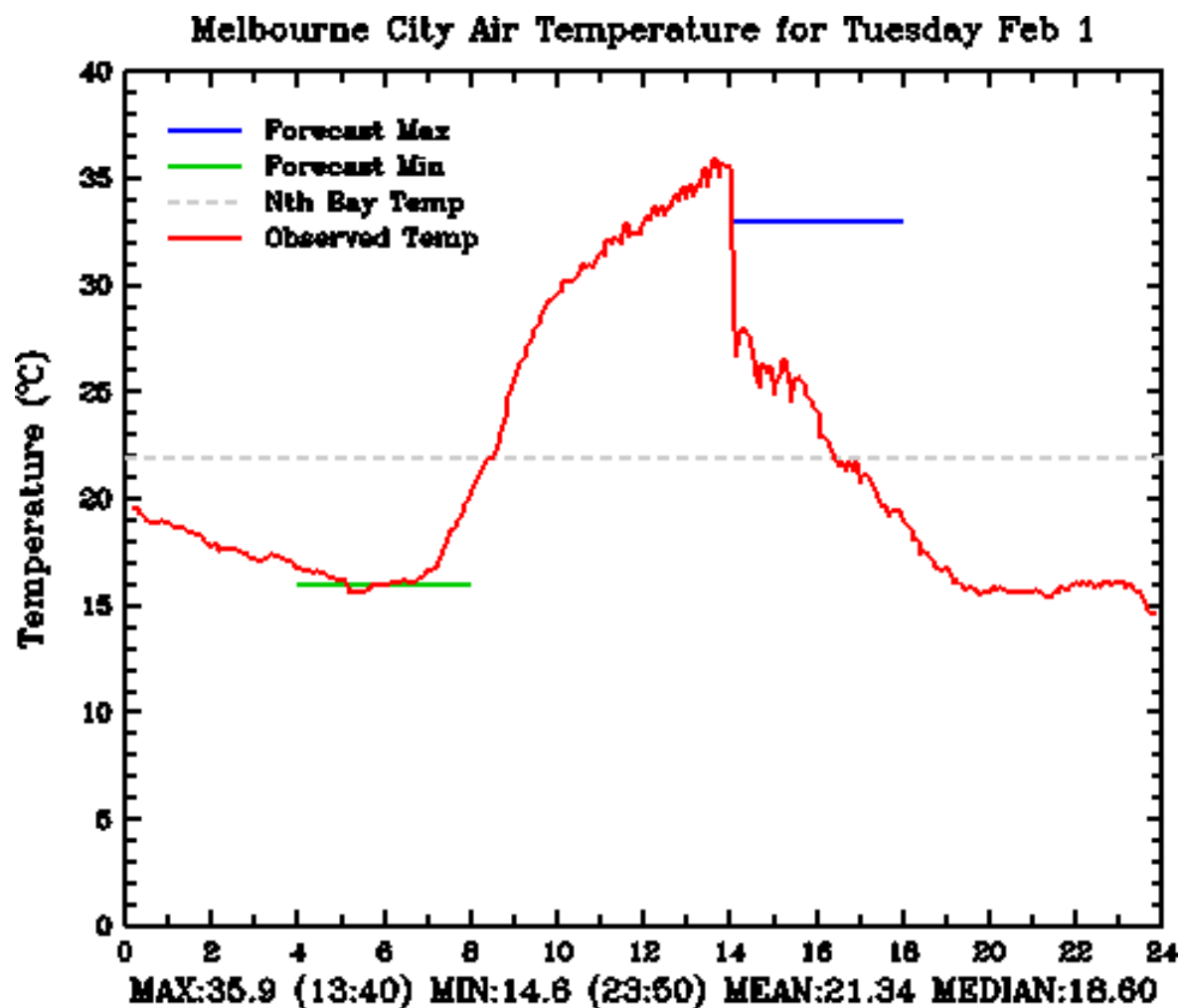
AUSTRALIAN DROUGHT



Monthly Rainfall

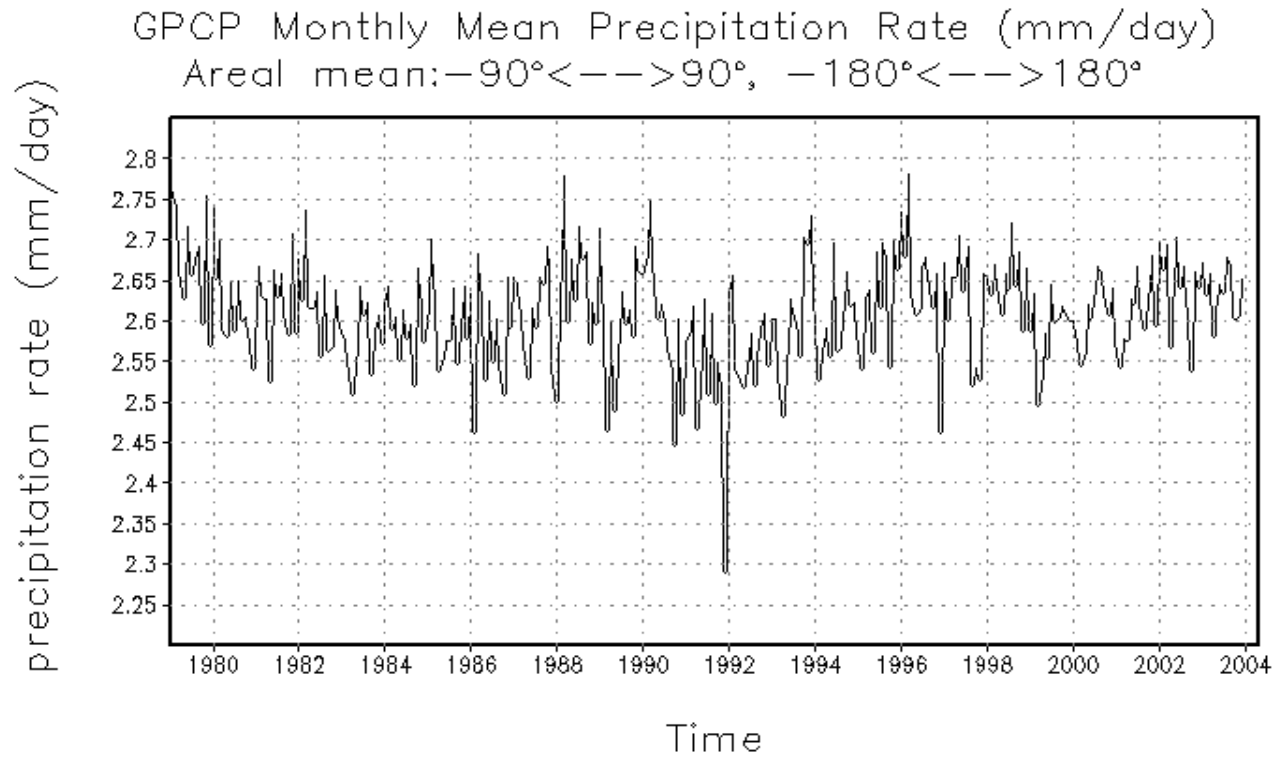


Coldest Feb. day on record



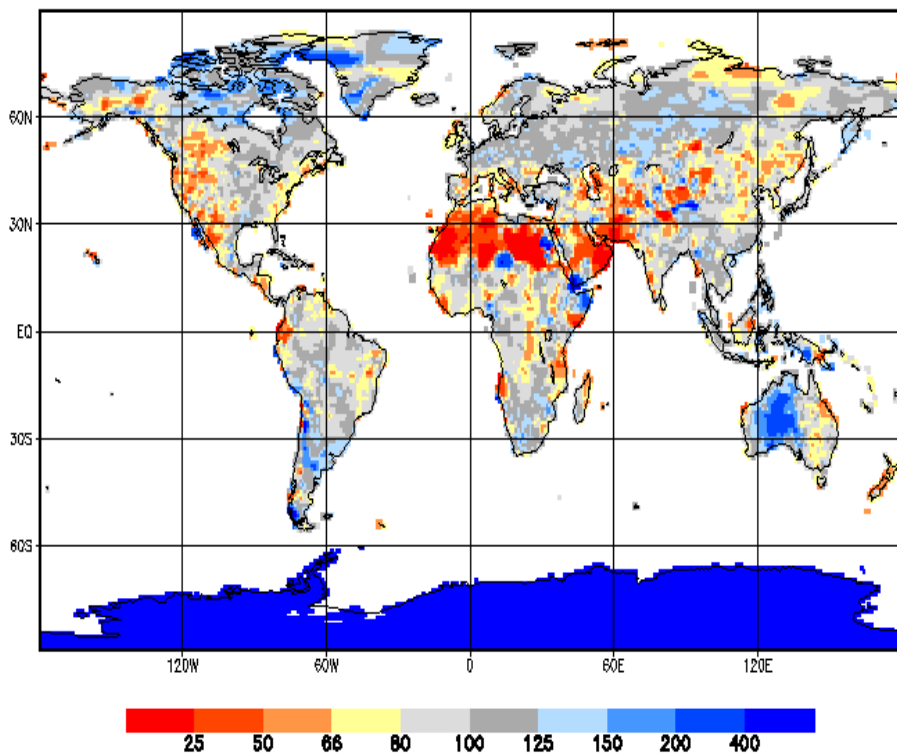
GLOBAL SYSTEM AND EXTREMES

GLOBAL PRECIPITATION



2001

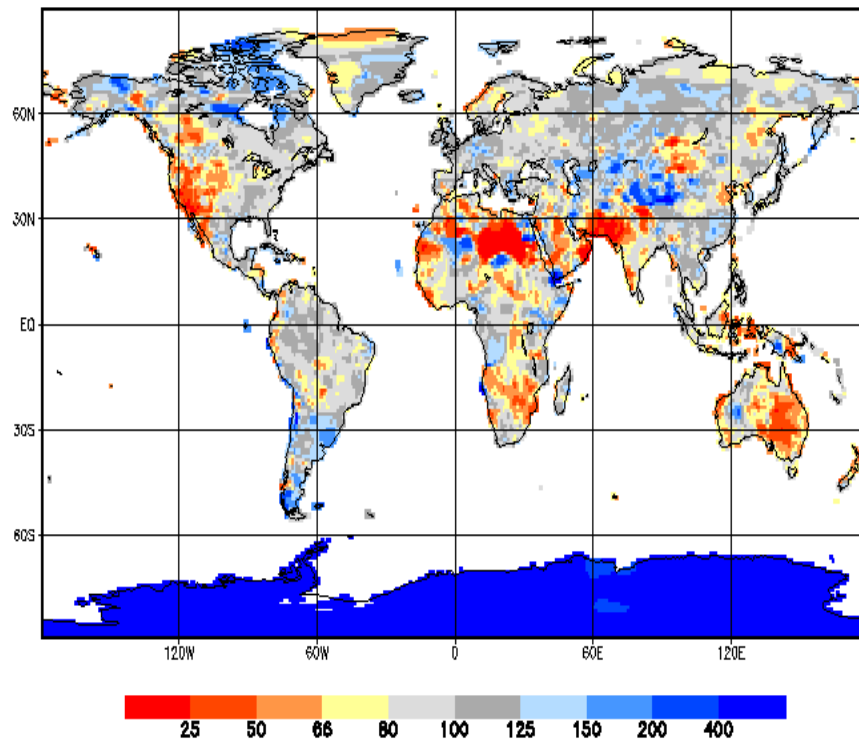
GPCC Monitoring Product Gauge-Based Analysis 1.0 degree
precipitation percentage of normals 61/90 for year (Jan - Dec) 2001



GPCC

2002

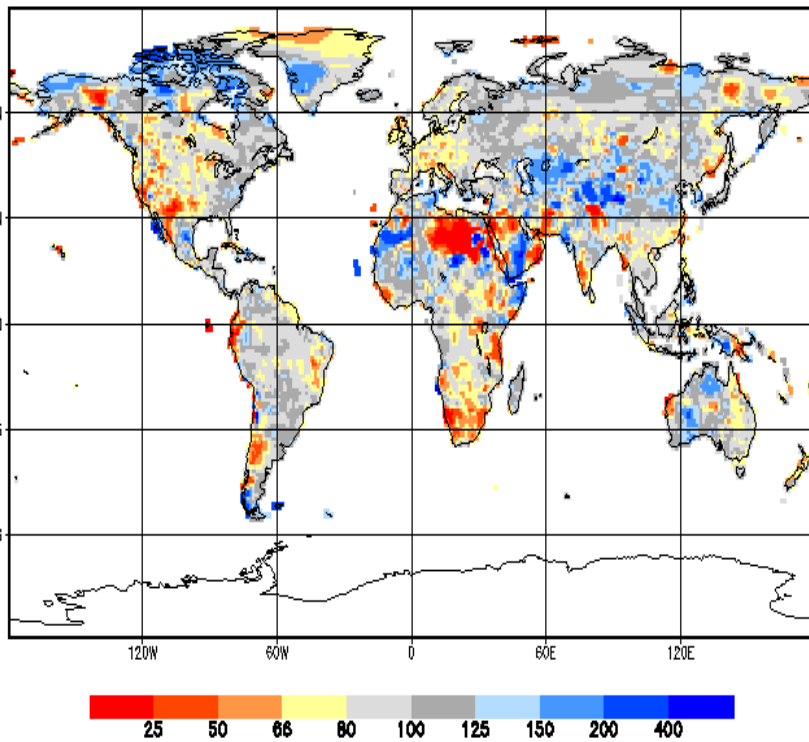
GPCC Monitoring Product Gauge-Based Analysis 1.0 degree
precipitation percentage of normals 61/90 for year (Jan - Dec) 2002



GPCC

2003

GPCC Monitoring Product Gauge-Based Analysis 1.0 degree
precipitation percentage of normals 61/90 for year (Jan - Dec) 2003

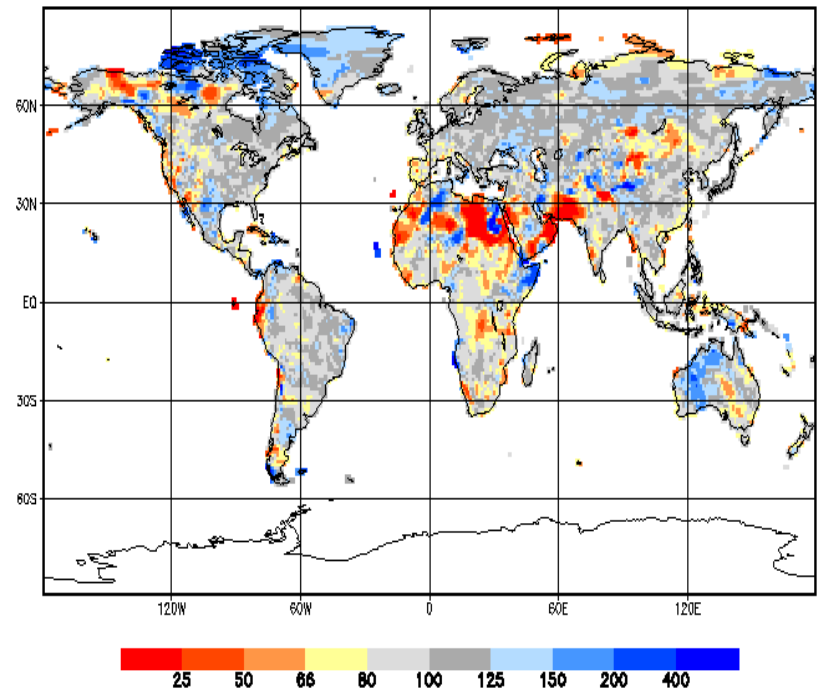


GPCC

2004

Nov/03 – Nov/04

GPCC Monitoring Product Gauge-Based Analysis 1.0 degree
precipitation percentage of normals 61/90 for year (Dec - Nov) 2003/2004



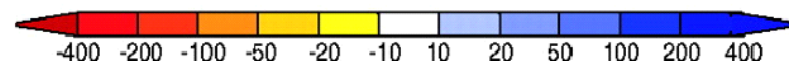
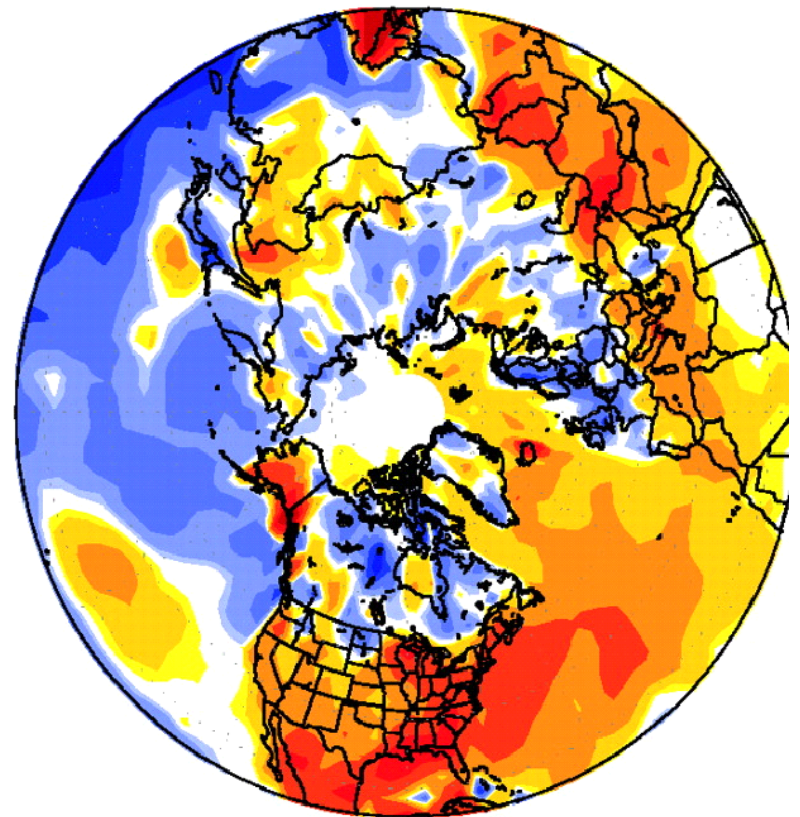
GPCC

RECENT DROUGHTS

(Hoerling and Kumar, 2003)

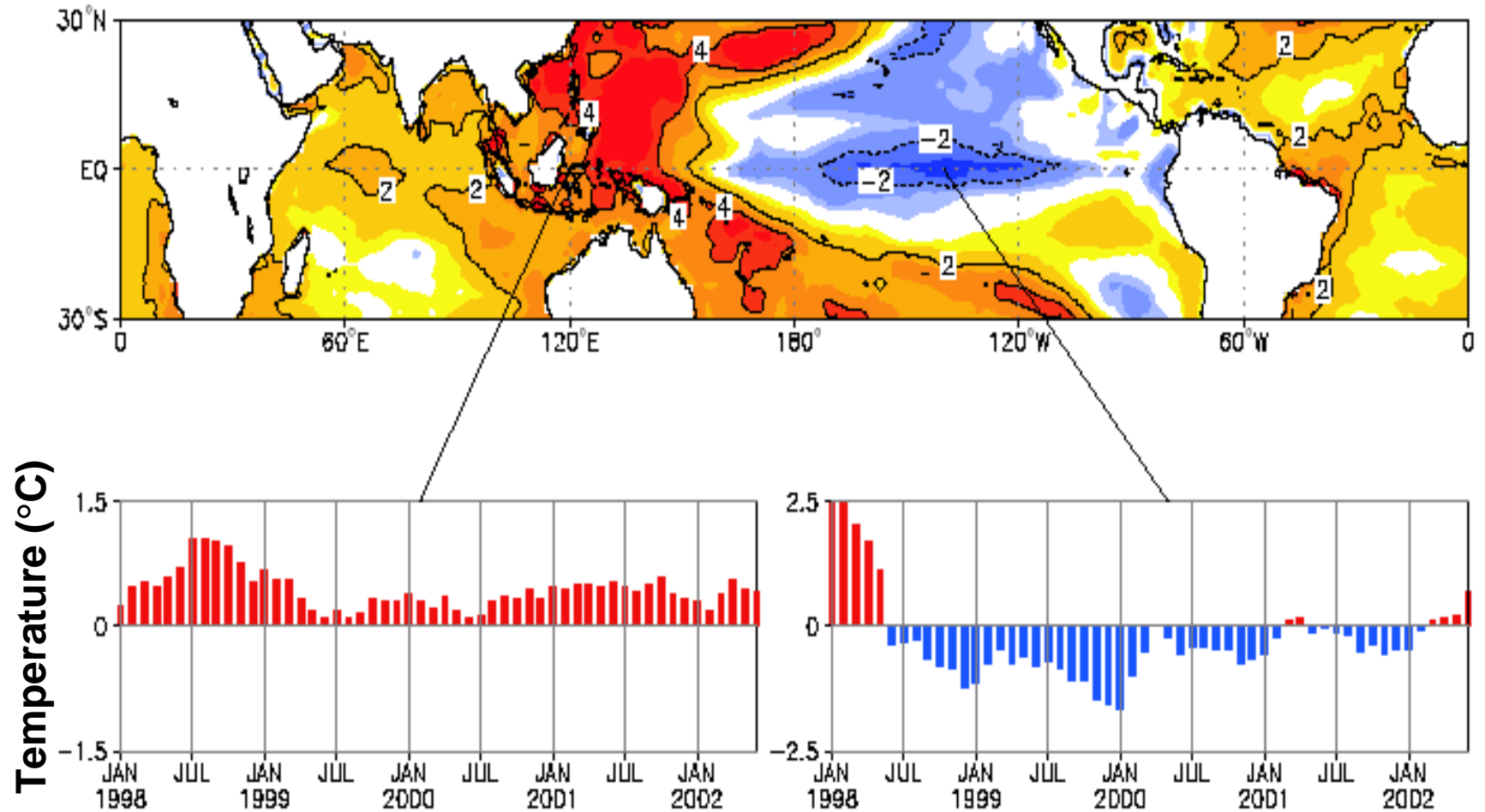
- **Drought caused widespread destruction in from 1998-2002**
 - **Impacting areas in Canada, United States, Australia, Africa, China, and Scandinavia**
- **20% of Earth's land mass was under drought conditions in 2002**

1998-2002 Precipitation Anomalies



Anomaly (mm)

SEA SURFACE TEMPERATURE ANOMALIES 1998-2002



SPECIFIC ISSUES

CEOP period

The following represent issues that could be addressed:

- **What extremes occurred during CEOP over the world?**
- **What are the characteristics of these extremes?**
- **What factors led to, sustained, and ended these extremes?**
- **To what degree were the extremes inter-connected?
ocean, land surface, and other patterns**
- **How typical and/or unusual is the CEOP period and why?**
- **What are the implications for extremes and the climate system?**

CURRENT STUDIES

- Some of these extremes are currently being studied. Examples include:
- Canada (1999-2004 drought)
- US (drought)
- Brazil (drought in 2001 and flooding in 2003)
- La Plata Basin (part of a book)
- Europe (drought and extended wet period)
- Australia (recent drought and its end)
- Asia
- ...

MOVING AHEAD ...

1. Keep an updated list of research on extremes during CEOP
2. Keep each individual effort on extremes during CEOP informed of others
3. Encourage overall workshop with the various research groups
4. Move towards addressing collective issues