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El Niño Effects on Major World Crop Growing Areas

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IRI for Climate Prediction
Earth Institute, Columbia University

Presented at:
USDA's Agricultural Outlook Forum 2003
20-21 February 2003
Arlington, VA

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OUTLINE

- A brief overview of ENSO (El Niño /Southern Oscillation)
- Typical ENSO rainfall patterns
- A review of the 2002-03 global rainfall
- A look at recent seasonal forecasts

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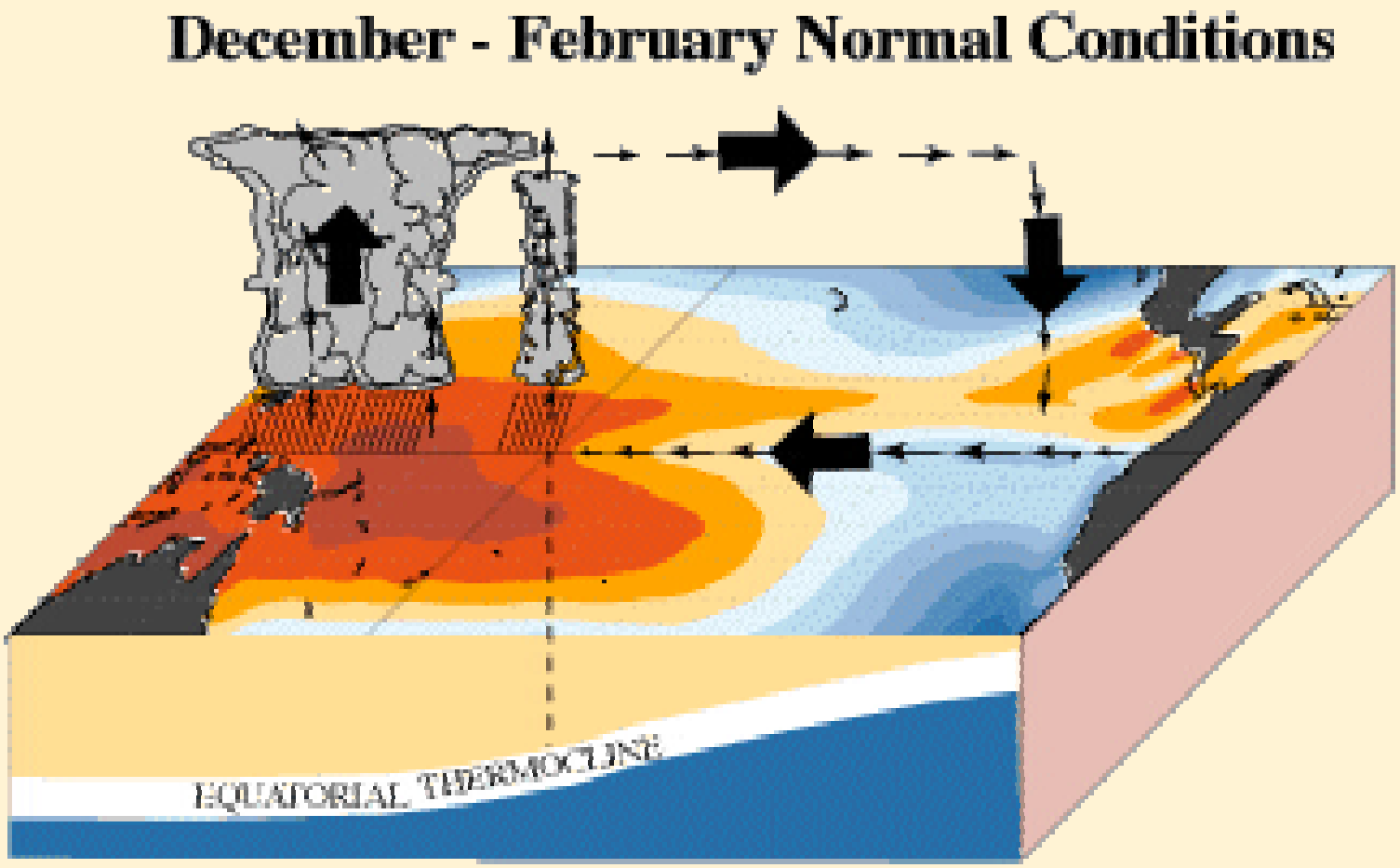
Tropical Pacific – Average State



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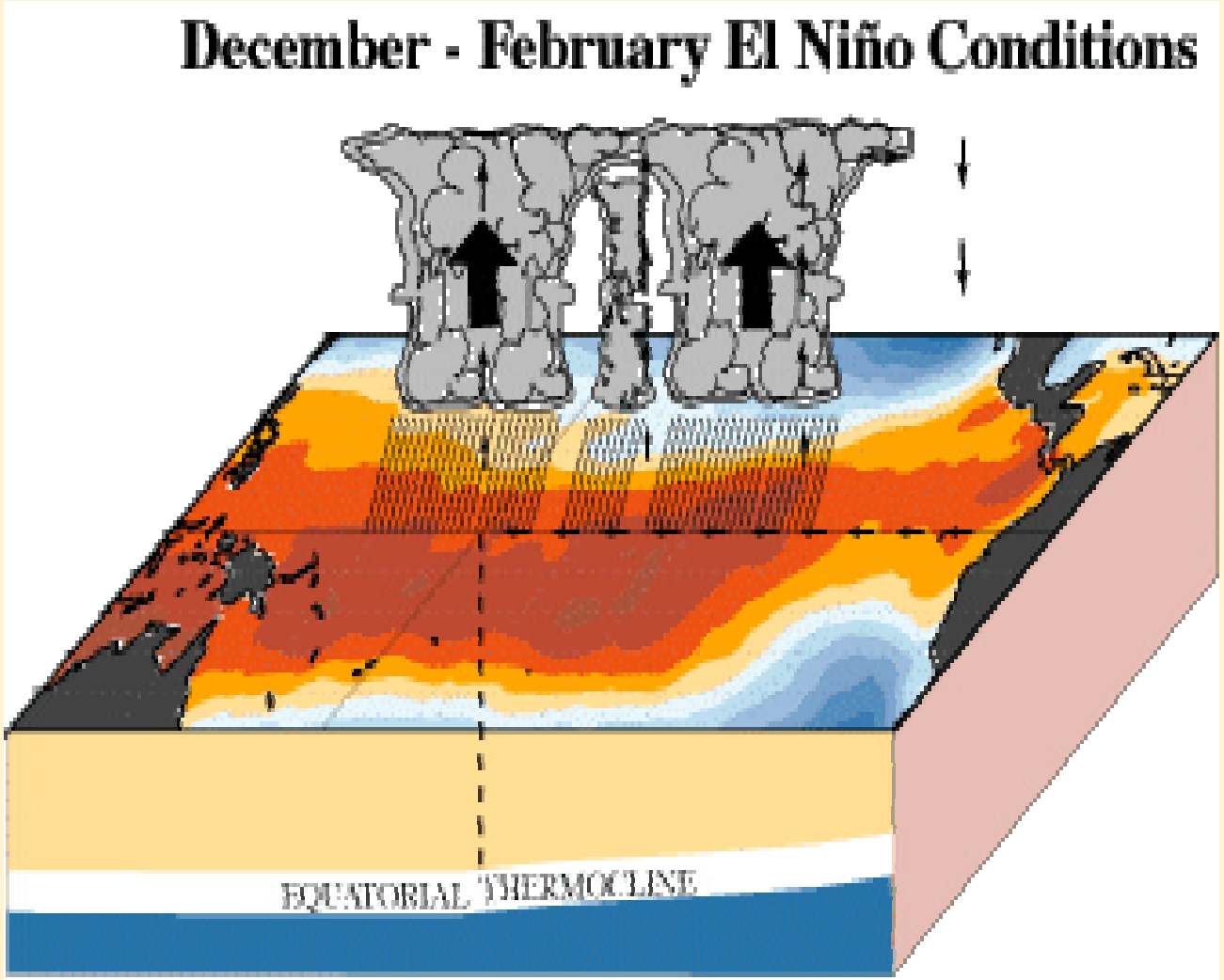
El Niño

Trade winds get weaker
Warm water flows back eastward
Convection moves eastward
Winds weaken further, etc.



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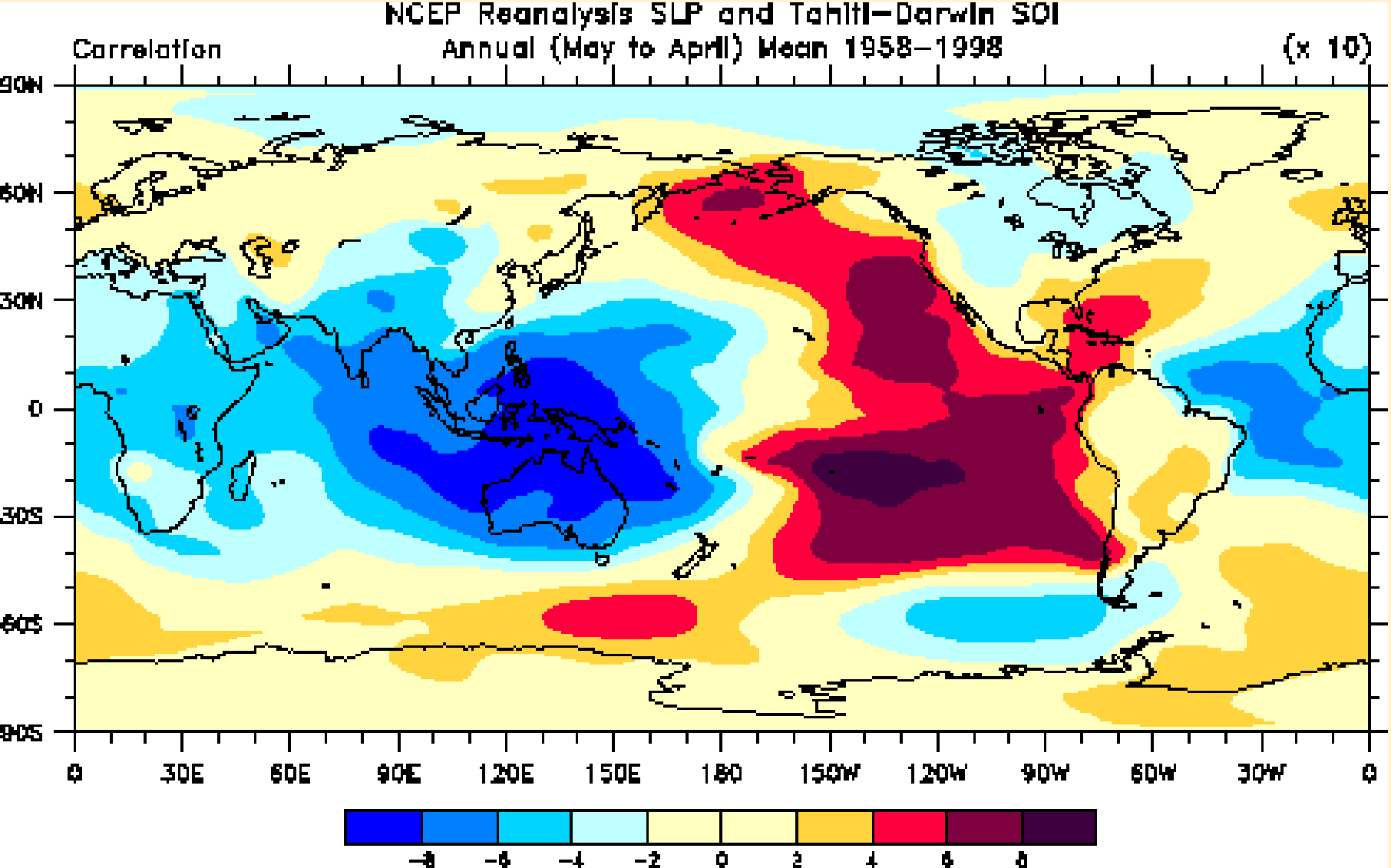
The Southern Oscillation



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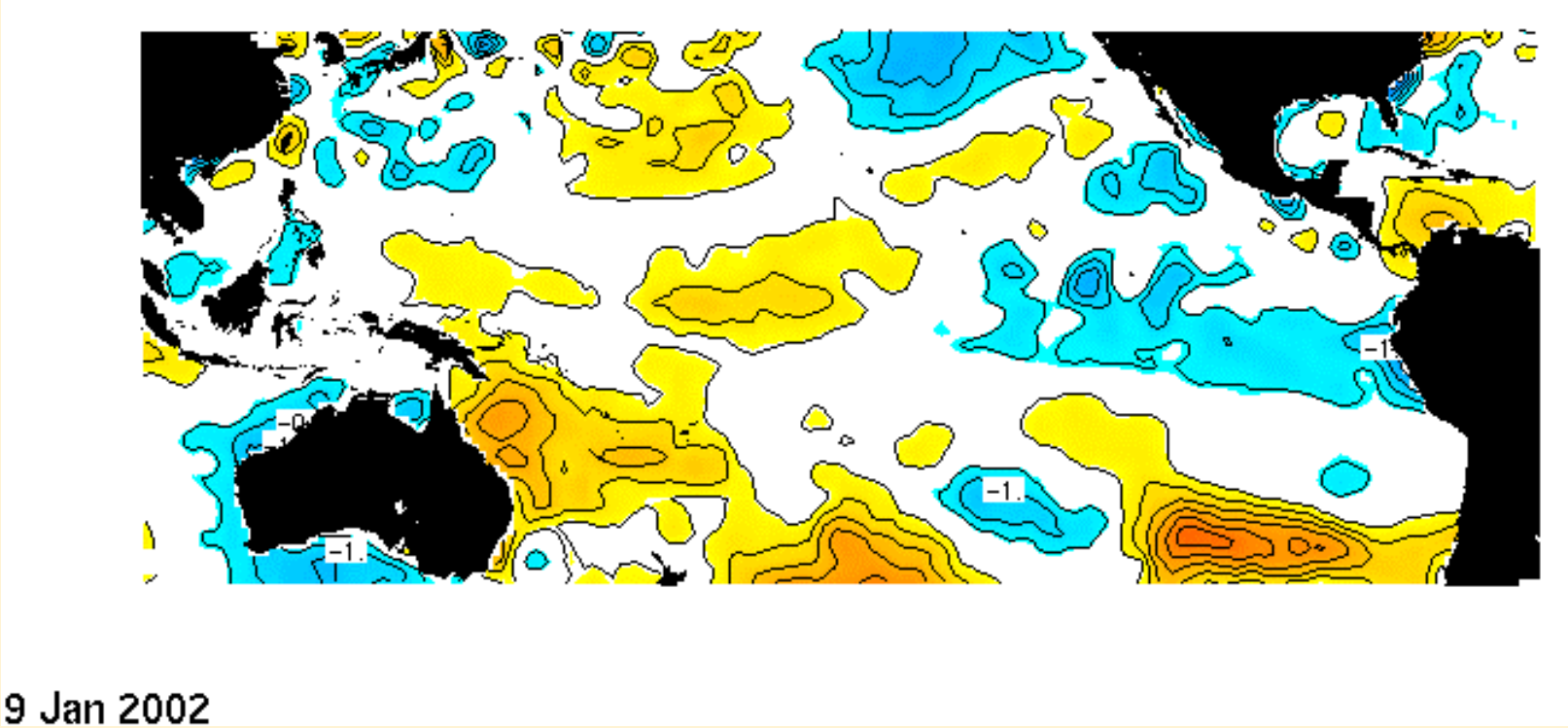
Animation SST



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All El Niño

and

La Niña

episodes are unique,

but they share

Common features

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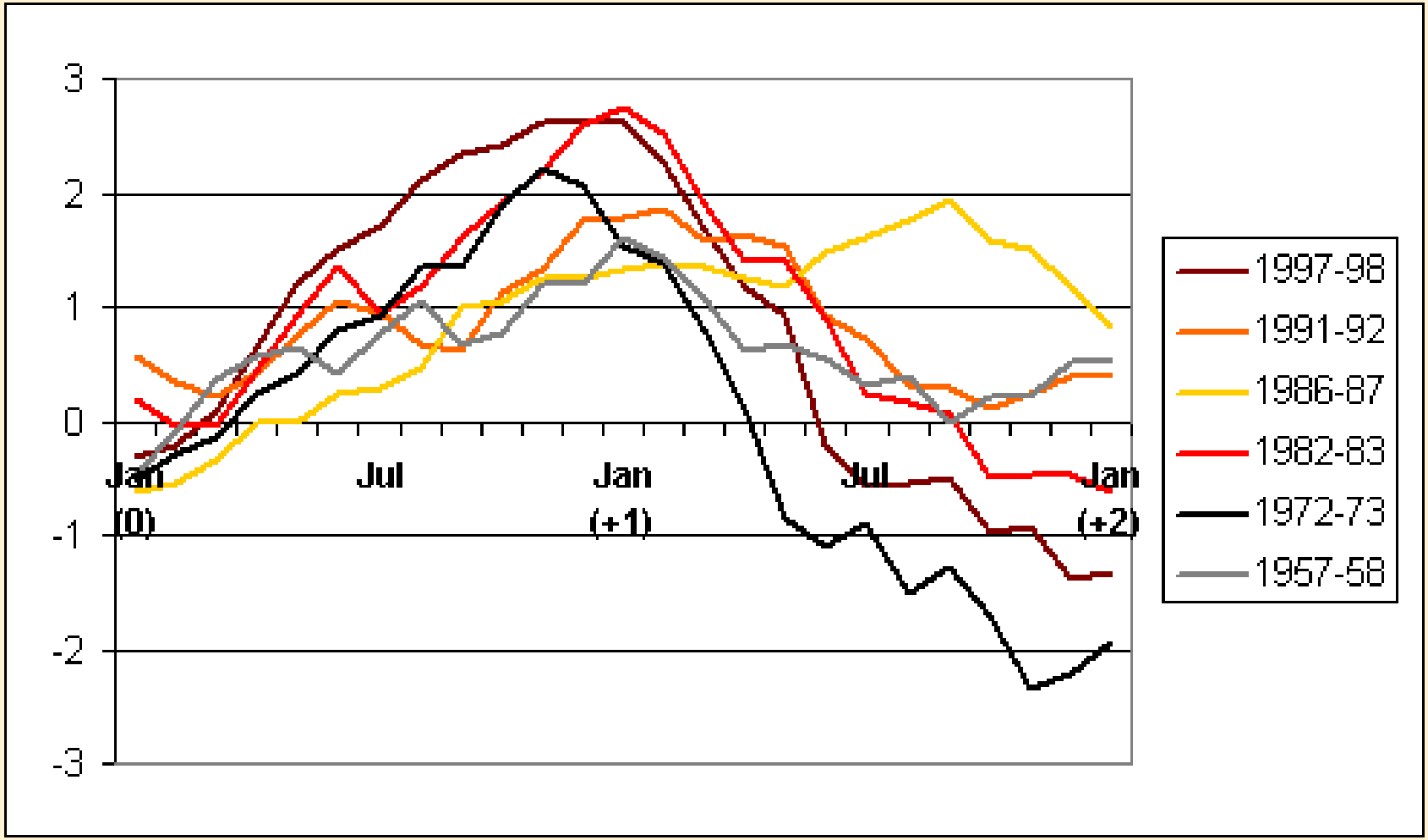
El Niño Events tend to peak near end of the year



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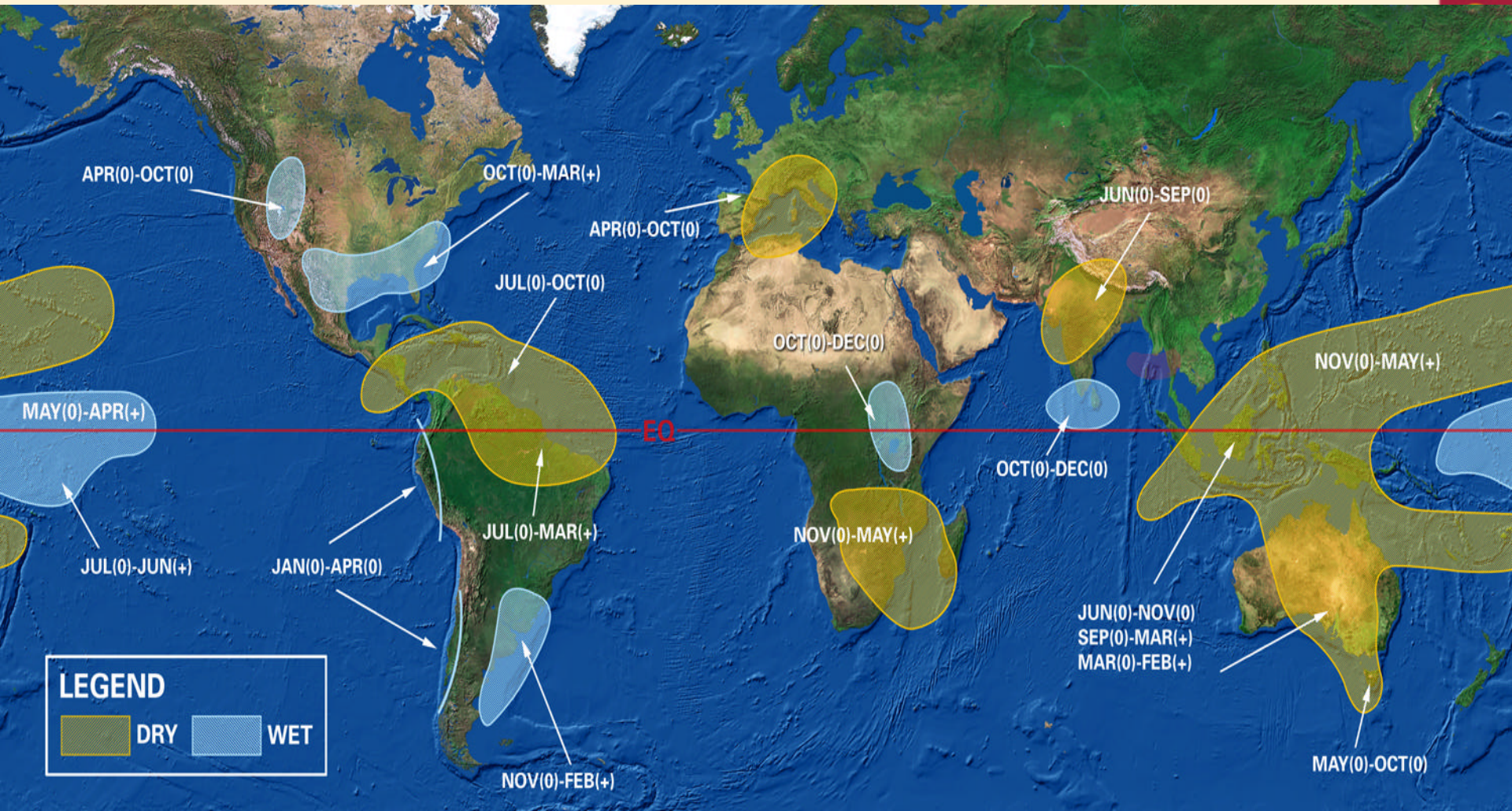
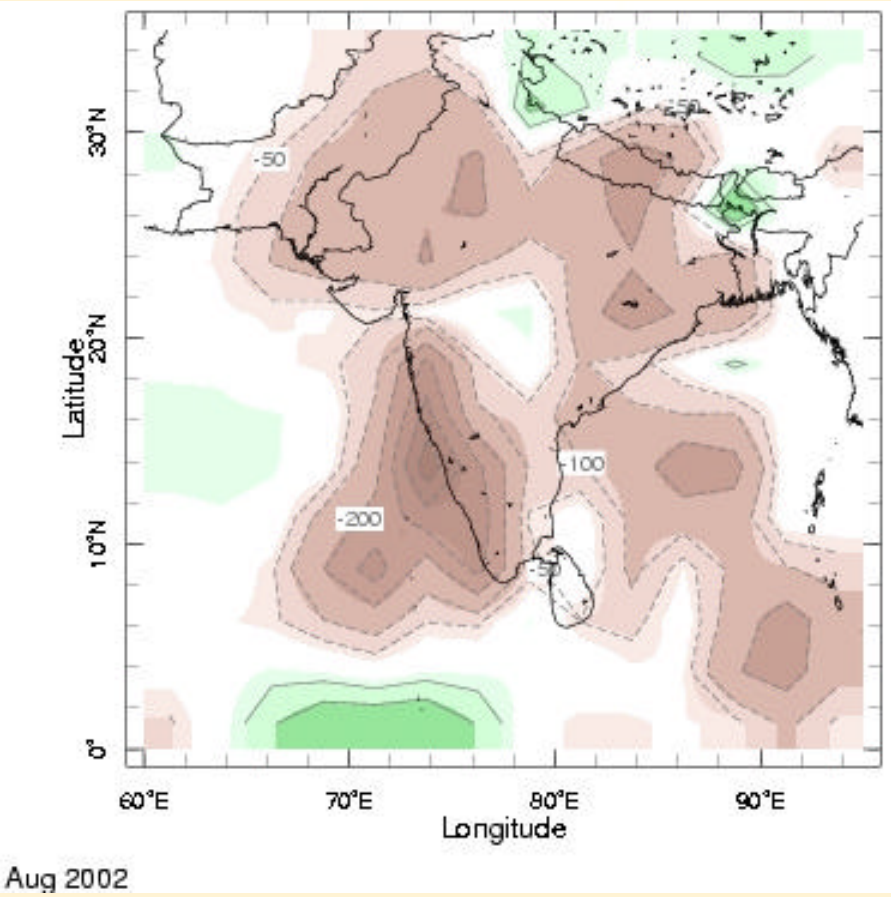
Typical Rainfall Patterns associated with El Nino Episodes



2002 Failed Monsoon



- First failed monsoon since 1987
- Driest July on record
- Drought comparable to 1972

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Southern Africa Drought

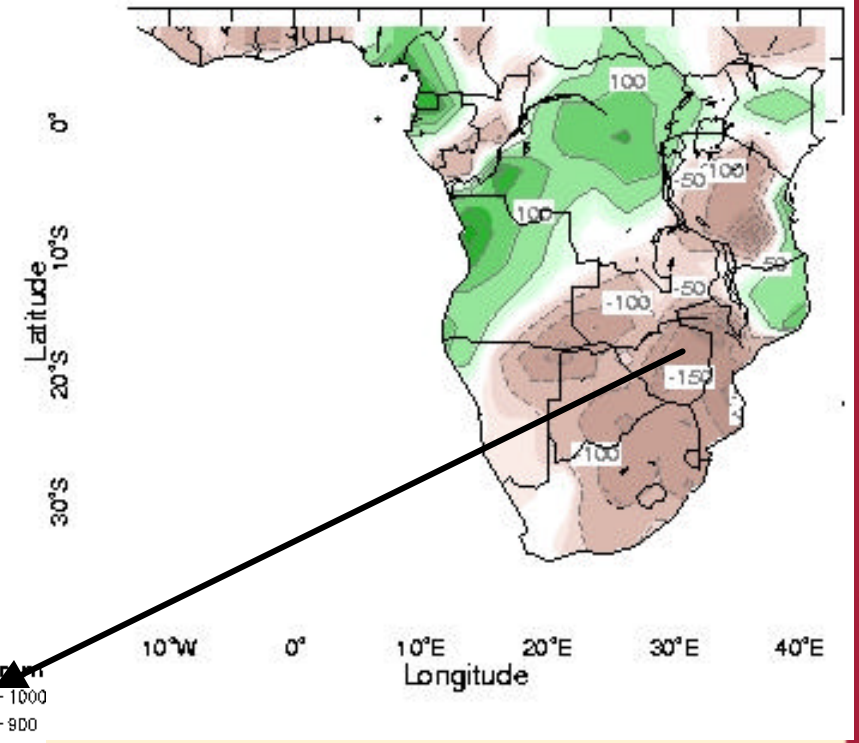
Jan-Apr 2002

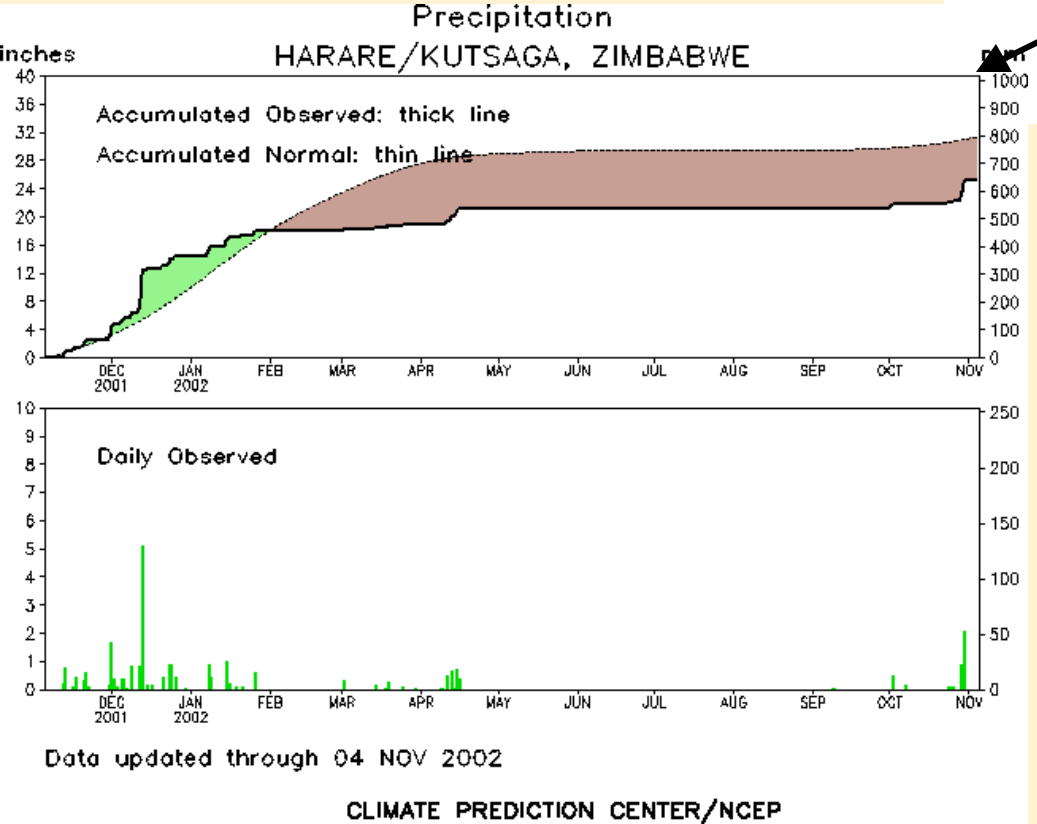
PRCP

Anomaly (mm)

Erratic end of rainy season

The coming El Nino?





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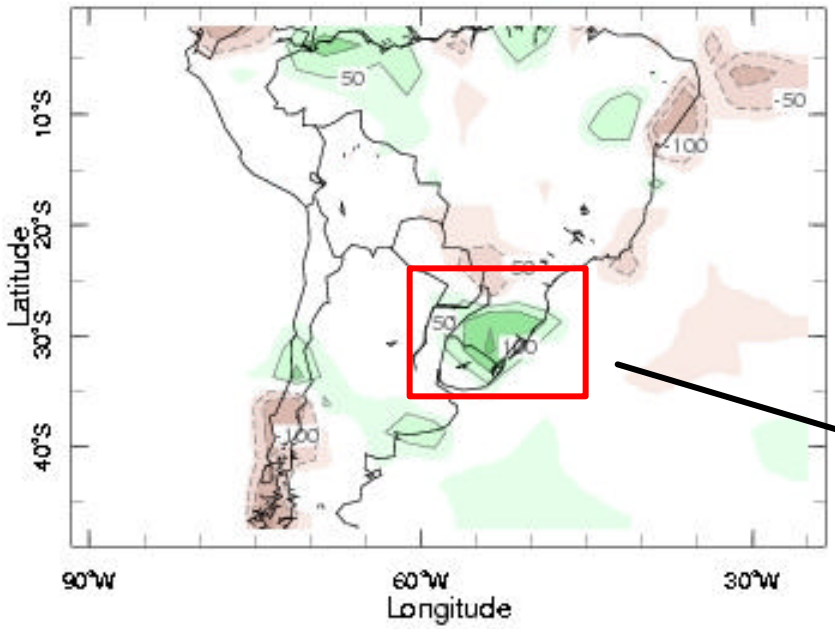
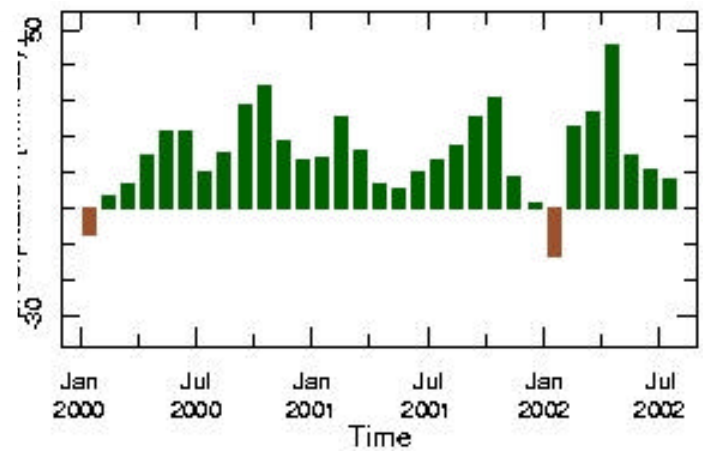
Prolonged Wet Spell SE South America



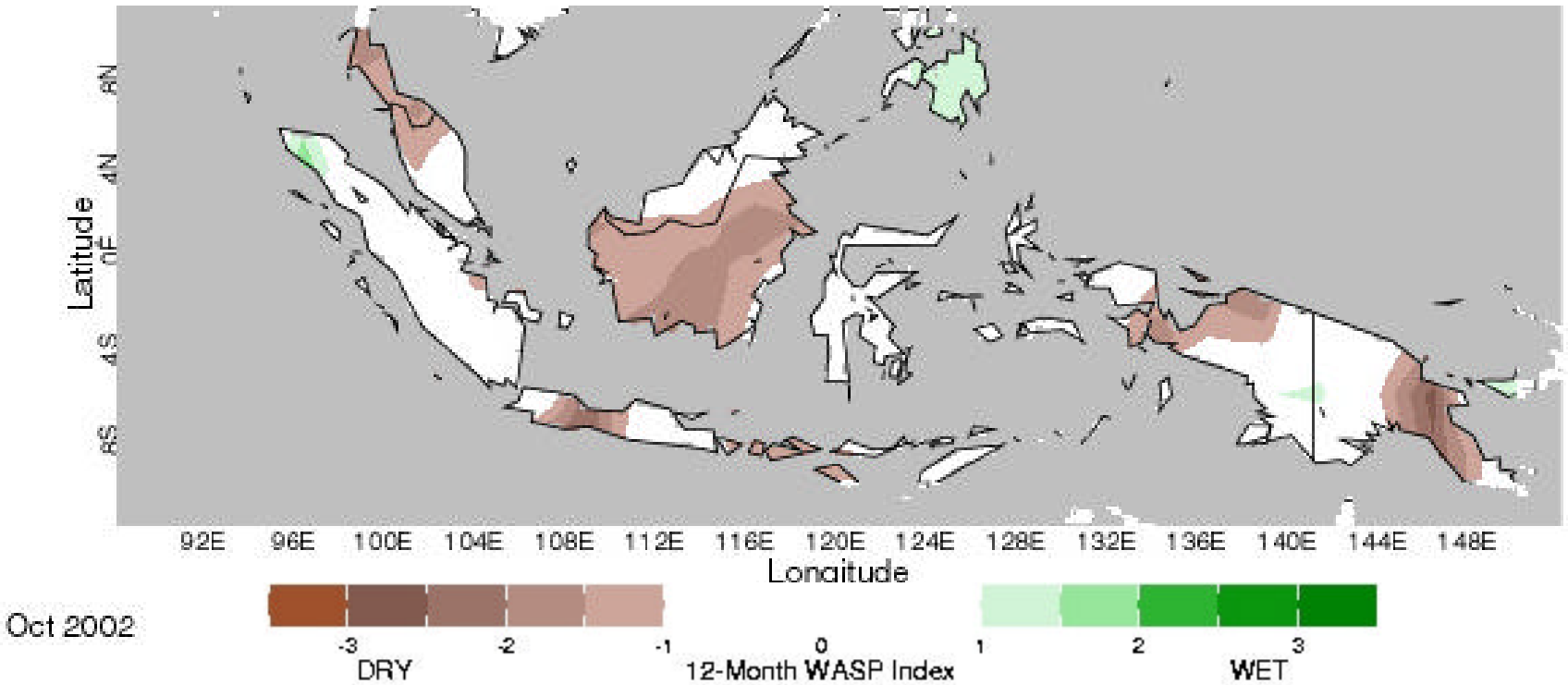
June – Aug PRCP anomaly (mm)

3-mo running average PRCP



Dry Conditions in Indonesia

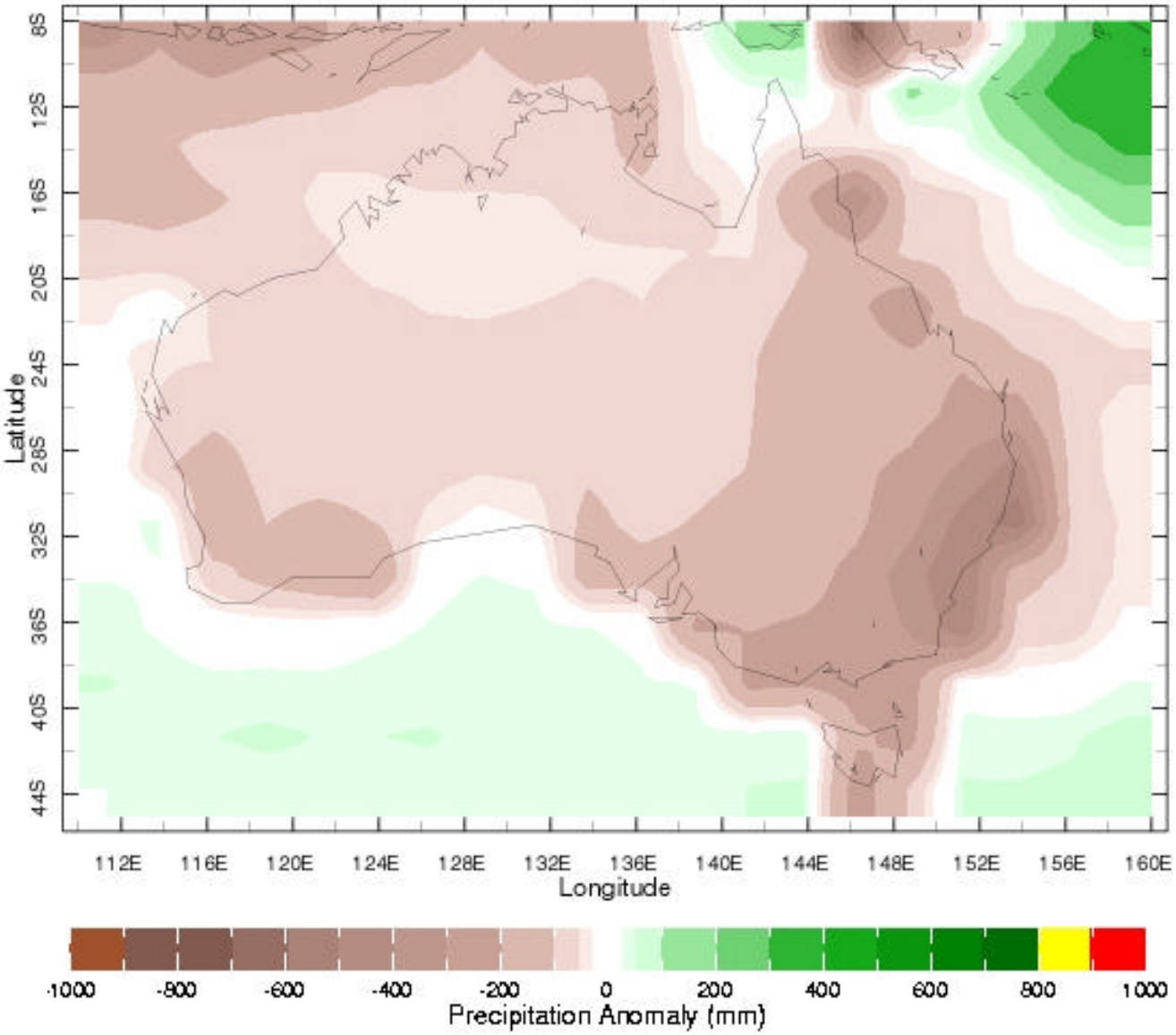
12-Month WASP Index, October 2002



WASP is an acronym for the *Weighted Anomaly Standardized Precipitation* index, which is based on monthly rainfall departures from the long-term (30-year) average.

- Very dry anomalies primarily in parts of Borneo and Java
- Deficits in the past year as large as 1000 mm

April-October 2002 Accumulated Precipitation Anomaly (mm, CAMS-OPI)

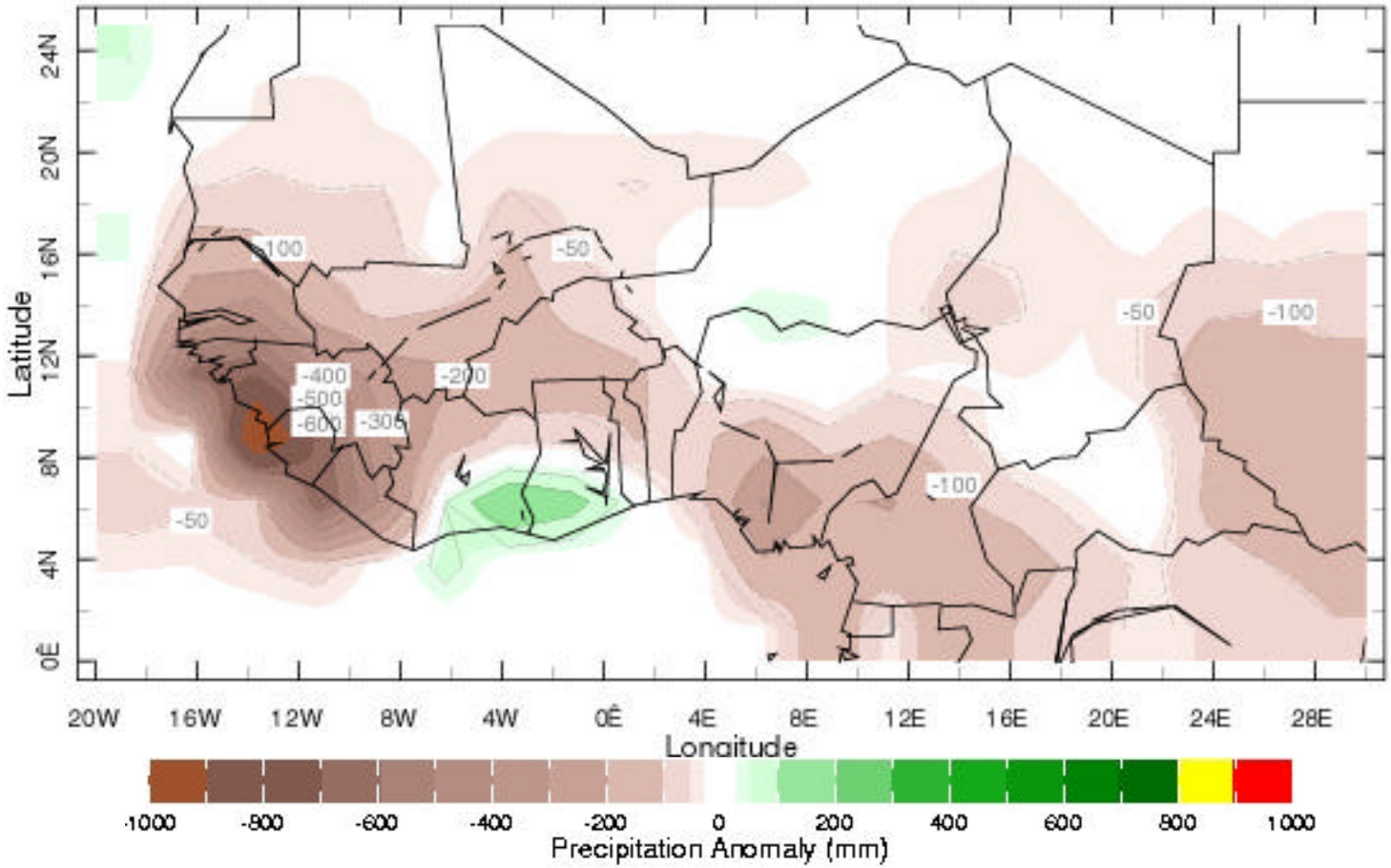


Australian Drought

Nearly 70% of Australia experienced April-October 2002 rainfall in the lowest 5% to 10% of the historical record for the period. In terms of extent and mean percentile, it was the **driest 7-month period** observed for the country as a whole. The areas most seriously affected are in the southern half of the country. (Australian BOM)

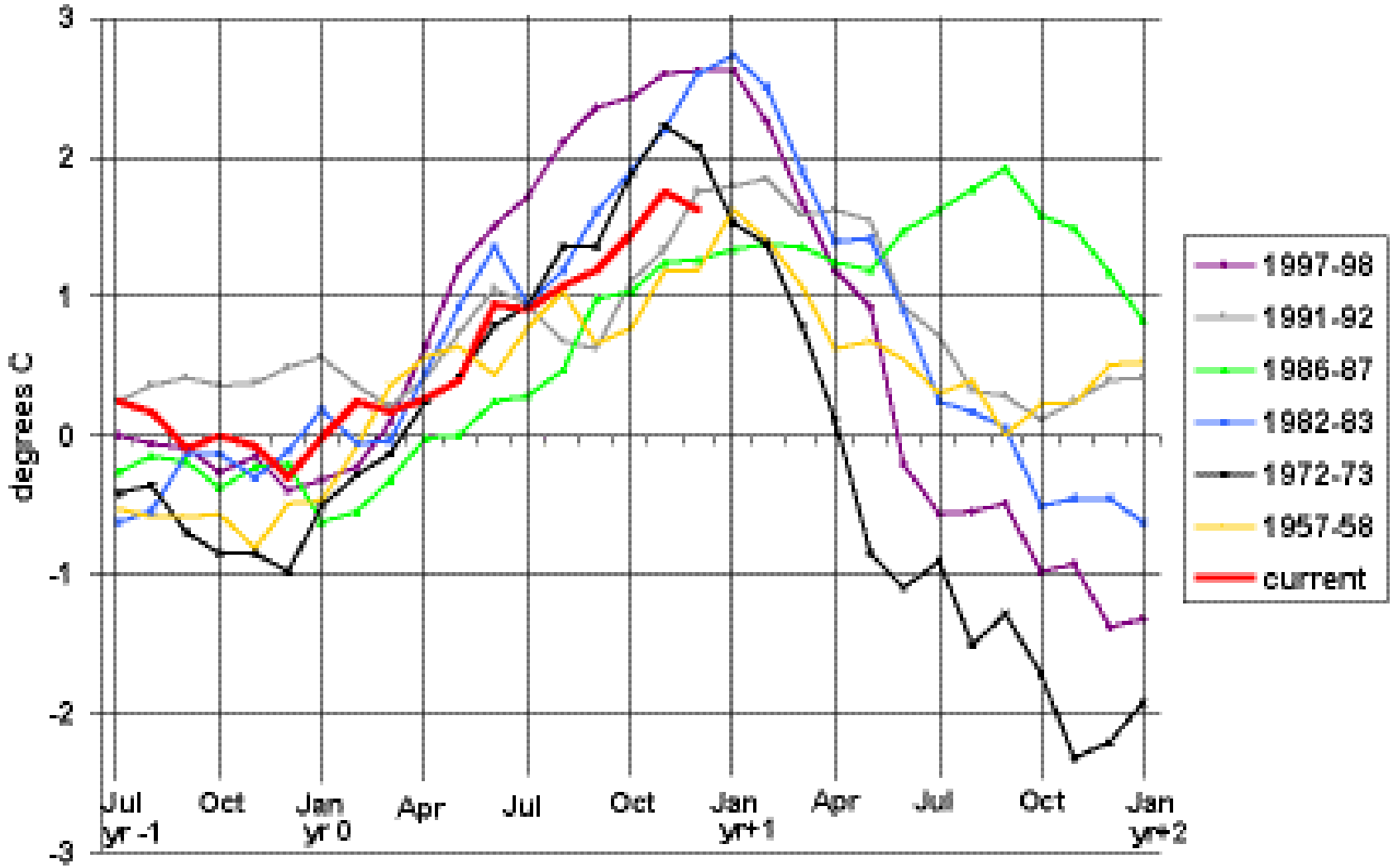
Dry Western Sahel, 2002 Rainy Season

July-September 2002 Accumulated Precipitation Anomaly (mm, CAMS-OPI)



Some stations in Senegal and Mauritania received just 25% to 50% of their normal precipitation

Current Conditions vs. Past El Niño



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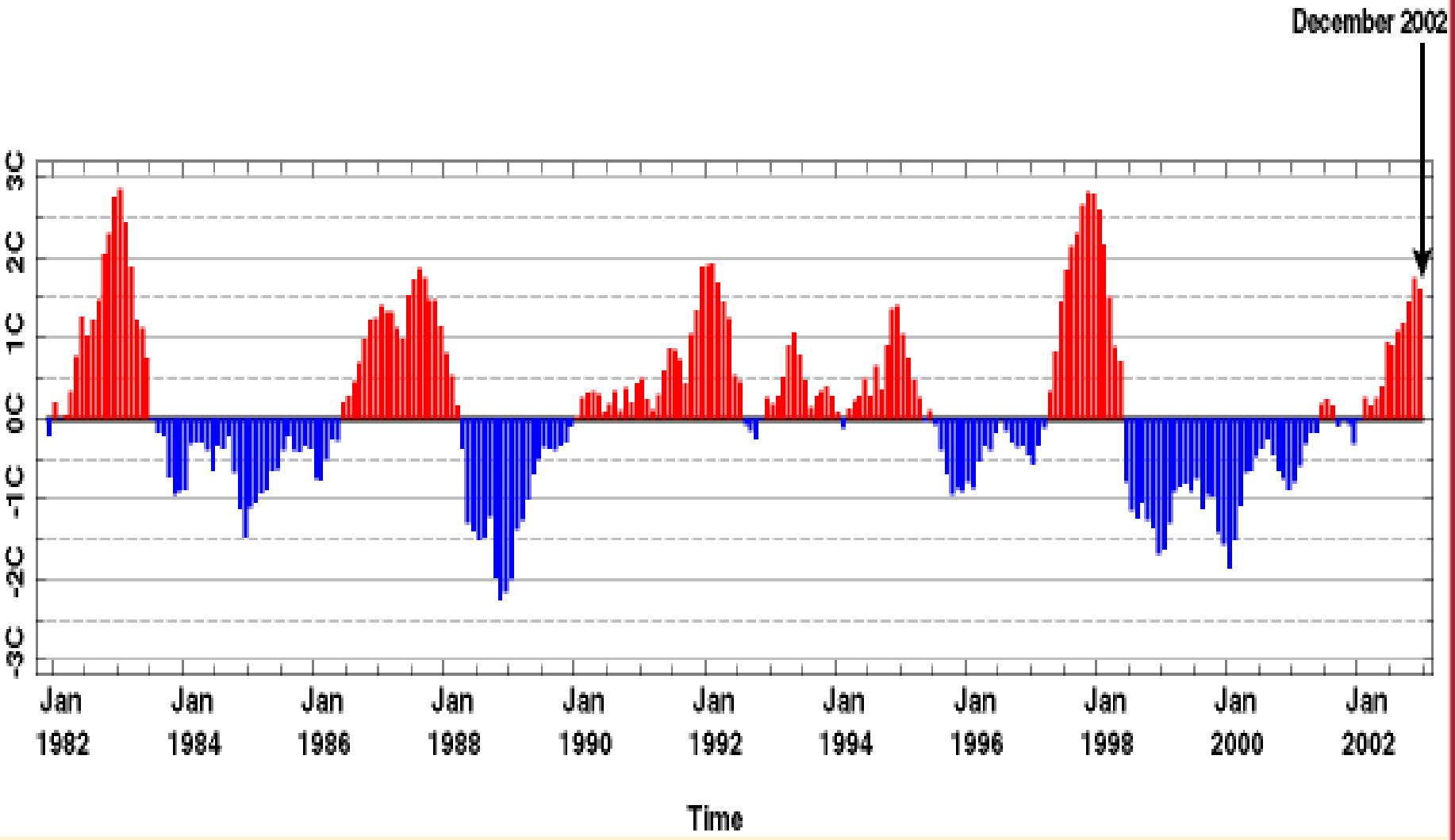
Historical Sea Surface Temperature Index **



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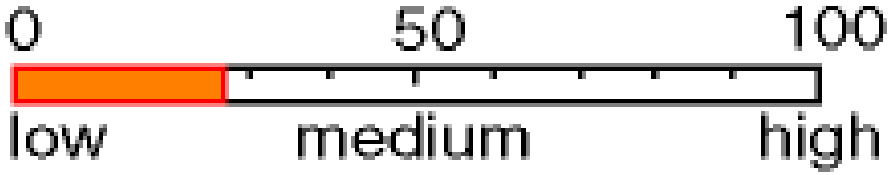
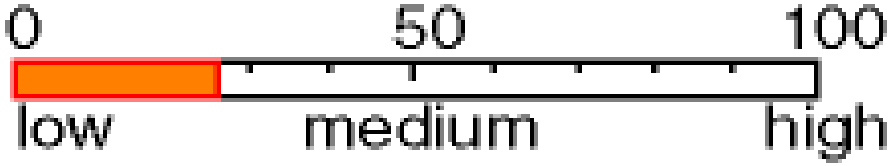
Current ENSO Forecast Summary *

Forecast Period: June 2003 - August 2003

- **Probability of El Niño**



- **Probability of La Niña**



- **Probable Magnitude of Event**

(not applicable)

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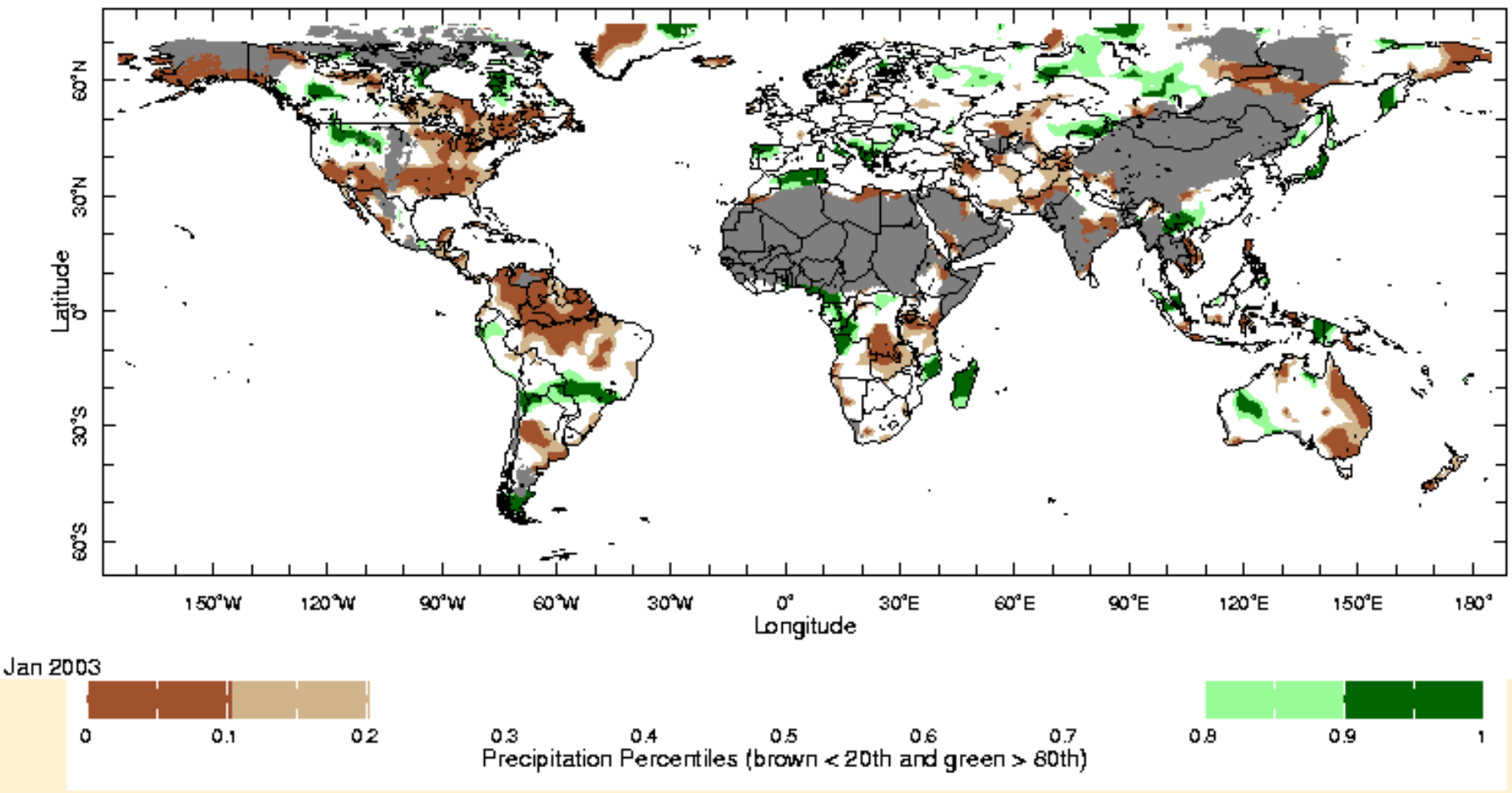
Precipitation Percentiles
January 2003



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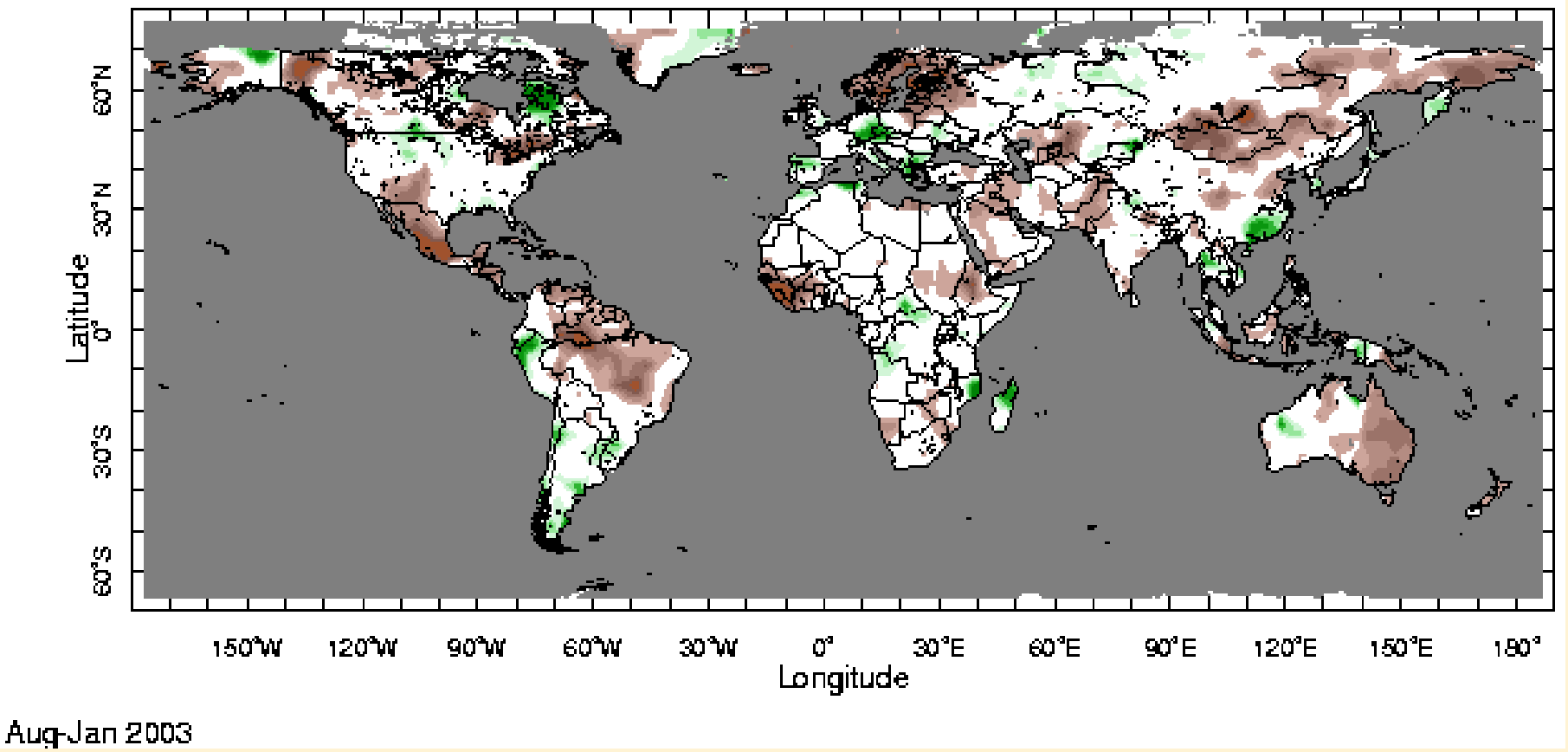
Weighted Anomaly Standardized Precip (WASP)

6 Months (Aug-Jan)



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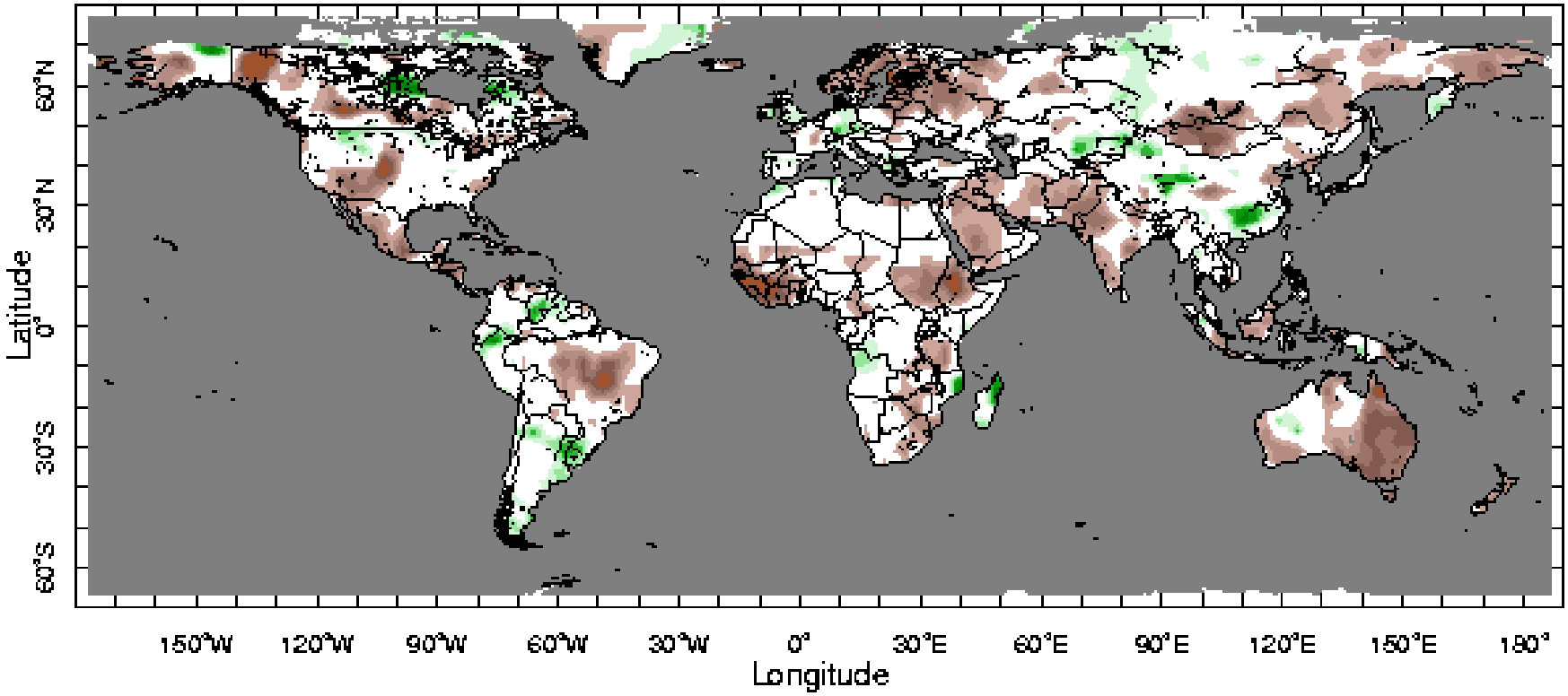
12 Month WASP

Feb 2002 to Jan 2003

WASP INDEX LEGEND

- (> +3) Extremely Wet
- (+2 to +3) Very Wet
- (+1 to +2) Moderately Wet
- (+1 to -1) Near-Normal
- (-1 to -2) Moderately Dry
- (-2 to -3) Very Dry
- (< -3) Extremely Dry



Feb-Jan 2003

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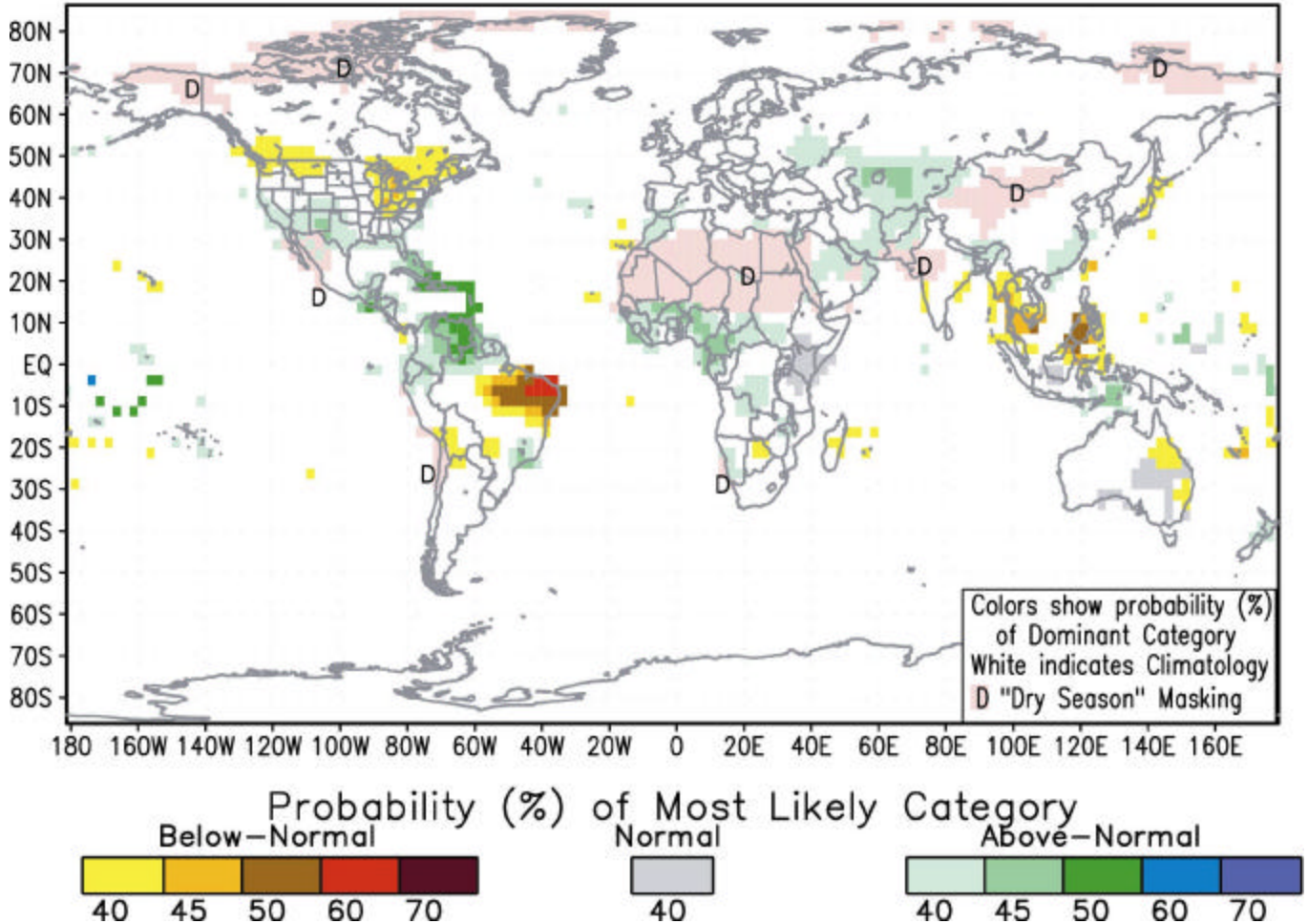
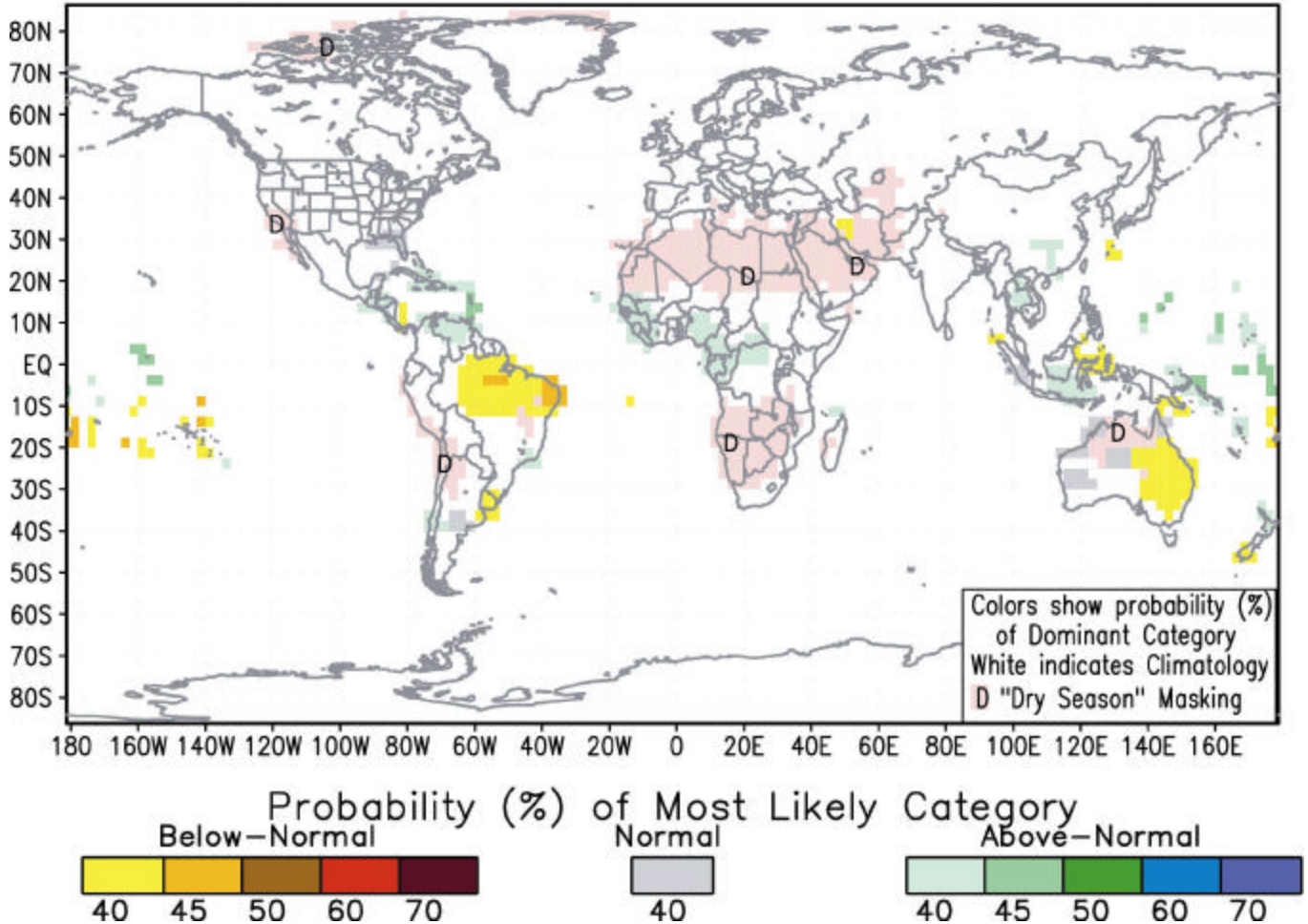
IRI Multi-Model Probability Forecast for Precipitation
March-April-May 2003 made January 2003



IRI Multi-Model Probability Forecast for Precipitation
May-June-July 2003 made January 2003



Summary

- No two El Nino Episodes are exactly alike
- Nonetheless, consistent broad patterns of rainfall (and temperature) tend to occur in association with ENSO
- The 2002-2003 El Nino Episode was a moderate event with many of the typical rainfall anomalies
- The 2002-2003 Episode is expected too decrease in strength and be over by late NH spring.

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