

Worldwide Integrated Study of Extremes

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ESSP

DIVERSITAS

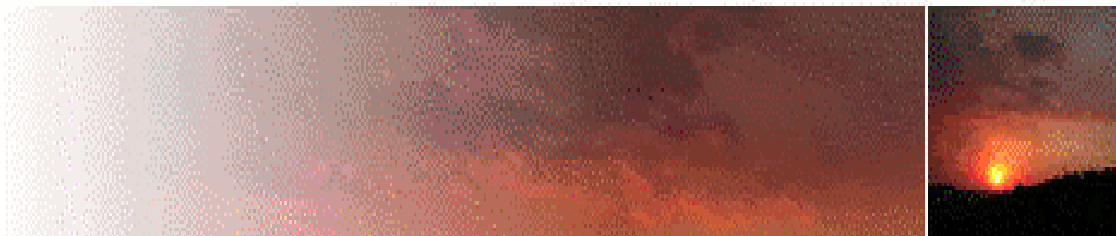
IGBP

IHDP

WCRP



World Climate Research Programme



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FLOODS & DROUGHTS | SNOW & ICE | CHEMISTRY & CLIMATE | EARTH SYSTEMS

WORLDWIDE INTEGRATED STUDY OF EXTREMES (WISE)

Objective: *To better understand the occurrence, evolution and role of extremes within the climate system (and to contribute to their better prediction)*

- It formally started in mid-2005
- The effort is initially focusing on ***droughts and extended wet periods***
- Extremes are an important aspect of GEWEX Phase II Roadmap

FOCAL POINTS

1. Definitions of extremes
2. Databases
3. WEBS follow-on for extremes
4. Trends of extremes
5. Extremes during CEOP

1. DEFINITIONS

Issue:

- How do we define an extreme event?

Action:

- Summary of many techniques currently being used to characterize extremes

2. DATASETS

Issue:

- How can we document the occurrence of extremes of interest to GHP?

Action:

- Numerous relevant datasets including those from GEWEX

WISE: Worldwide Integrated Study of Extremes

Home
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Members
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Definitions
Databases
WEBS follow-on for extremes
Trend of extremes
Extremes during CEOP
Prediction
Summary of Activities
Plans
Reports
Presentations
Meetings and Conference Calls
Links: Extreme Events

Web Sites of Extreme Events

Extreme Monitoring

- [North American Drought Monitor](#)
- [US Drought Monitor](#)
- [Canada Drought Watch](#)
- [NOAA/CPC Climate Data and Maps](#)
- [Australia Climate Information \(BoM\)](#)
- [Famine Early Warning Systems Network](#)
- [Sahel Weather and Crop Situation \(UN\)](#)
- [Drought Monitoring Centre for the Greater Horn of Africa](#)
- [Weekly Weather and Crop Bulletin](#)

Extreme Forecasting

- [US Hazards Assessment](#)
- [IRI Forecasts](#)
- [NOAA/CPC Forecasts](#)

Past Extreme Events

- [NOAA/NCDC Extreme Weather and Climate Events](#)
- [International Federation of Red Cross and Red Crescent Societies](#)
- [International Natural Disaster Response Archive](#)
- [International Natural Disaster Situation Reports Archive](#)
- [Global Active Archive of Large Flood Events](#)
- [Munich Re Group Publications](#)
- [Climate Information Project \(NOAA/OGP\)](#)
- [International Disaster Database \(OFDA/CRED\)](#)
 - [EM-DAT Emergency Disasters Data Base](#)
- [Global Natural Disasters and Catastrophes](#)
- [Paleoclimate Drought Resources \(NOAA/NGDC\)](#)
- [Australian Climate Extremes of the 20th Century](#)
- [Asian Disaster Reduction Center](#)
- [US Federal Disaster Declaration Archive \(FEMA\)](#)
- [Tornado Project](#)
- [Statistics of Weather and Climate Extremes \(UCAR/ESIG\)](#)

Extremes-Related Organizations

- [National Drought Mitigation Center](#)
- [NOAA Drought Information Center](#)
- [International Research Institute for Climate Prediction \(IRI\)](#)
- [NOAA Climate Prediction Center \(CPC\)](#)
- [NCAR Environmental and Societal Impacts Group Extreme Weather and Climate Research](#)
- [Statistical Methods for Extreme Events in Weather and Climate](#)
- [Modelling the Impact of Climate Extremes \(MICE\)](#)

3. WEBS Follow-On

Issues:

- What are the 'water and energy cycling' characteristics of extremes?
- What processes and feedbacks are responsible for these evolving features in different regions?

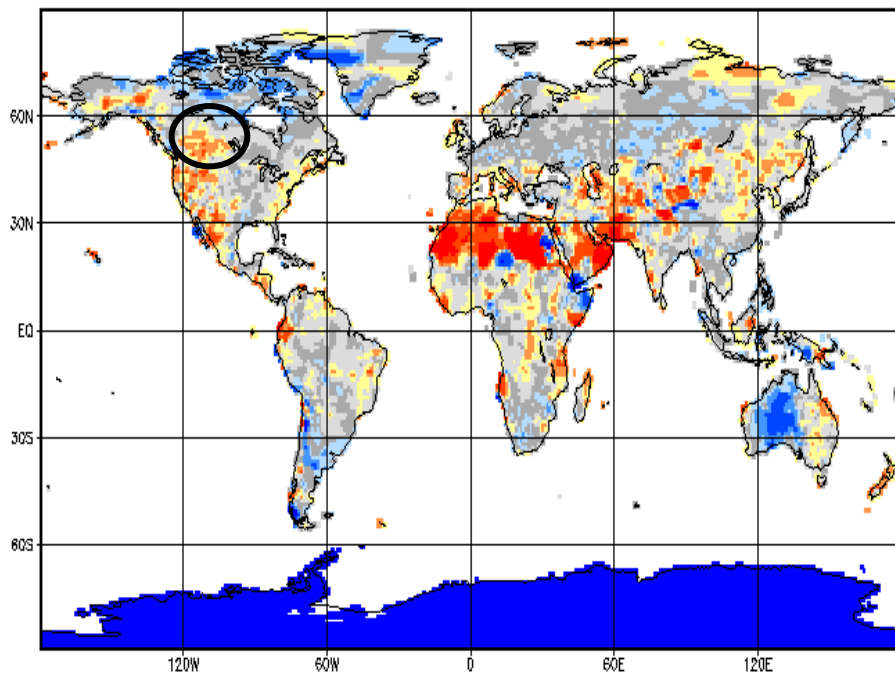
Actions:

- One approach: Case Studies of Extreme Events
- One initial case study: Canadian Prairies (1999-2005)

GLOBAL PRECIPITATION ANOMALY

2001

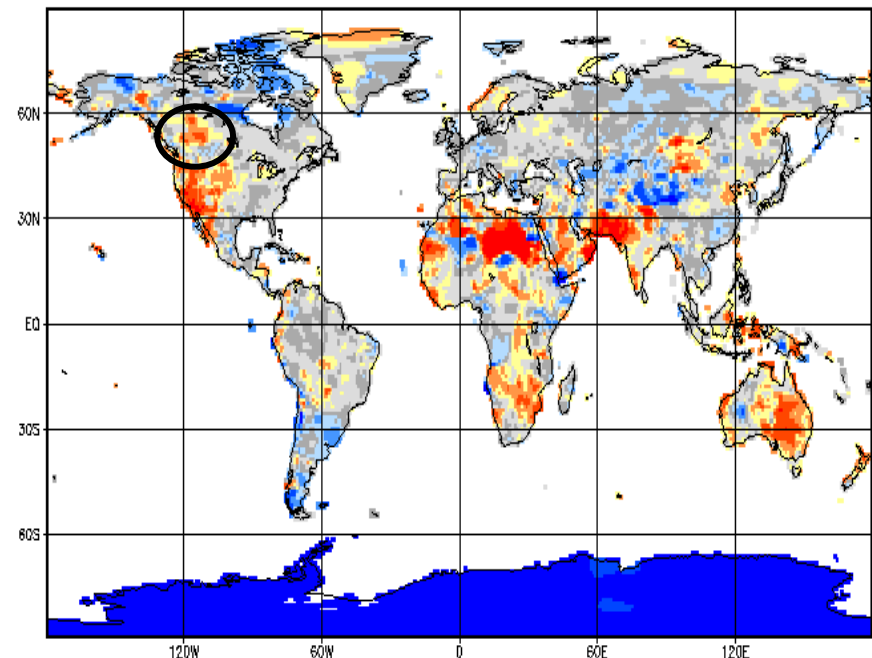
GPCC Monitoring Product Gauge-Based Analysis 1.0 degree
precipitation percentage of normals 61/90 for year (Jan - Dec) 2001



GPCC

2002

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



GPCC

4. TRENDS OF EXTREMES

Issue:

- Have extremes changed in their characteristics and how can we explain the results?

Actions:

- Summary of trend studies
- Possibly carry out other trend studies based on our other results

5. EXTREMES DURING CEOP

Issues:

- During the CEOP period ...
 - What extremes occurred?
 - What are the characteristics of these extremes?
 - How did the cycling of water and energy occur within these extremes?
 - To what degree were the extremes inter-connected?

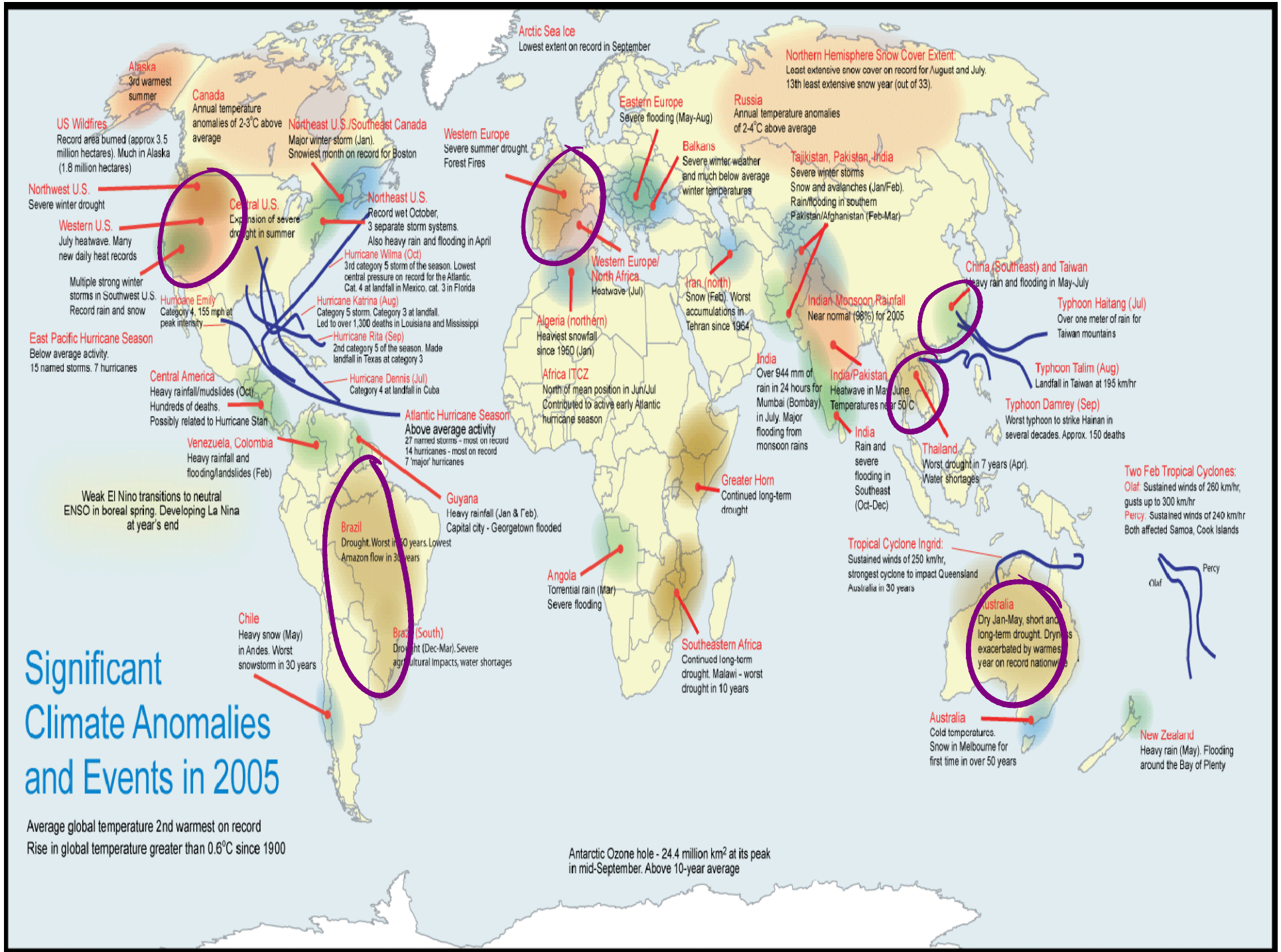
Actions:

- Studies underway

Significant Climate Anomalies and Events in 2005

Average global temperature 2nd warmest on record
 Rise in global temperature greater than 0.6°C since 1900

Antarctic Ozone hole - 24.4 million km² at its peak in mid-September. Above 10-year average



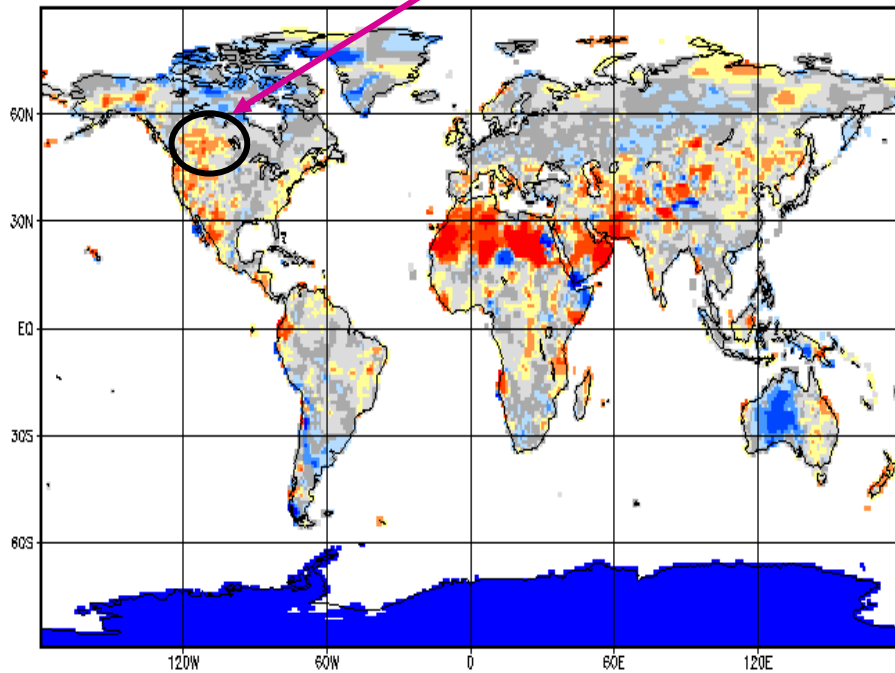
GLOBAL PRECIPITATION ANOMALY

2001

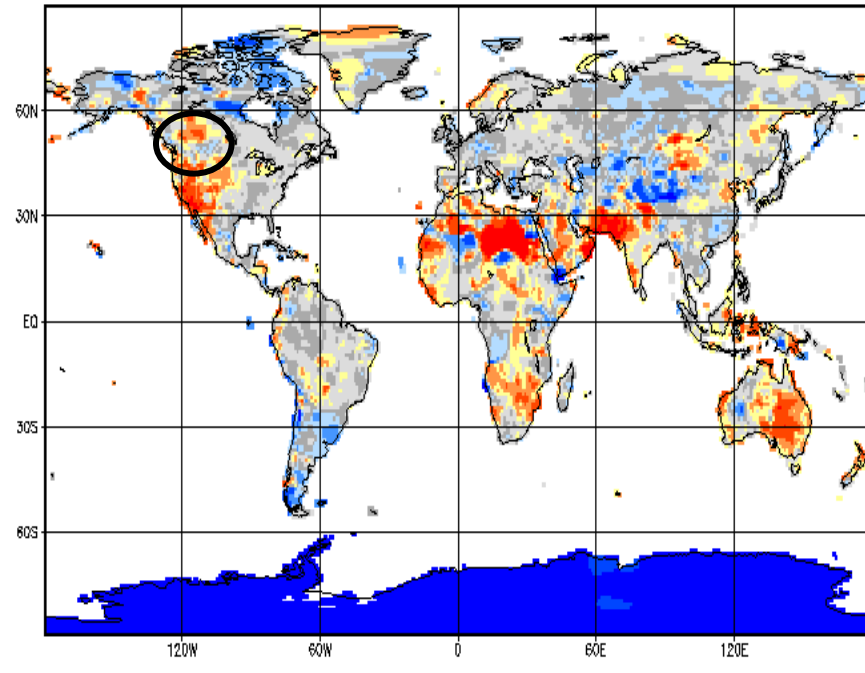
An initial WISE case study

2002

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



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



GPCC

GPCC

We also need to document extremes worldwide and study their inter-connections

PLANS FOR WISE

Some examples include.

Short-term (~ 1 year)

- WISE-related session at the autumn 2006 AGU
- WISE session in conjunction with the 2007 CEOP workshop
- WISE-related sessions at IUGG 2007

Longer-term (1-4 years)

- Inventory of events during CEOP
- Case studies from CSEs and CEOP and comparisons
- Inter-connections of extremes during CEOP
- Study of trends in extreme events and interpretations
- Synthesis-review article on extremes and the climate system
- ...

SUMMARY

- **Extremes are important and are a highlight of WCRP and are a focal point of most (or all) CSEs**
- **WISE is currently focusing on a sub-set of this large issue: key aspects of droughts and extended wet periods**
- **Initial activities build on and contribute to GEWEX and CEOP**
- **Important issues include:**
 - extremes within GEWEX and WCRP?**
 - extremes within merged GHP-CEOP?**

Definitions and Characteristics of Extreme Precipitation

1. Definitions

(1.1) IPCC Definition

(1.2) “Frequency quantiles”

(1.3) “Amount quantiles”

(1.4) Return period

(1.5) Tail of the Gamma Distribution

(1.6) “Expandable” 5 Day Window

2. Characteristics

(2.1) Threshold Surplus

(2.2) Concentration Index

(2.3) Gamma distribution – alpha and beta value

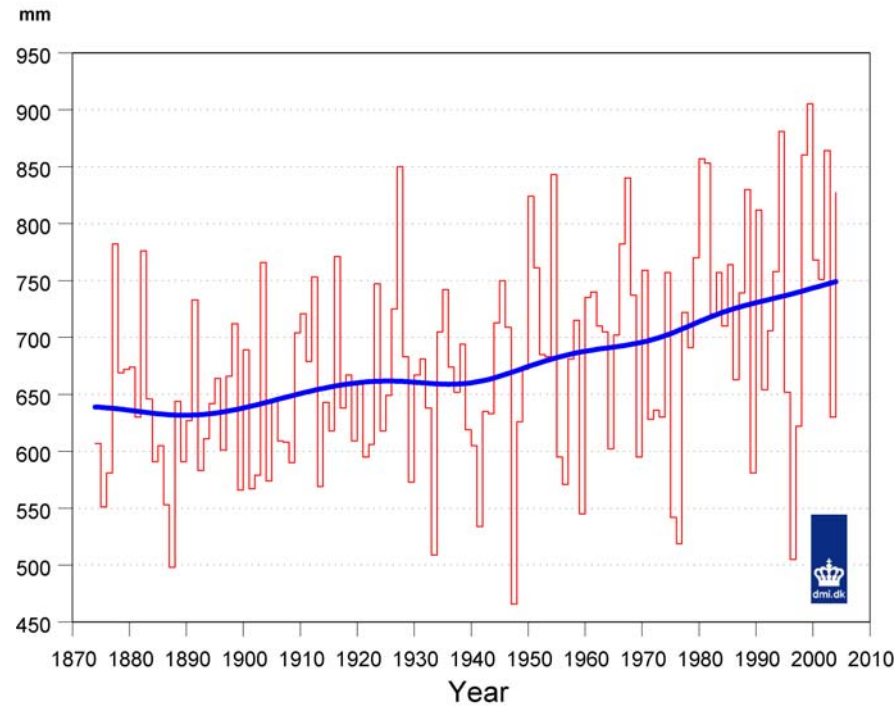
(2.4) Classified according to origin

BACC (7): Selected example material from chapter 2



BACC
BALTEX ASSESSMENT OF CLIMATE CHANGE
for the Baltic Sea Basin

www.gkss.de/BACC



Variation of annual precipitation amount over Denmark, 1874-2004 (Cappelen and Christensen 2005).

Africa Weather Hazards/Benefits Assessment

1) Several consecutive poor dry seasons have left central Kenya with significant rainfall deficits. Rainfall typically moves into the area in October.

2) Very slow improvement continues over northern Somalia and Ethiopia's Somali region. Seasonably dry conditions continue in the south.

3) Conditions have improved in Djibouti as a result of near normal precipitation in most of the country. Slightly dry conditions continue in the north.

4) Small moisture deficits in eastern Niger have mildly stressed pastures in the area. This attributed to a slow start to the season.

5) Moisture deficits continue in a crescent stretching from Uganda to Kenya. Conditions have moderated, however deficits remain throughout the area.

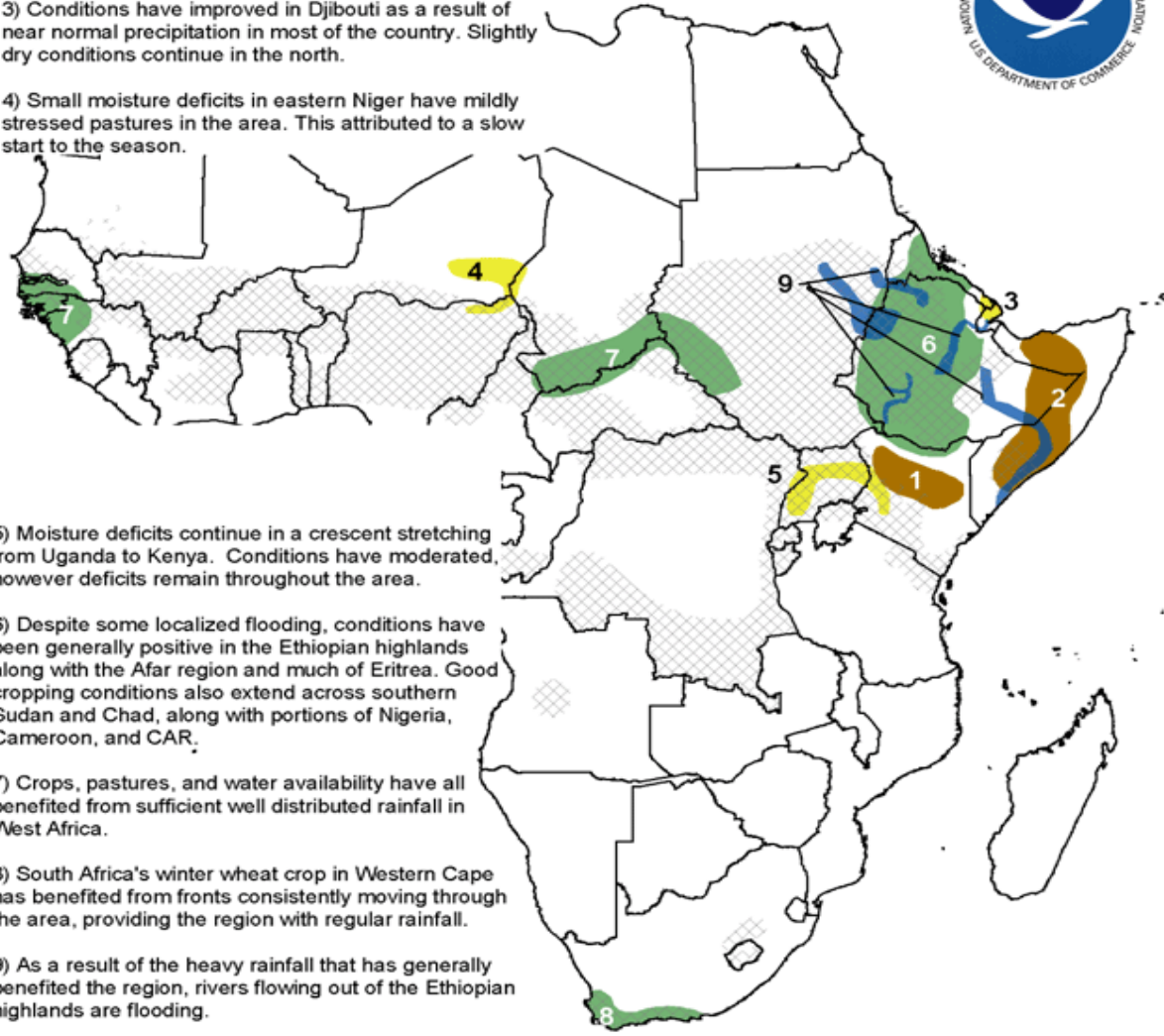
6) Despite some localized flooding, conditions have been generally positive in the Ethiopian highlands along with the Afar region and much of Eritrea. Good cropping conditions also extend across southern Sudan and Chad, along with portions of Nigeria, Cameroon, and CAR.

7) Crops, pastures, and water availability have all benefited from sufficient well distributed rainfall in West Africa.

8) South Africa's winter wheat crop in Western Cape has benefited from fronts consistently moving through the area, providing the region with regular rainfall.

9) As a result of the heavy rainfall that has generally benefited the region, rivers flowing out of the Ethiopian highlands are flooding.

NOTE: Black hatched regions depict combined wheat, maize, sorghum, and millet crop zones which are active (sowing to harvest) during the current month. (from FAO)



2006

Valid: August 24 - 30, 2006



International Federation of Red Cross and Red Crescent Societies
Fédération internationale des Sociétés de la Croix-Rouge et du Croissant-Rouge
Federación Internacional de Sociedades de la Cruz Roja y de la Media Luna Roja
الاتحاد الدولي لجمعيات الصليب الأحمر والهلال الأحمر

Information bulletin 01/2006
Issued 24 August 2006
FL-2006-000125-THA

Thailand: Floods



As a result of incessant rain over the last several days, provinces of the northern part of Thailand have suffered severe flooding. Especially the flood situation in Nan and Chiang Rai are still worrying. The current Nan flooding is the worst in more than 40 years. The hardest-hit areas were in Nan's 3 districts [Tha Wang Pha, Maung, Vieng Sa] which is now under floodwaters 1.20-1.80 metres deep.

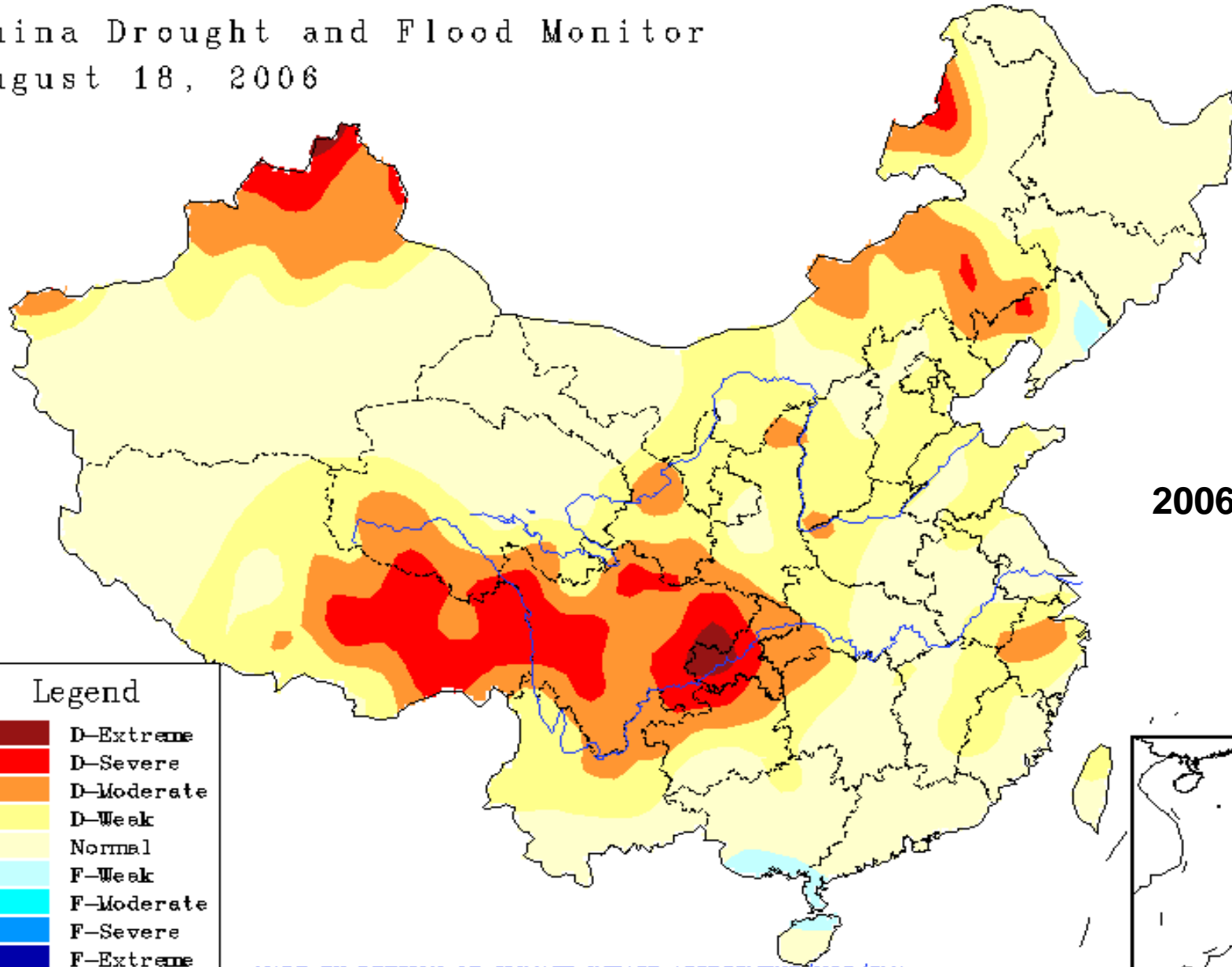
In Chiang Rai flood situation is still worrying, more than 5,000 villagers have been affected by flooding.

The maps used do not imply the expression of any opinion on the part of the International Federation of Red Cross and Red Crescent Societies or National Societies concerning the legal status of a territory or of its authorities.

Map data sources: ESRI, Federation

CMA NCC

China Drought and Flood Monitor August 18, 2006



20060818

IMAGE COURTESY: CHINA METEOROLOGICAL ADMINISTRATION

CURRENT FOCAL POINTS

Current focal points include:

- Detailed case studies
- Occurrences worldwide

keep trimming and adding
Wisdom... don't flood them with
detail but give them a clear vision

- think about key messages
-
- keep it simple ... what is the goal, steps (including global drought), .. actions(case studies, prepare for global, data integration), scientific hypotheses (large scale vs local scale .. etc.)

Overview

- Background
- Issues
- Detailed Case study (Kit)
- Summary and Comments

Scientific Issues include ...

- To what extent is the occurrence of droughts/large scale flooding driven by ...
 - large scale factors
 - internal factors
- Given a drought/flooding, what determines its exact nature
 - large scale factors
 - internal factors

AN OVERALL PERSPECTIVE

- **What extremes have occurred?**
- **How do extremes develop, evolve and end within the climate system?**
- **How are extremes inter-connected?**
- **Have extremes changed in occurrence and character and why?**
- **Given our progress, how can we contribute to better predicting extremes on 'short' and 'long' time scales?**