Drought Activities at the NOAA/NCDC Climate Monitoring Branch

Richard R. Heim Jr.

NOAA/NESDIS/National Climatic Data Center
Asheville, North Carolina

USDM Workshop
Austin, TX, October 2009
Overview

- Monthly State of the Climate drought reports
- Drought Monitor Activities (USDM, NADM)
- FMDI – Floating Month Drought Index
- Living Blended Paleo Drought Monitoring
- U.S.-Canadian GEO Bilateral Studies
- April 2010 NADM Workshop
State of the Climate Drought Reports

- Monthly reports
  - Narrative & graphics
  - NOAA press release, plus: Global Analysis, Global Hazards & Significant Events, National Overview, Drought, Wildfire, Hurricane sections

- Drought has U.S. focus
- Online by mid-month (12th to 15th)
CMB Drought Web Pages

✓ Drought Monitoring Tools
  - A static page that provides links to drought web resources from other organizations

✓ Drought Termination in the U.S.
  - Based on Palmer Drought Index
  - Precip required to end/ameliorate drought & probabilities of it occurring

✓ Weekly maps
  - Plot of indicators derived from CPC weekly data
  - Monthly Palmer Drought Index computed weekly
Drought Monitor (USDM/NADM) Activities

✓ Author U.S. Drought Monitor (USDM) and North America Drought Monitor (NADM)

✓ Host the NADM web site:

✓ Compute the continental indicators for the NADM
  - U.S., Canadian, Mexican SPI, PCTPCP, & Palmer Drought Indices
FMDI – Floating Month Drought Index

- FMDI – a new drought index to provide guidance on drought termination amidst conflicting indicators
FMDI – Floating Month Drought Index

✓ FMDI – a new drought index inspired by the Australian decile-based drought definition, USDM, & Objective Blends

✓ Based on precipitation percentiles

✓ Computes:
  - Precipitation percentile for current month
  - Length (number of consecutive months) and begin year/month of current dry spell
  - Precipitation percentile for current N-month dry spell
  - Dx dry spell category (based on USDM categories) for current month
  - Length (number of consecutive months) and begin year/month of current wet spell
  - Precipitation percentile for current N-month wet spell
  - Wx wet spell category (based on analog to USDM categories)
FMDI – Floating Month Drought Index

✓ Dry Spell begins – when 3 consecutive months each have an anomaly <= 30th percentile and the anomaly of total precipitation for the 3 consecutive dry months falls beyond the cutoff (<= 30 percentile)

✓ Dry Spell ends when:

- the total precipitation for the months from beginning anchor year-month to current month no longer falls beyond the cutoff (<= 30th percentile), OR

- the precipitation for the past 3 months is extremely wet (3-month total precipitation >= 70th percentile)

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FMDI – Floating Month Drought Index

✓ Wet Spell begins – when 3 consecutive months each have an anomaly >= 70th percentile and the anomaly of total precipitation for the 3 consecutive dry months fall beyond the cutoff (>= 70 percentile)

✓ Wet Spell ends when:

- the total precipitation for the months from beginning anchor year-month to current month no longer falls beyond the cutoff (>= 70th percentile), OR

- the precipitation for the past 3 months is extremely dry (3-month total precipitation <= 30th percentile)

    | 70-80 (W0) |
    | 80-90 (W1) |
    | 90-95 (W2) |
    | 95-98 (W3) |
    | 98-100 (W4) |
FMDI – Floating Month Drought Index

✓ Has a Near-Real Time component
✓ Has a Near-Real Time component and a Backstepping component
✓ Requires serially complete data

FMDI Drought Categories
fmdx-cur-dat-2007-08
PCTDRY

- 6-2 (D1)
- 3-5 (D2)
- 5-10 (D3)
- 10-20 (D4)
- 20-30 (D5)

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FMDI – Floating Month Drought Index

✓ Modification added for exceptionally dry seasons

✓ If no seasonality in precipitation, then monthly normal = 1/12 of annual normal for every month:

\[ P_{\text{norm(month)}} = \frac{1}{12} \times P_{\text{norm(annual)}} \]

✓ If a month is normally very dry, then don’t count it as a drought or wet spell trigger.

✓ Solution: Find threshold \( X \):

\[ P_{\text{norm(month)}} < X \times \frac{1}{12} \times P_{\text{norm(annual)}} \]
FMDI Correlations With Other Drought Indices, All Months, All Divisions: Different Thresholds for Dry Season (Value for Factor X)

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No Seasonal Check: Strongest Correspondence

Strong Seasonal Check: Weakest Correspondence
Comparison of FMDI to other standard drought indicators.

U.S. Drought Monitor

National Climatic Data Center, NOAA

Floating Month Drought Index

NO SEASONALITY August 2009

Standardized Precipitation Index

June-August 2009

National Climatic Data Center, NOAA

http://drought.unl.edu/udm
Comparison of FMDI to other standard drought indicators.

SEASONALITY:  
X = 0.30
The instrumental data record (PDI & PHDI) only ~100 years long

Paleoclimatic (tree ring) data can extend our drought historical perspective back several hundred to thousands of years

The LBPD project blends the current instrumental Palmer Drought Index data with the long-term gridded paleo data
Living Blended Paleo Drought Project

- This project is intended to expand our historical perspective
- But it will have an operational component that can be used to support the NADM

- Station data network across U.S., Canada, & Mexico
- 0.5 x 0.5 degree latitude/longitude grid, 11,398 gridpoints
- Fine spatial resolution for continental monitoring
- Will be updated operationally on a monthly basis

11,398 Grid Boxes over North America
The LBPD gridded data base can support:

- NADM continental indicators
- NADM Objective Blends
- FMDI for North America
Living Blended Paleo Drought Project

✓ Status:

- Historical instrumental gridded data base created from station data (1895-2005)
- Paleo regression software ready
- Operational software and data base “in progress”
GRACE Drought Project

✓ NOAA/NCDC, NOAA/CPC, NASA/GSFC, NDMC, UCI*, UMBC**, ESSIC***

✓ Goal: incorporate groundwater & soil moisture from NASA’s Gravity Recovery and Climate Experiment (GRACE) satellites as input to the objective blends to support the USDM & NADM

* Univ. California at Irvine  ** Univ. Maryland, Baltimore County
*** Earth System Science Interdisciplinary Center, College Park, MD
U.S.-Canadian GEO Bilateral Drought Studies

- 5 testbeds/projects approved by the bilateral US-Canada GEO Committee at its May 2009 meeting:
  - Three international, interdisciplinary water-related monitoring testbeds, building on existing initiatives, along the U.S.-Canada border:
    - Great Lakes
    - Prairie Region
    - Rocky Mountains
  - Two studies of drought in the context of hazards and extreme events:
    - Drought Definitions and Indices Study
    - Surface Water Supply Index (SWSI) Study
  - Charters being developed
Drought Definitions and Indices Study

- Improved definition of drought for different climatic regions needed, & new & improved indices for drought needed
- Continent-wide study for comparative analysis across regions, with close links to testbed activities
- 58 participants involved
- GEO Drought Indices community set up on NIDIS drought portal
North American Drought Monitor Forum

✓ USDM & NADM workshop “season” shifting from Autumn this year to Spring next year

✓ USDM & NADM workshops alternate each year

✓ Last year’s (2008) NADM workshop was in Canada, 2006’s was in Mexico, U.S. up to host 2010’s

✓ NOAA/NCDC is volunteering to host and organize the 2010 NADM Forum workshop
NADM 2010 Forum

✓ Location: Asheville, NC, USA
✓ When: April, 2010
✓ Potential Agenda:
  ▪ NADM technical & administrative issues
  ▪ NADM user issues & general drought issues
  ▪ U.S.-Canadian GEO bilateral testbeds & drought studies
  ▪ Expanded international drought monitoring, global drought early warning system
Thank You!

Richard.Heim@noaa.gov

NCDC Climate Monitoring Branch Reports & Products:
http://www.ncdc.noaa.gov/oa/climate/research/monitoring.html

NCDC State of the Climate Reports:
http://www.ncdc.noaa.gov/sotc/

North America Drought Monitor:

U.S. Drought Monitor:
http://drought.unl.edu/dm/monitor.html

NIDIS:
http://drought.gov/