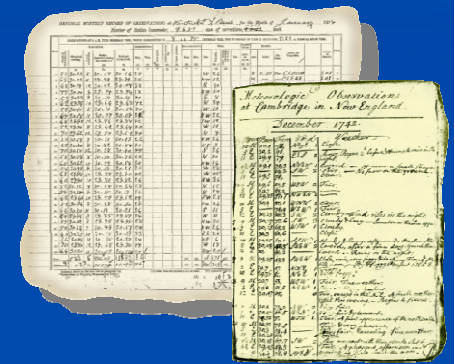
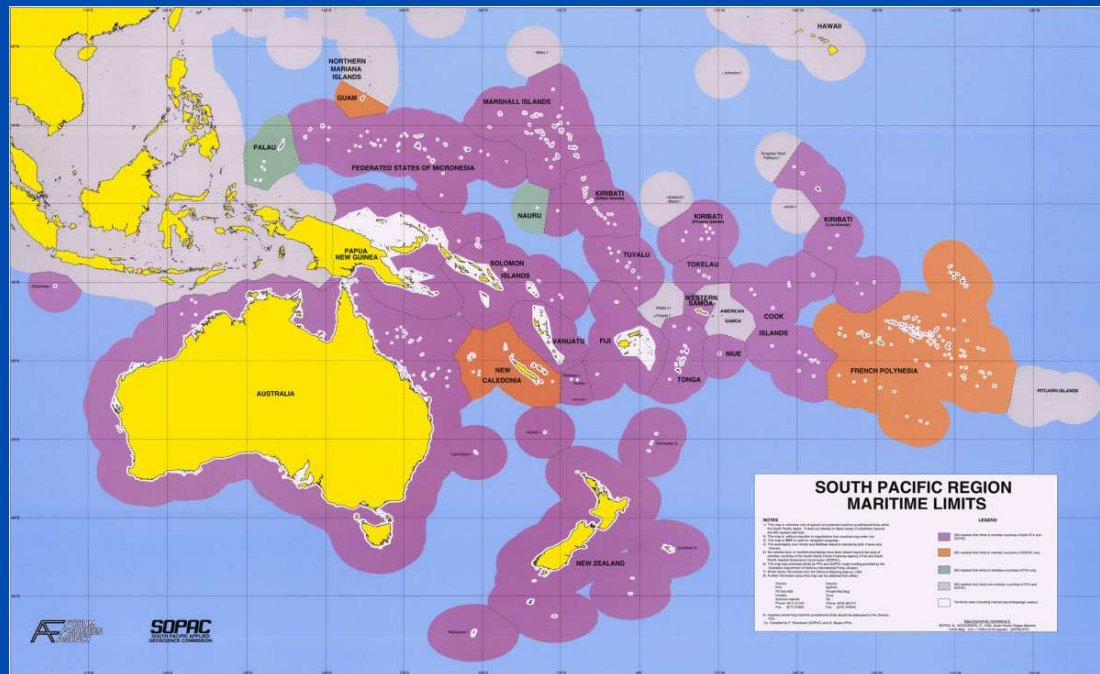


Climate Data Management – Challenges and Opportunities

Presented by Howard Diamond, NOAA/National Climatic Data Center Director, World Data Center for Meteorology



Agenda/Overview

- Challenges in Climate Data Management
- Data Quality Considerations
- Data Standards
- Processing and Quality Control
- Where are the Data?
- Considerations of Data Management
- Summary of Activities and Tools from WMO/CCI
- Why Contribute Data to Global Climate Efforts?
- Relationship to the Global Framework for Climate Services (GFCS)



Consider an island running low on drinking water during a drought



- If you were in charge of the island's long-term water planning, what would you do?

The answer depends on the climatic conditions

- Is this is a once in 200 years drought or a once in 20 years drought?
- What do the seasonal forecasts say?
- What measures can be taken to adapt to the risks?



Challenges

- Increasing data volumes and diversity.
- Breadth of expertise needed to manage this variety cannot all exist in one place.
- Changing technology of instruments underscores the importance of preserving information about the measurement methods.
- Many agencies and individuals are involved in data collection. Knowing them all is hard.
- There is increasing importance of real-time data access.

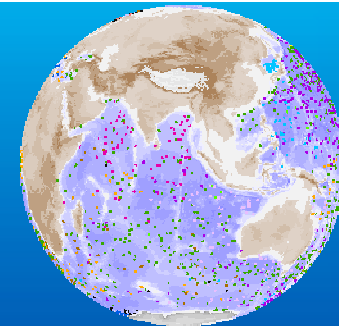


What is Climate Data Management?

- What data is available?
- Where is it?
- What is the quality of data?
- Who owns the data?
- How do I use the data?



Data Quality Considerations



- Are the data continuous?
- Is there good metadata to document the data?
- Paper versus Digital
- Physical Security (e.g., back-ups, on-site, off-site; paper)
- Have the data been quality controlled – there is obviously a big difference between 100.0 mm of rain and 1000 mm of rain – so are they reasonable?



Data Standards

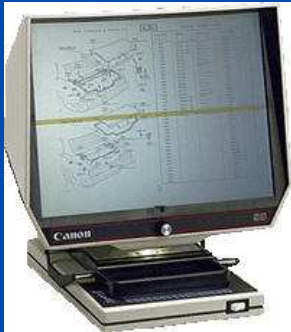


Was that feet or meters?

There are many areas where standards will improve interoperability.

- Vocabularies (e.g. variables, taxa, instrument names).
- Discovery metadata.
- Processing (e.g. quality control, browse features).
- Metadata content (e.g. provenance, instrumentation, methods).
- Example is the Z39.50 data interchange standard used by the WMO Information System (WIS)

Processing and QC



- A variable is measured by a variety of instrumentation, with differing precision, accuracy and methods.
- The variable should undergo common QC, with testing influenced by consideration of how the variable was measured.
- QC by experts should augment that done by data centres.
- There needs to be standards for indicating reliability of the measured value for intercomparability of observations.
- Original values must be preserved regardless of whether any changes are made.
- Clear and easily found documentation (e.g., metadata) of the is critical.




Where are the data?

- National Meteorological Services
- Regional Centers (e.g., NIWA, BoM, IPRC)
- World Data Centers (e.g., NCDC, Hadley Center)
- Universities and international research institutions
- Hard copy archives
- Digital storage on PCs
- Data Portals (e.g., WIS, GOSIC, GEO Portal, etc.)
- PCs/file cabinets/etc...
- Resolution 40 – Can I get to the data?



Global Observing Systems Information Center



GOSIC
Global Observing Systems Information Center

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Facilitating Access to Global Observing Systems Data and Information

The GOSIC Portal provides convenient, central, one-stop access to data and information identified by the Global Climate Observing System (GCOS), the Global Ocean Observing System (GOOS) and the Global Terrestrial Observing System (GTOS) and their partner programs, such as the Global Atmosphere Watch (GAW) and regional observing systems, such as the GOOS Regional Alliances (GRA). [More information on the GOSIC and the GOSIC Portal](#)

Updated July 13, 2009

<p>Access Data, Metadata & Data Products</p>	<ul style="list-style-type: none"> • GCOS - Global Climate Observing System • GAW - Global Atmosphere Watch • GTOS - Global Terrestrial Observing System • GOOS - Global Ocean Observing System • GRA - GOOS Regional Alliances • Maps and Google Earth(TM) Products
<p>Search Tools</p>	<ul style="list-style-type: none"> • Data Registry (search for data and metadata) • Portals (search for metadata in NASA's Global Change Master Directory (GCMD)) • Data Access Matrices (provides quick access to data download by program or theme) • Text Search • Publications (search by observing system, year or title keyword/cross referenced by GCOS, GOOS, GTOS, GAW, WMO and UN ID) (1985 to present)
<p>Information</p>	<ul style="list-style-type: none"> • Data Flow Diagrams • Meeting Calendars: GCOS - GOOS - GTOS • Publications/Documents: GCOS - GOOS - GTOS - GAW - GOSIC • Data Management Plans: GCOS/GOOS/GTOS - GCOS - GOOS - GTOS - GAW • Strategic Plans: GOOS - GAW - GCOS/GOOS/GTOS • Review the scientific and technical basis for the design of GCOS - GOOS - GTOS - GOSIC - GCOS/GOOS/GTOS • Scientific Panels • Climate Change News Feed (from the Ocean United web site) • Related Links • Disclaimer

GOSIC is supported and hosted by the National Oceanic and Atmospheric Administration's (NOAA) National Climatic Data Center (NCDC), and the U.S. GCOS Program on behalf of the global observing community.

Provides more information on GCOS – data, documentation, etc.

URL: <http://gosic.org>

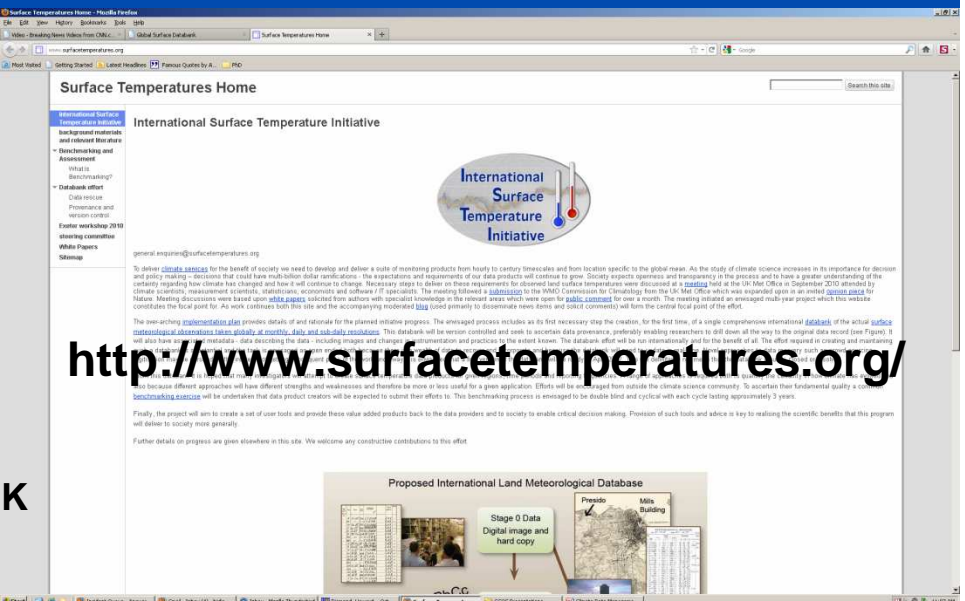
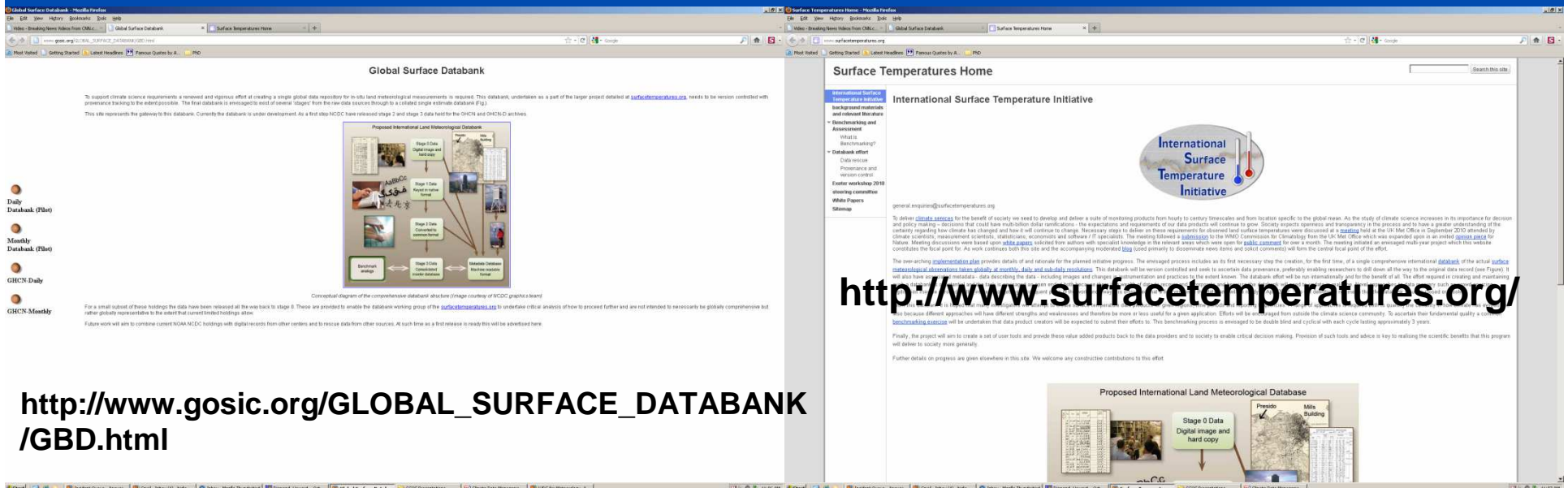
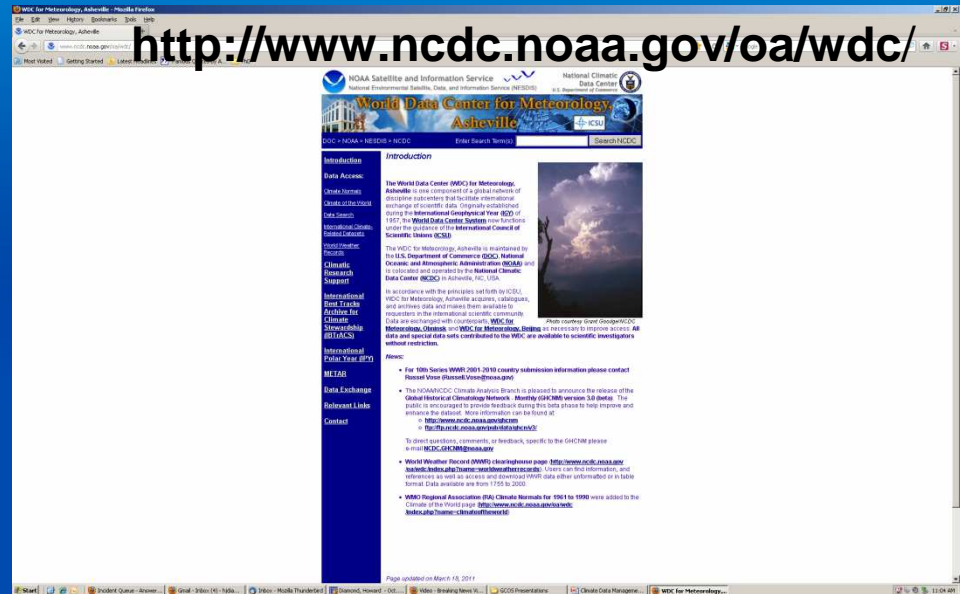
Data Access – serves as a node of the WMO Information System (WIS)

Information about Atmospheric, Oceanic, and Terrestrial Observing Systems

Goal: Easy access to data across multiple data centers

Why Contribute Data to Global Climate Efforts?

- Everyone benefits and all contributions are valued
- Improves inputs to models
- Contributes to key studies - IPCC
- Berkeley Earth Surface Temperature project – Data are key to countering claims that the Earth is not warming
- More complete databases of QC'd global climate data benefits climate services world-wide – intent of the GFCS – and something all of society will benefit from



Some Considerations of Data Management

- Historical Data
- Assessments and Monitoring
- Climate Predictions
- Adapting to Climate Risks

Historical data

- Are the original observations on paper forms rescued and digitized?
- Are the data managed in such a way that you can get easy access to them?
 - These are the domain of CCI Panel I: Climate Data Management

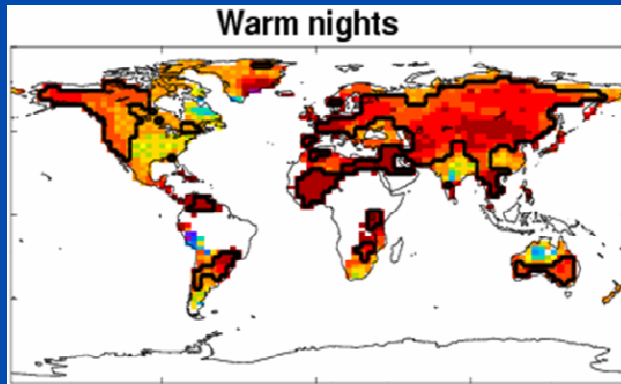
50.0	24.0	38.0
56.0	24.0	38.5
58.0	22.0	36.0
53.0	17.0	31.5
53.0	21.0	34.2
44.0	22.0	36.0

Original records of the highest temperature ever recorded by a meteorological station. Courtesy of Khalid Ibrahim El Fadli, Libyan National Meteorological Center. Max, Min and 9 am temperatures



Assessing and monitoring

- Can you easily put the current drought into accurate historical context?
- Are you actively monitoring climatic developments in real time?



North American Drought Monitor

March 31, 2011

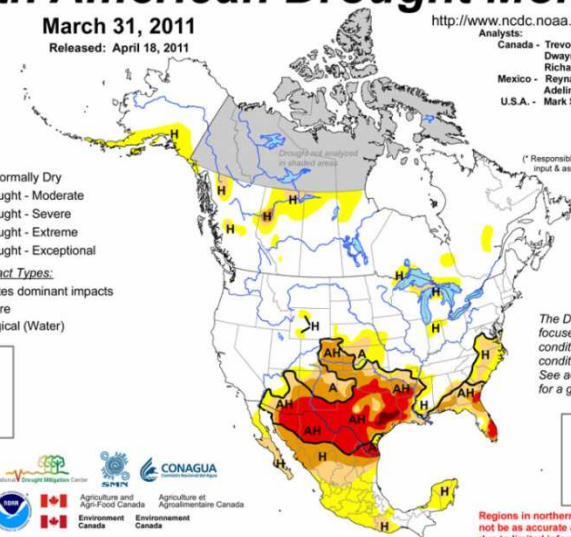
<http://www.nodc.noaa.gov/nadm.html>

Released: April 18, 2011

Analysts:
Canada - Trevor Hadwen
Dwayne Chobanik
Richard Rieger
Mexico - Reynaldo Pascual
Adelina Albanil
U.S.A. - Mark Svoboda

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

Drought Impact Types:
A = Agriculture
H = Hydrological (Water)



(* Responsible for collecting analysts' input & assembling the NA-DM map)

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



Regions in northern Canada may not be as accurate as other regions due to limited information.



Climate predictions

- Do seasonal forecasts predict lessening or worsening of the drought?
- Can you quickly get access to the most reliable forecast products and disseminate them to your key stakeholders?

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World Meteorological Organization
Working together in weather, climate and water

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Global Weather & Climate Extremes

Hemispheric Weather & Climate Extremes

Continental Weather & Climate Extremes

World Tornado Records

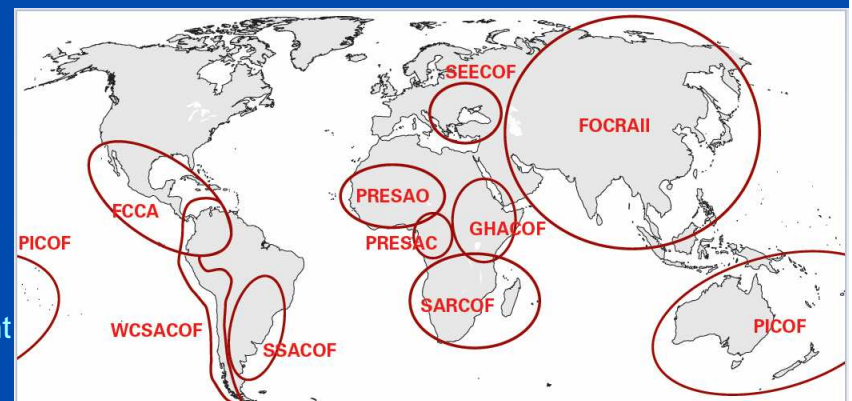
World Tropical Cyclone Records

World Weather / Climate Extremes Archive

Global Weather & Climate Extremes

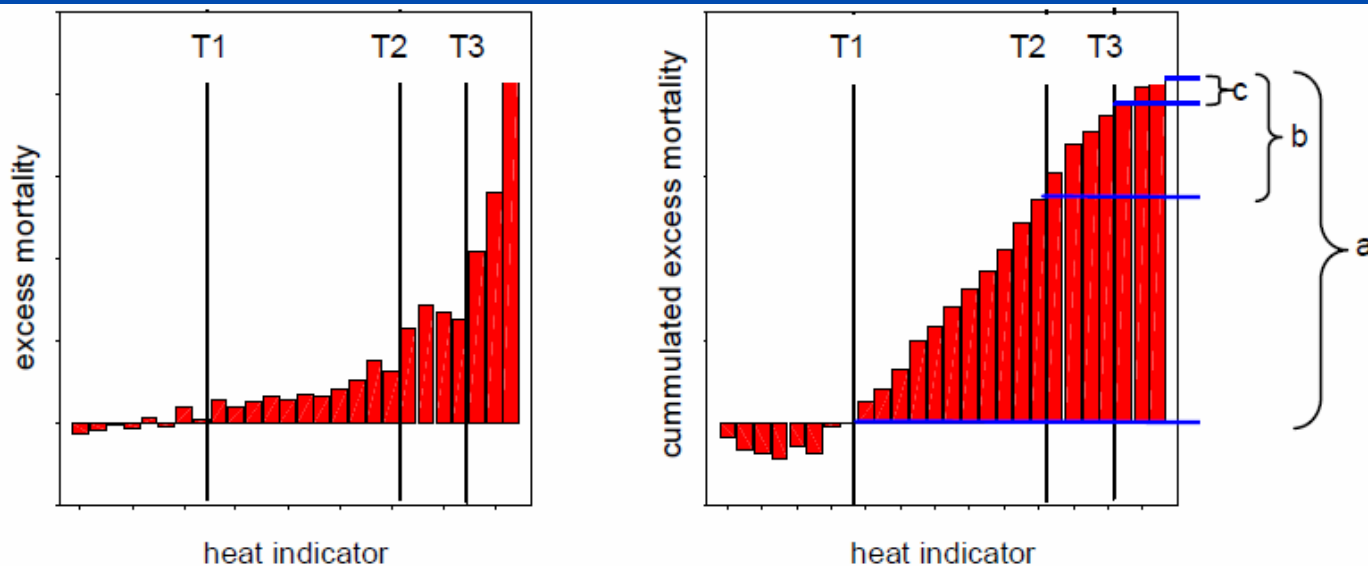


Regional Climate Outlook Fora



Adapting to climate risks

- Can you assess the risk of the drought continuing?
- Can you adapt and plan for the relevant risks?
 - These are the domain of Panel IV: Climate Information for Adaptation and Risk Management



Relationship between temperature and excess mortality. Warning systems can prevent mortality above certain thresholds.

Summary of CCI Activities Supporting Data Management

- Development of a data rescue portal
- Climate Database Modernization Systems – improved functionality
- Guiding the development of normals and making them more useful
- Shepherding World Weather Records [<http://www.ncdc.noaa.gov/oa/wdc/>]
- Indices of extremes from daily data and defining extreme events
- Official source of world weather and climate events [<http://wmo.asu.edu/>]
- Guiding evolution of Climate Information & Predictions Services (CLIPS)
- Foster, coordinate and guide Regional Climate Centers
- Preparing a document defining Climate Risk Management
- Developing socio-economic sector-specific climate indices (CAgM & CHy)
- Support data access via the WIS

WMO/CCI has a Facebook page to help facilitate the exchange of information – see <http://www.facebook.com/pages/WMO-Commission-for-Climatology/250818188276296>

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Serhat Sensoy <http://siga.uubf.itu.edu.tr/atmosfer/index.php/atmosfer/ATMOS2011>



5th Atmospheric Science Symposium - ATMOS 2011

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5th Atmospheric Science Symposium

Global Framework for Climate Services

- The GFCS is a critical global climate effort
- Good Climate Data Management practices will help us get to the kind of reliable, consistent, and high-quality climate data required for efforts like GFCS to succeed

CLIMATE KNOWLEDGE FOR ACTION:

A GLOBAL FRAMEWORK
FOR CLIMATE SERVICES—
EMPOWERING
THE MOST VULNERABLE



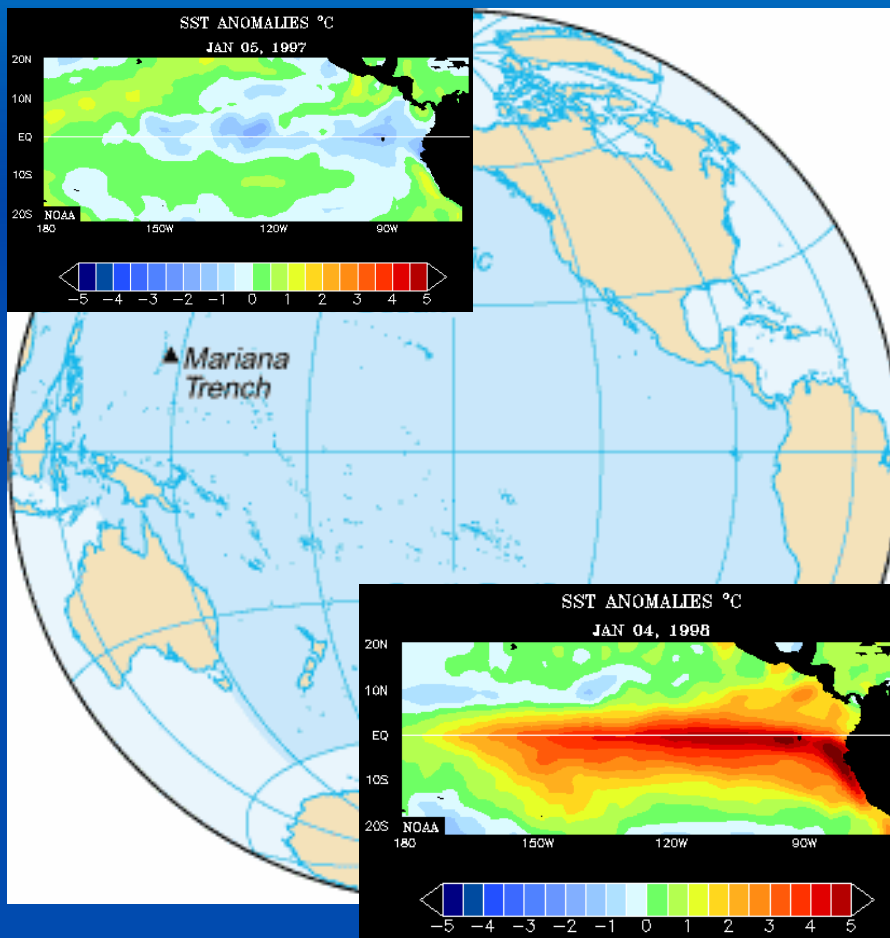
Goal: To fulfill societal needs and development through a well resourced Pacific Climate System (including Data Mgmt)

Natural Resources & Environment

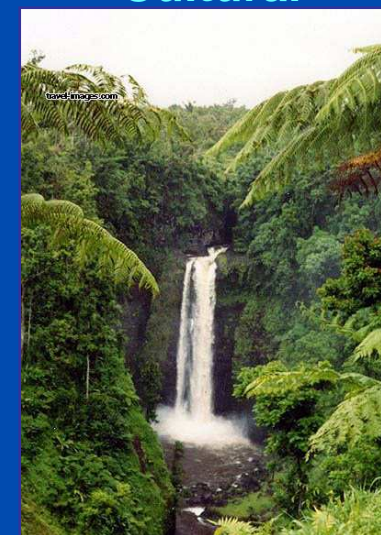


Agriculture

Village Communities



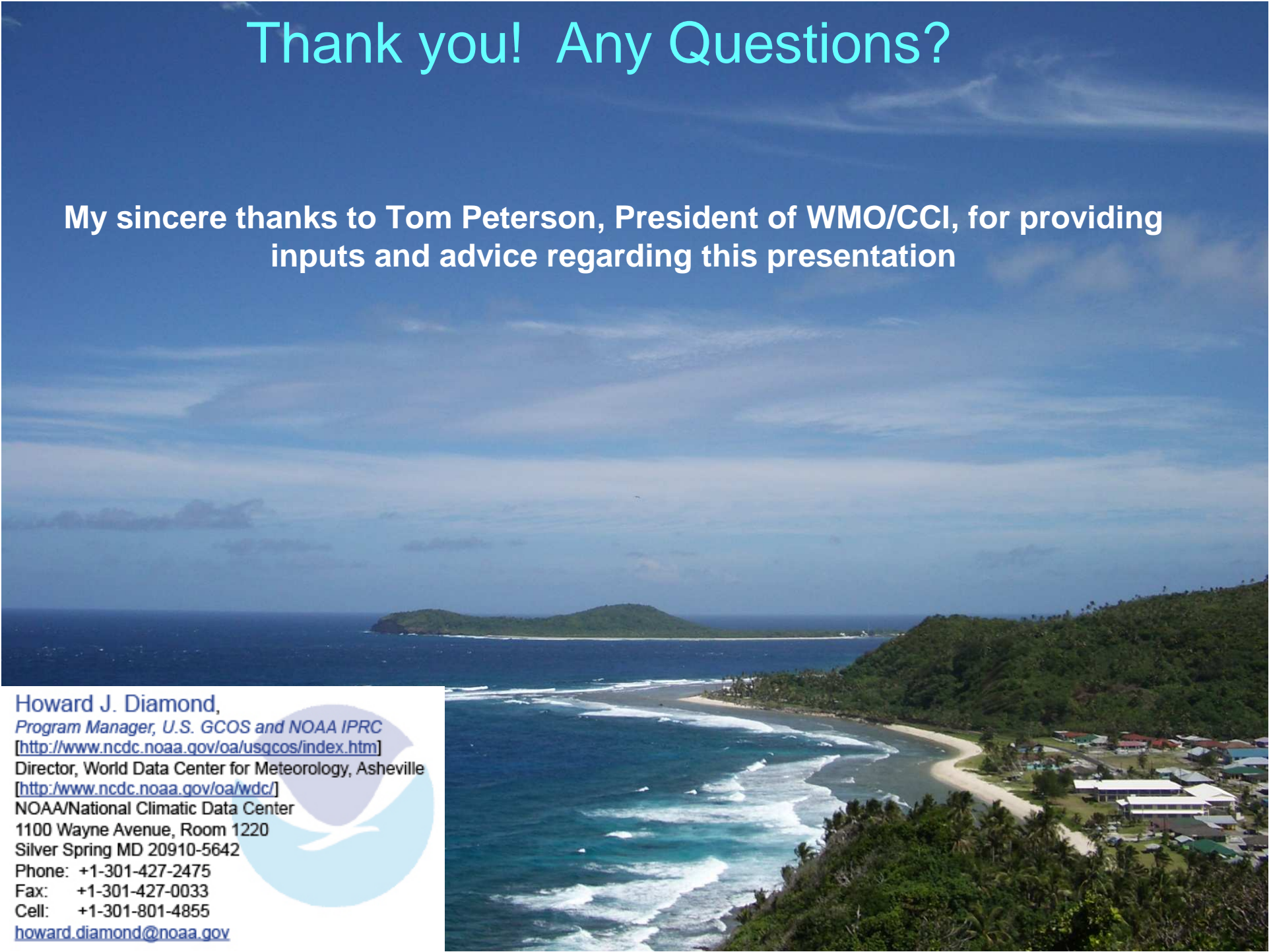
Cultural



Water 20

Thank you! Any Questions?

My sincere thanks to Tom Peterson, President of WMO/CCI, for providing inputs and advice regarding this presentation



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