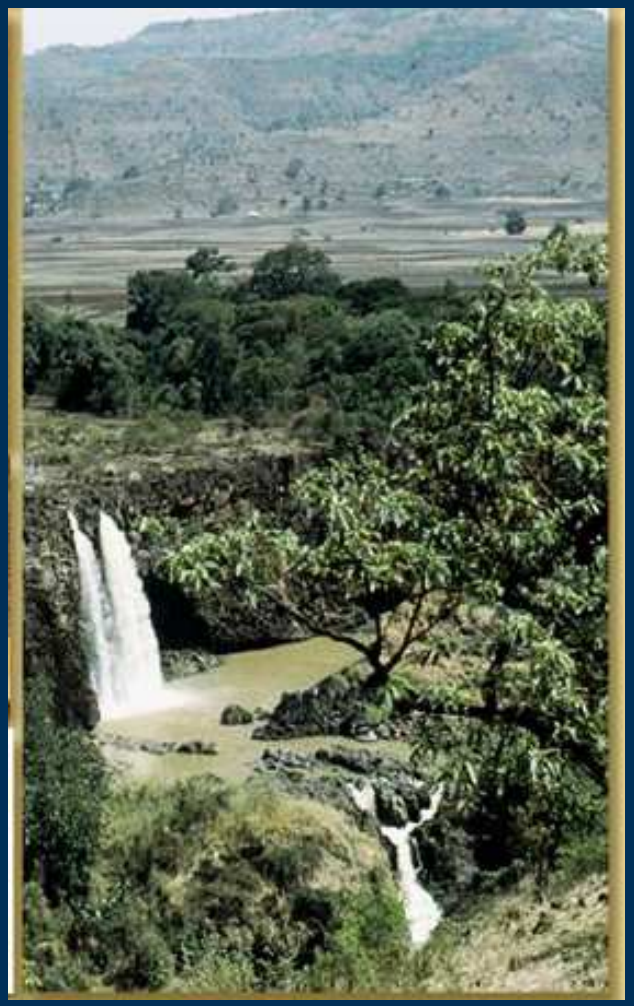
USGS
science for a changing world



Water and Climate in Semi-Arid Africa

James Verdin, Ph.D.
U.S. Geological Survey

Famine Early Warning Systems Network
Earth Resources Observation and Science Center
Sioux Falls, South Dakota
and
National Integrated Drought Information System
Boulder, Colorado

U.S. Department of the Interior
U.S. Geological Survey

2008 Water Sciences Forum
Cutting-Edge Technologies for Water Services: Applications in Africa
Washington, D.C. – June 27, 2008

Water Availability in Semi-Arid Africa

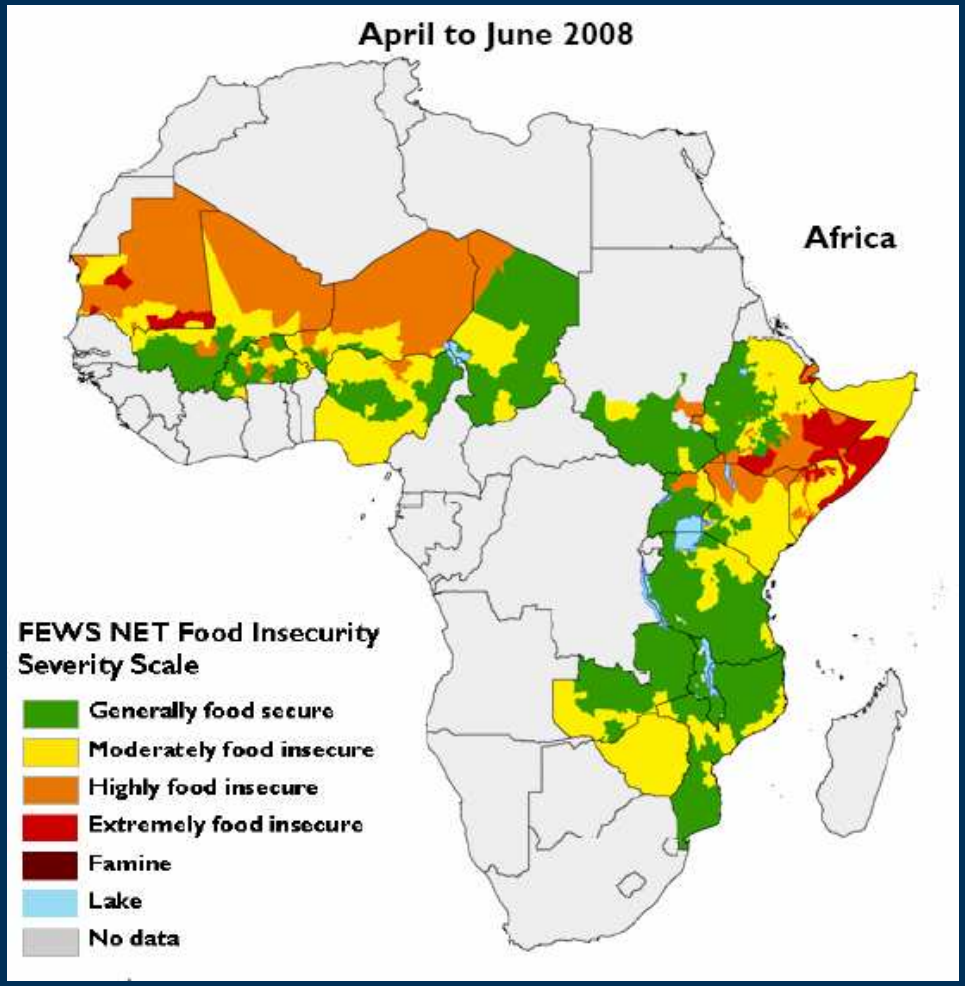
- Many significant unknowns
- Inter-annual climate variability is high
- Station networks are sparse, report with delays
- Warming climate is expected to change rainfall patterns, increase frequency of extreme events, increase evapotranspiration rates
- Increased food insecurity for vulnerable pastoralists and subsistence farmers due to yield reductions and livestock losses

Water Availability Challenges

- Enhance adaptation and early warning
- Observation networks and institutions must be strengthened
- Use remote sensing and modeling to complement station networks
- Modest production increases through effective agricultural water use can negate CC impacts - but
- First you should know how much you have!

Food Insecurity in Africa

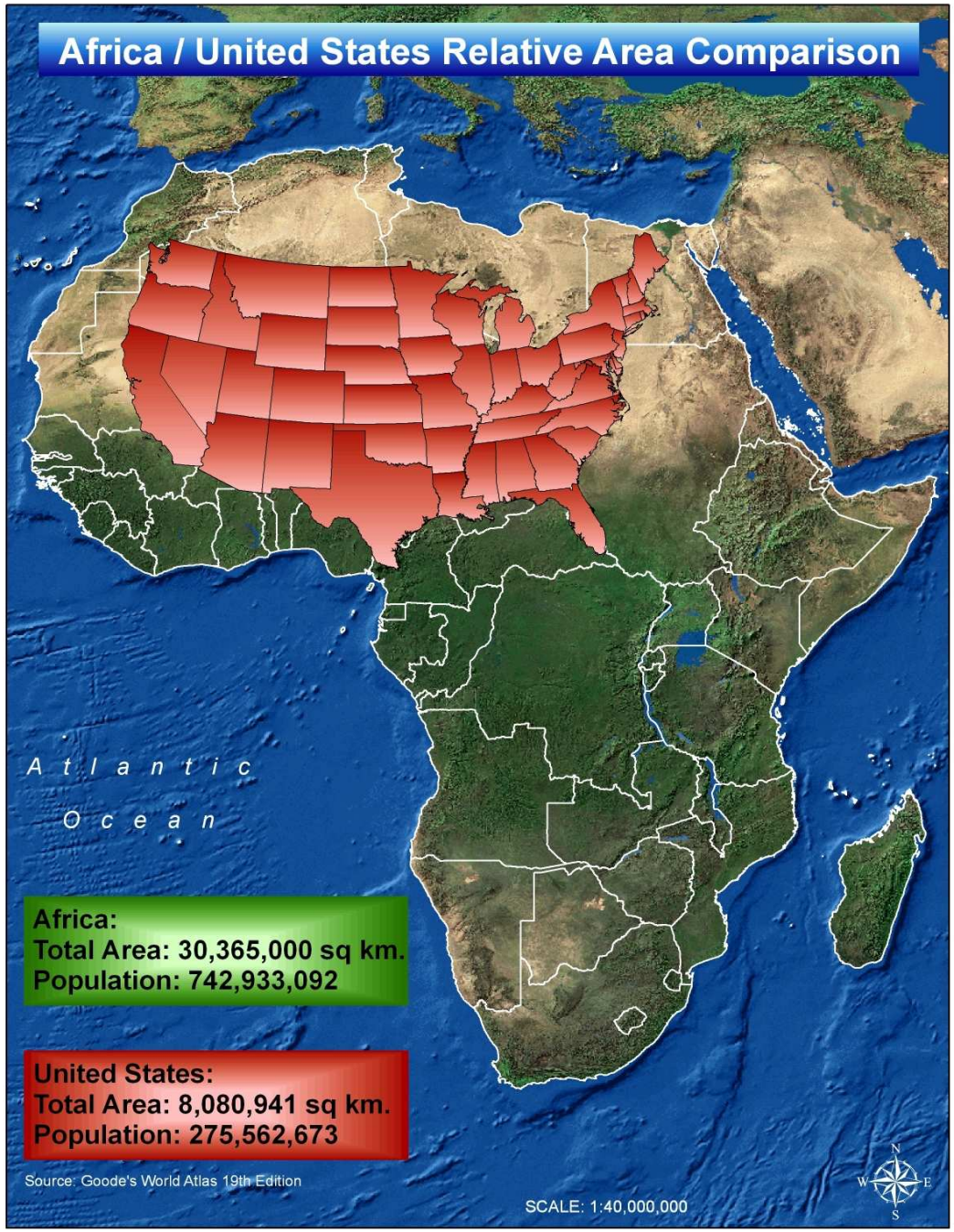
- Widespread dependence on subsistence agriculture
- 12 million people are currently at risk of food insecurity
- Drought can be a devastating factor



USGS

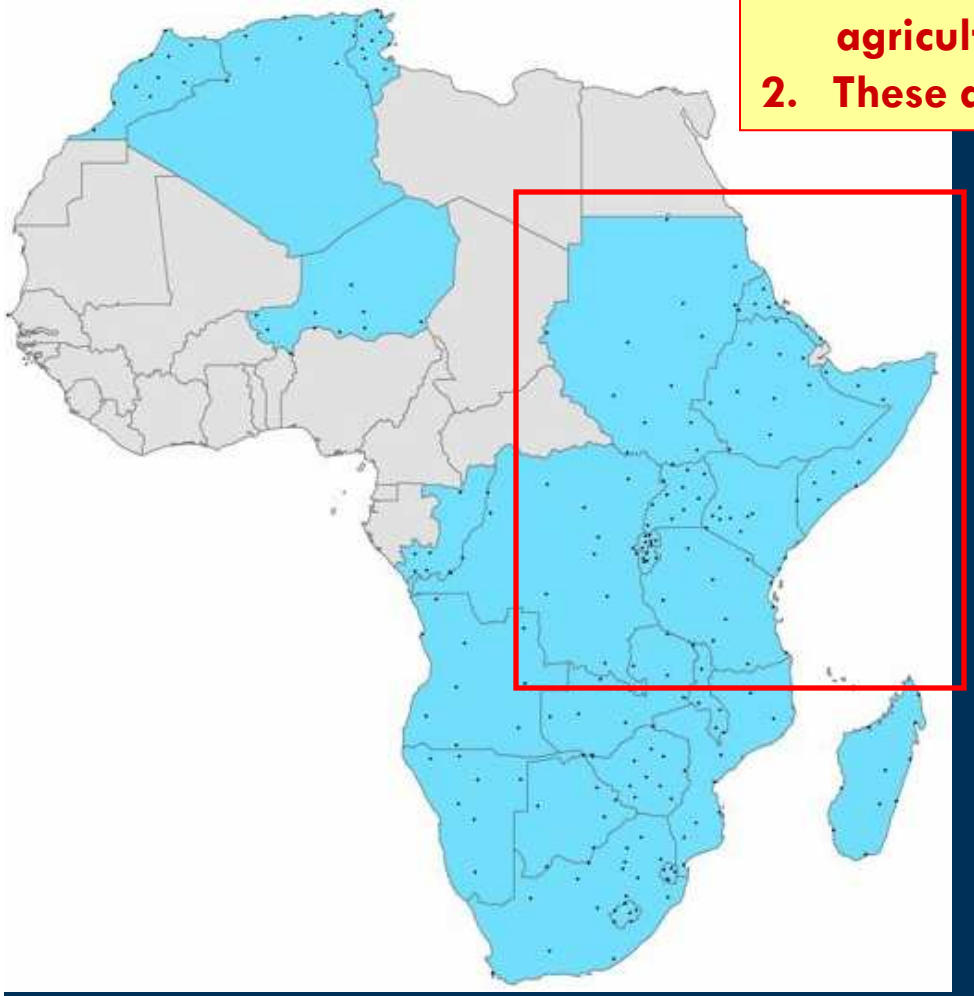
Precipitation Stations

- Africa is nearly 4 times the area of the continental U.S.
- U.S. has 6 times as many precipitation stations reporting internationally in real time
- Density ratio is thus ~ 22:1



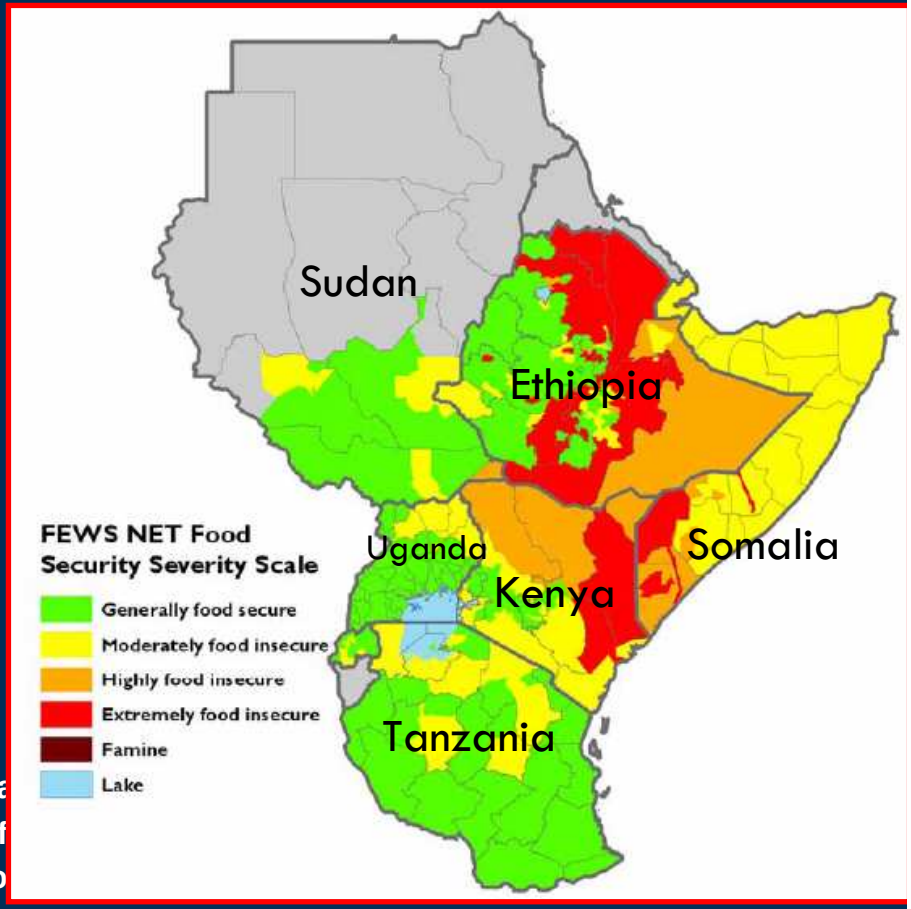
Station Coverage vs. Food Insecurity

WMO/GTS station network



1. **The most food insecure populations are in marginal agricultural & pastoral regions**
2. **These areas have only scant "in-situ" data**

Food Security Status: February, 2007

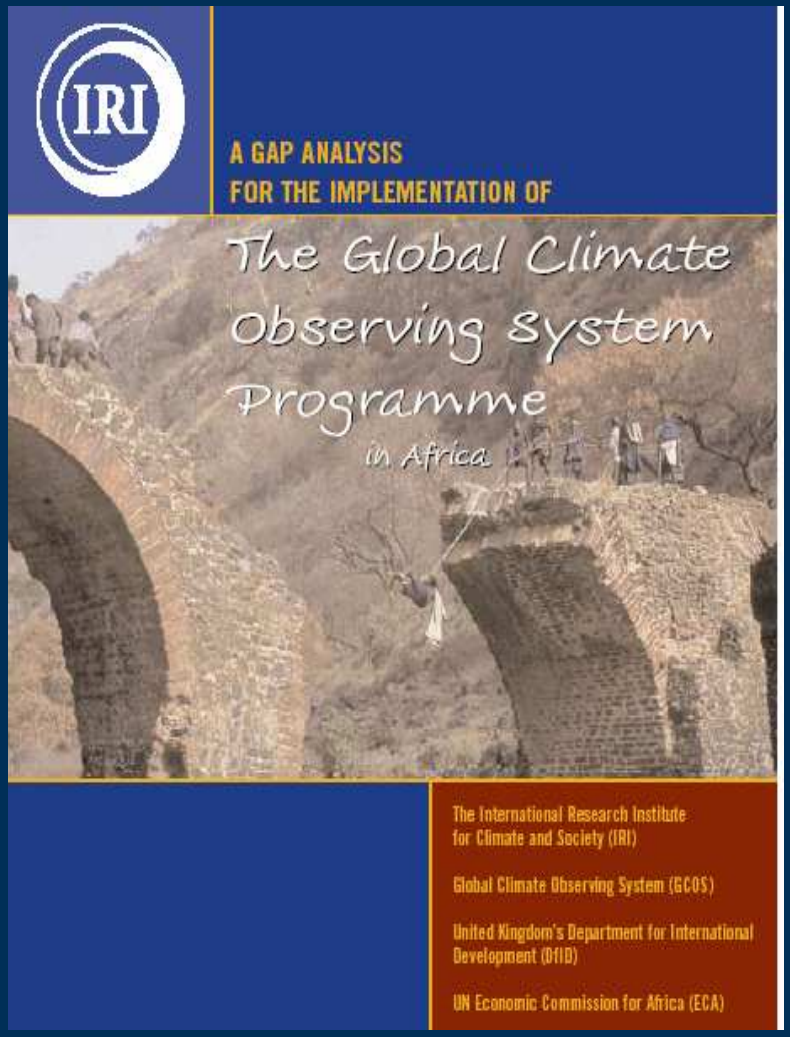


USGS

2008 Wa
Cutting-Edge Technologies f
Washingto

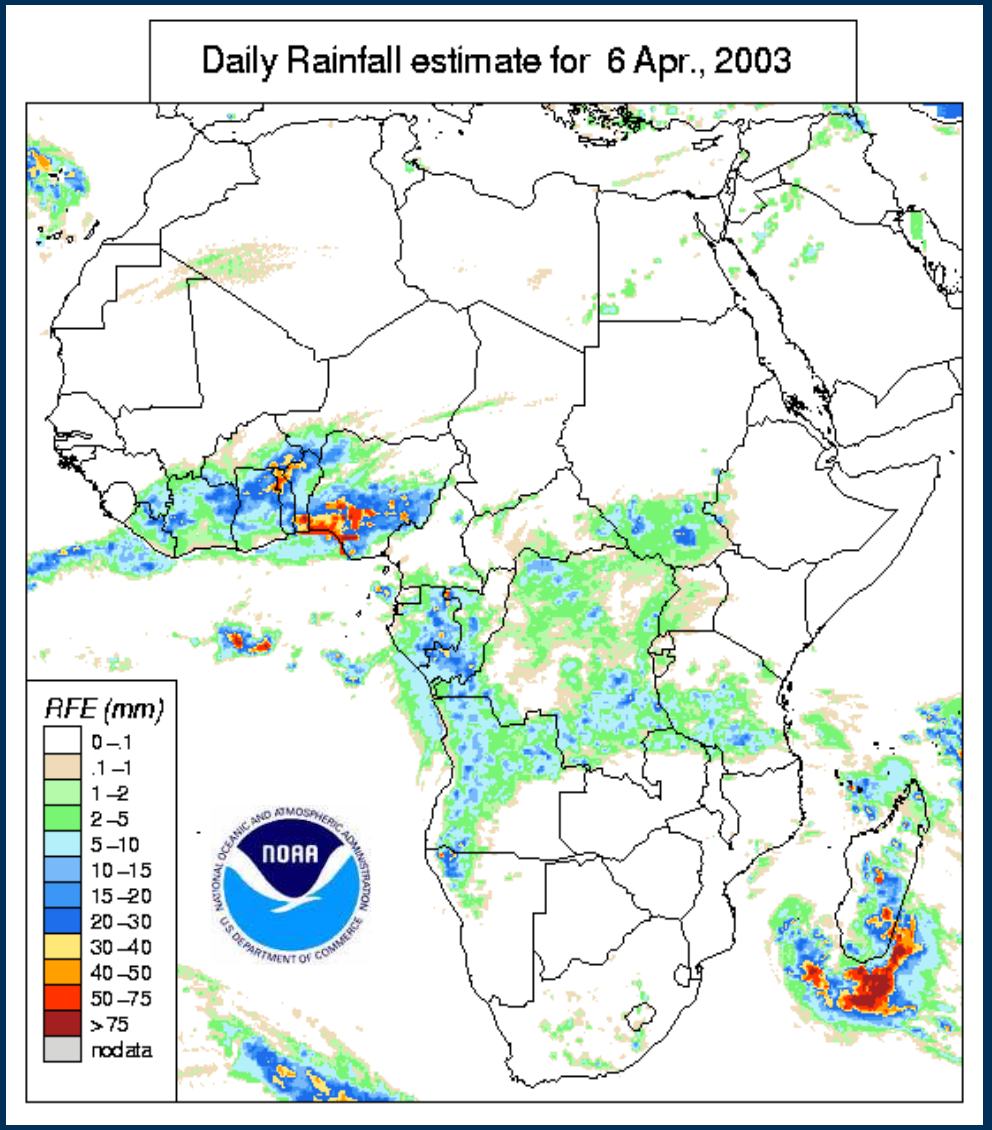
Gap Analysis for GCOS in Africa

- Found profound gaps in supply and use of climate information
- Regional workshops developed Action Plans for Clim-Dev
- **Enhancement of station networks a high priority**



USGS

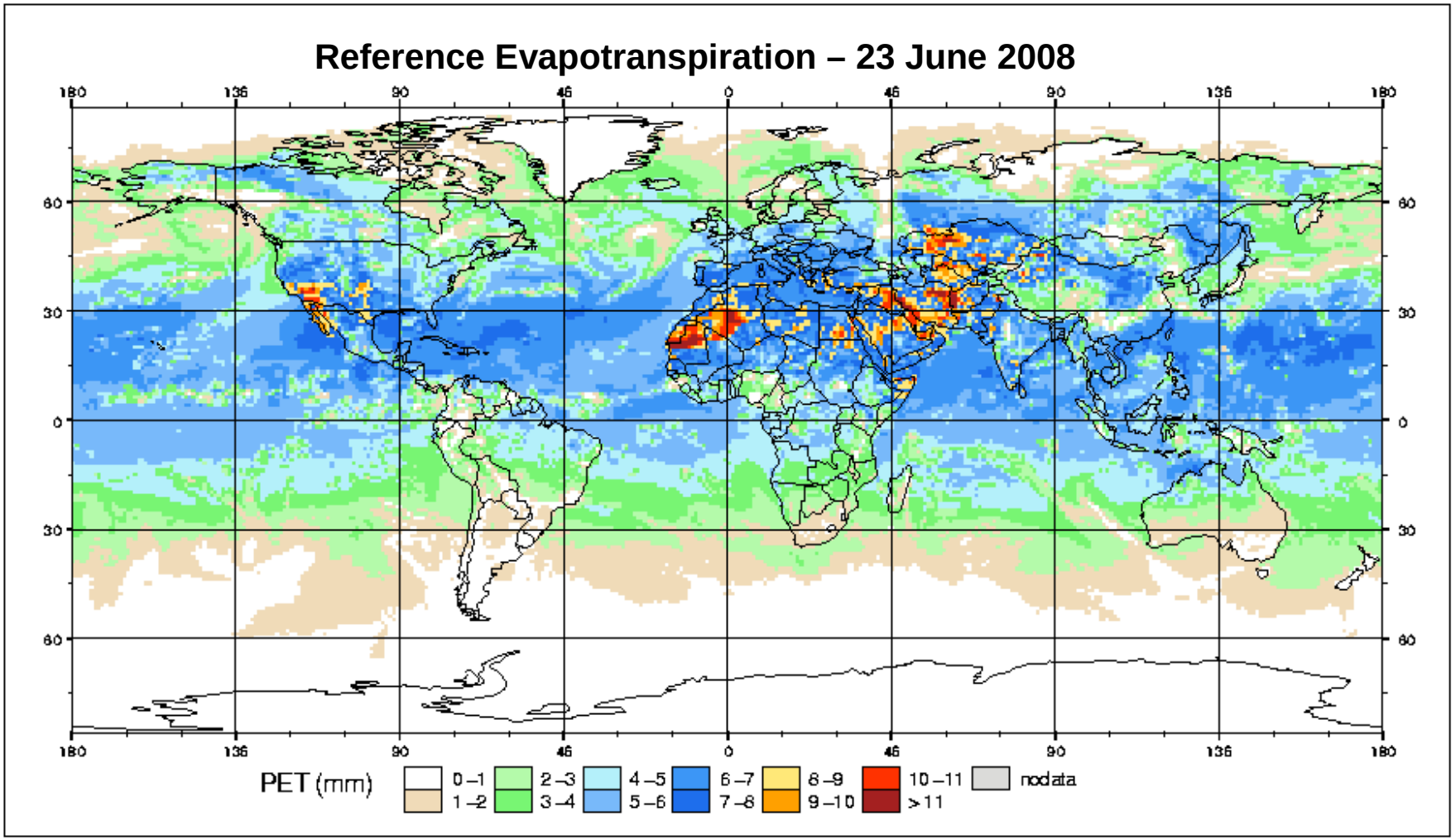
NOAA and NASA rainfall estimates blend satellite and station observations



USGS

2008 Water Sciences Forum
Cutting-Edge Technologies for Water Services: Applications in Africa
Washington, D.C. – June 27, 2008

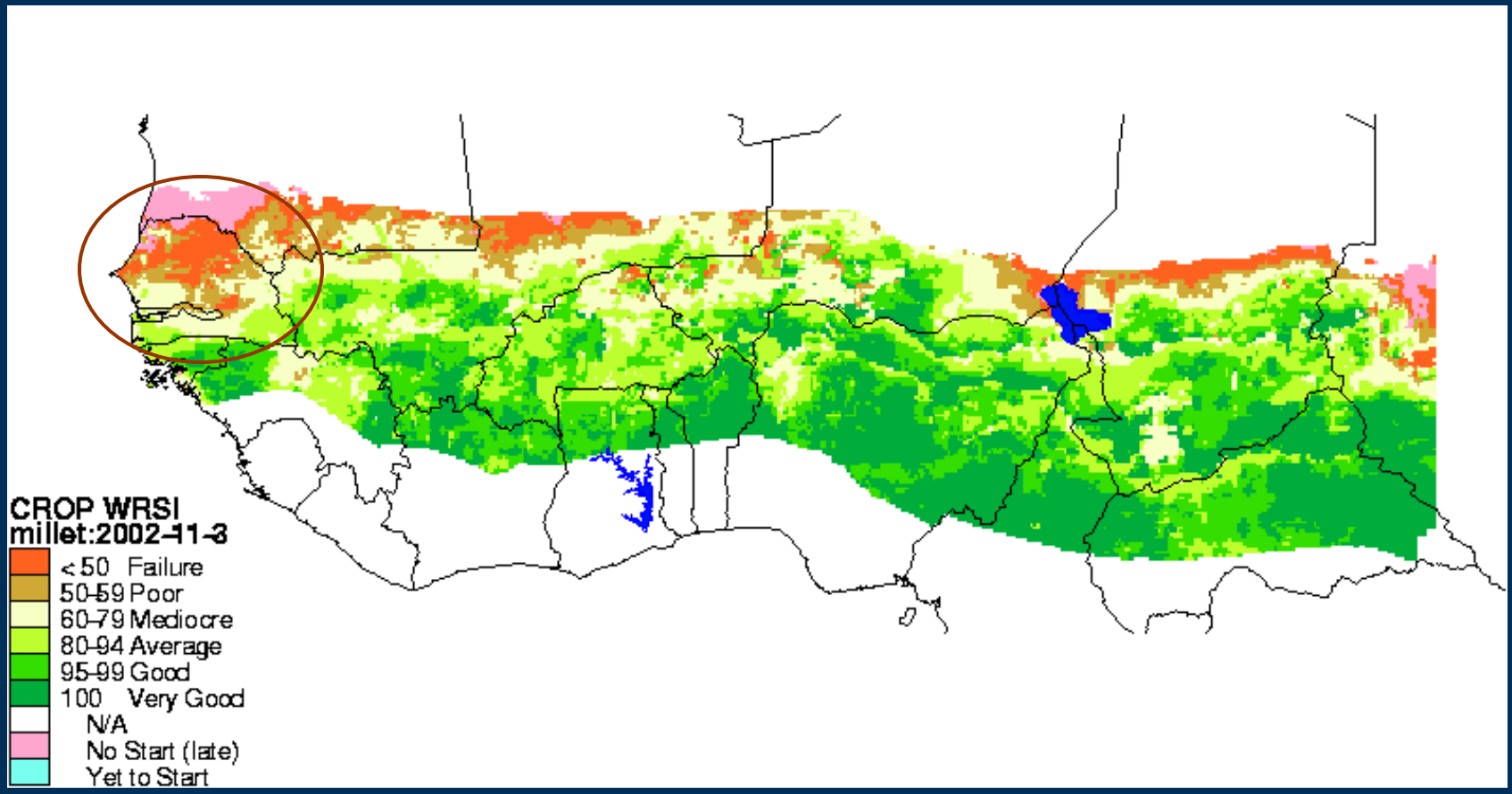
Atmospheric model assimilations



USGS

2008 Water Sciences Forum
Cutting-Edge Technologies for Water Services: Applications in Africa
Washington, D.C. – June 27, 2008

Water Requirement Satisfaction Index



USGS

Summary remarks

- High priority should be placed on strengthening climate and water station networks, while making the most of remote sensing and modeling
- More African scientists need to be trained to use these for analysis and modeling
- Meaningful career paths must be provided
- Because the best adaptations to shortages will blend local knowledge with the latest science and technology