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Monitoring Drought Across Many Scales

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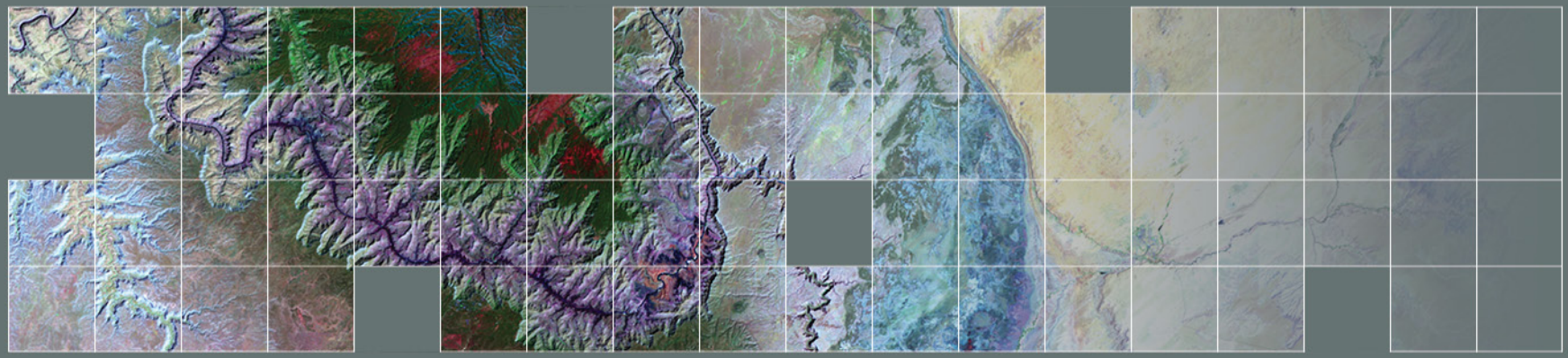
USGS
science for a changing world

Climate and Land Use Change
Earth Resources Observation and Science (EROS) Center

UCSB Climate Hazard Group

Monitoring drought across many scales



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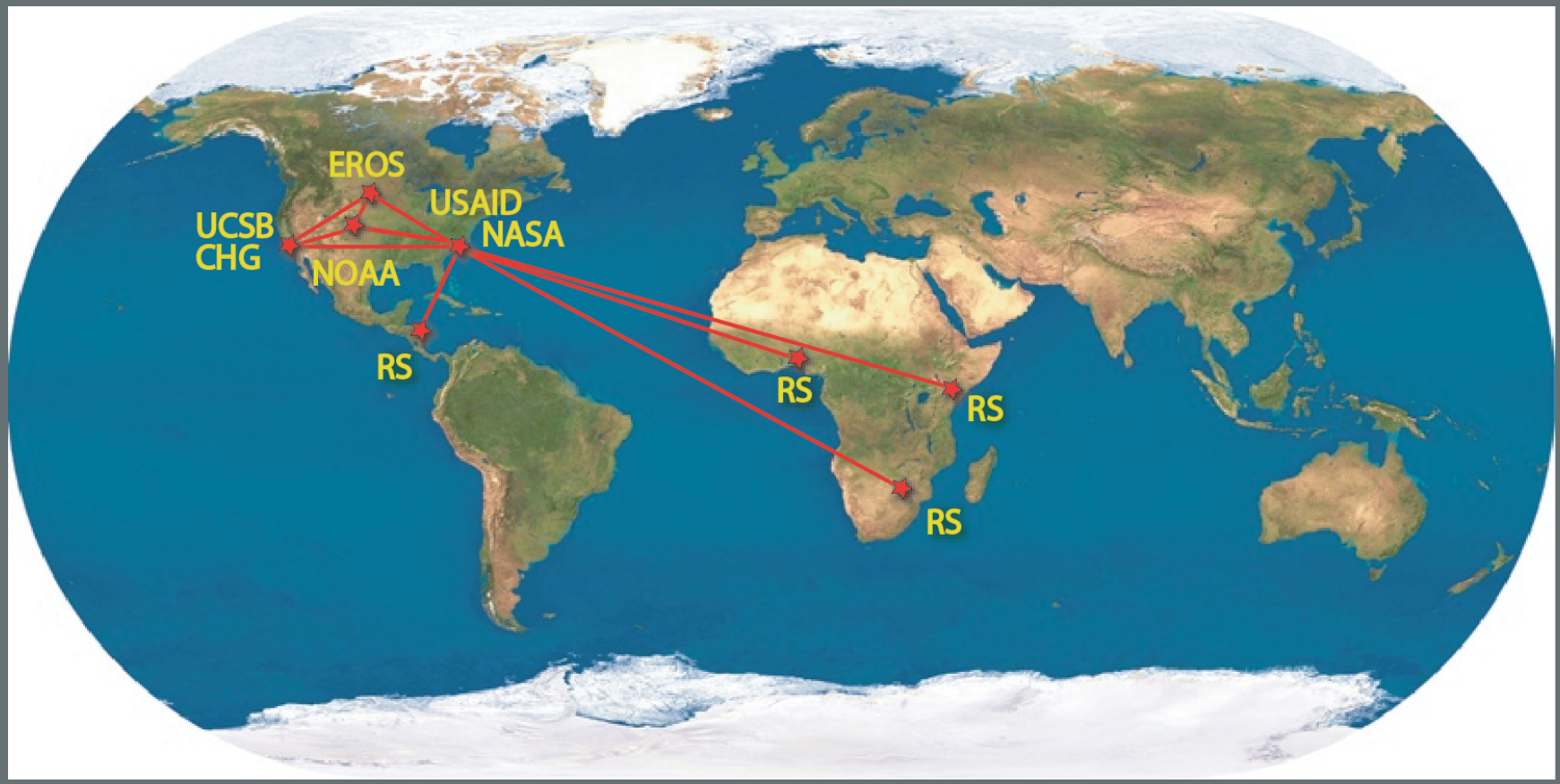
U.S. Department of the Interior
U.S. Geological Survey

USGS EROS – Climate Hazard Group – FEWS NET



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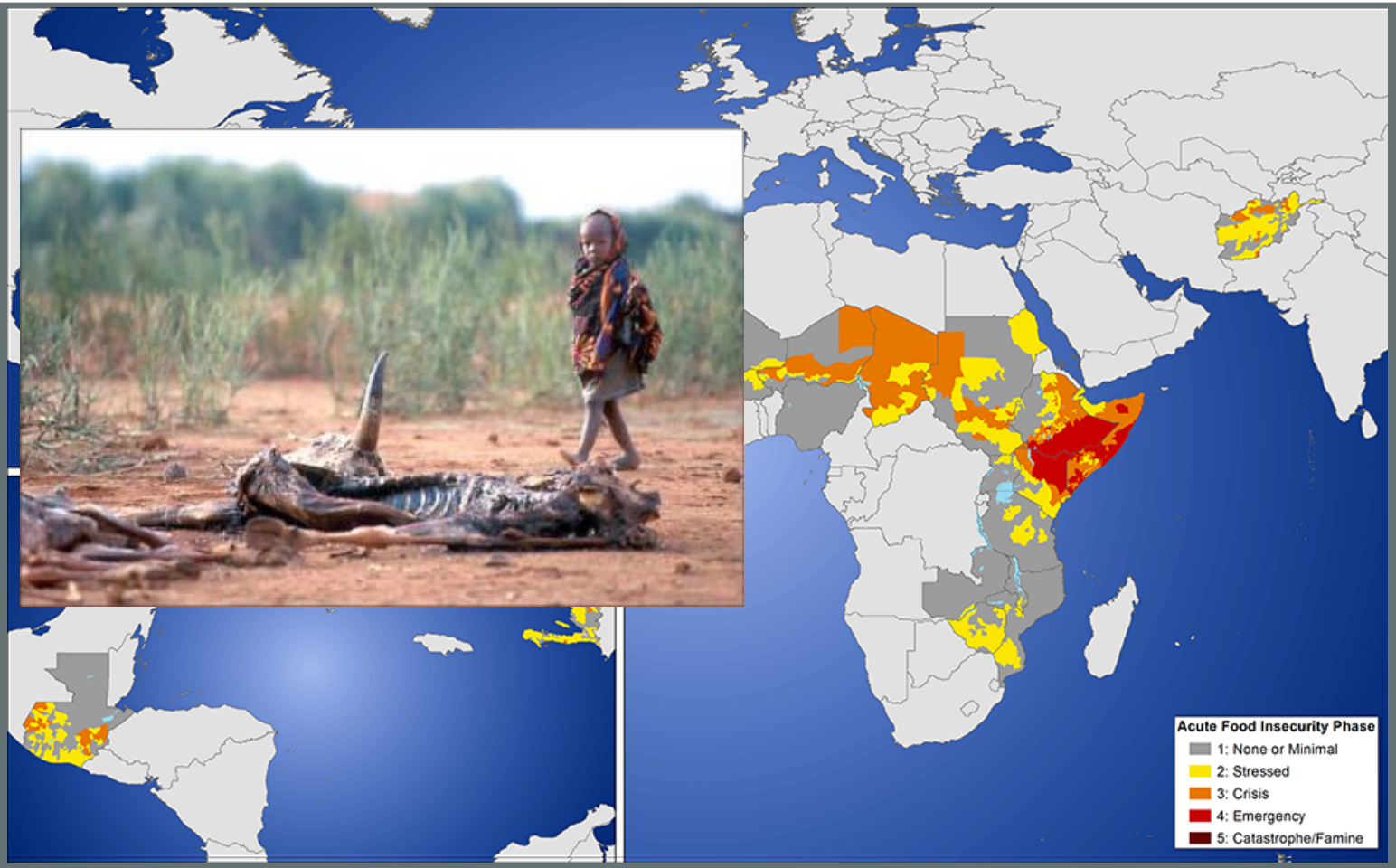
Famine Early Warning System Network



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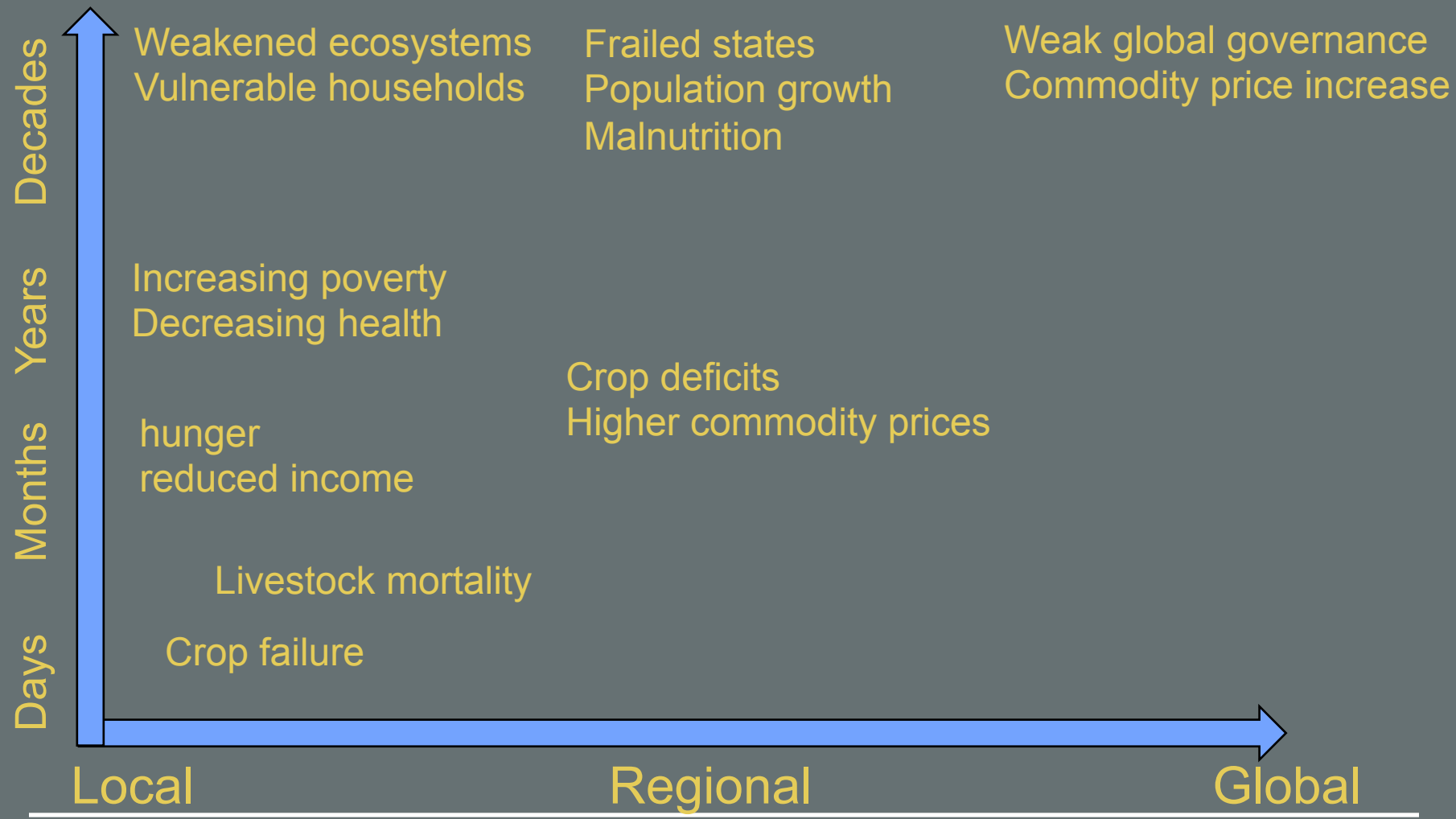
Drought – water deficits at many scales



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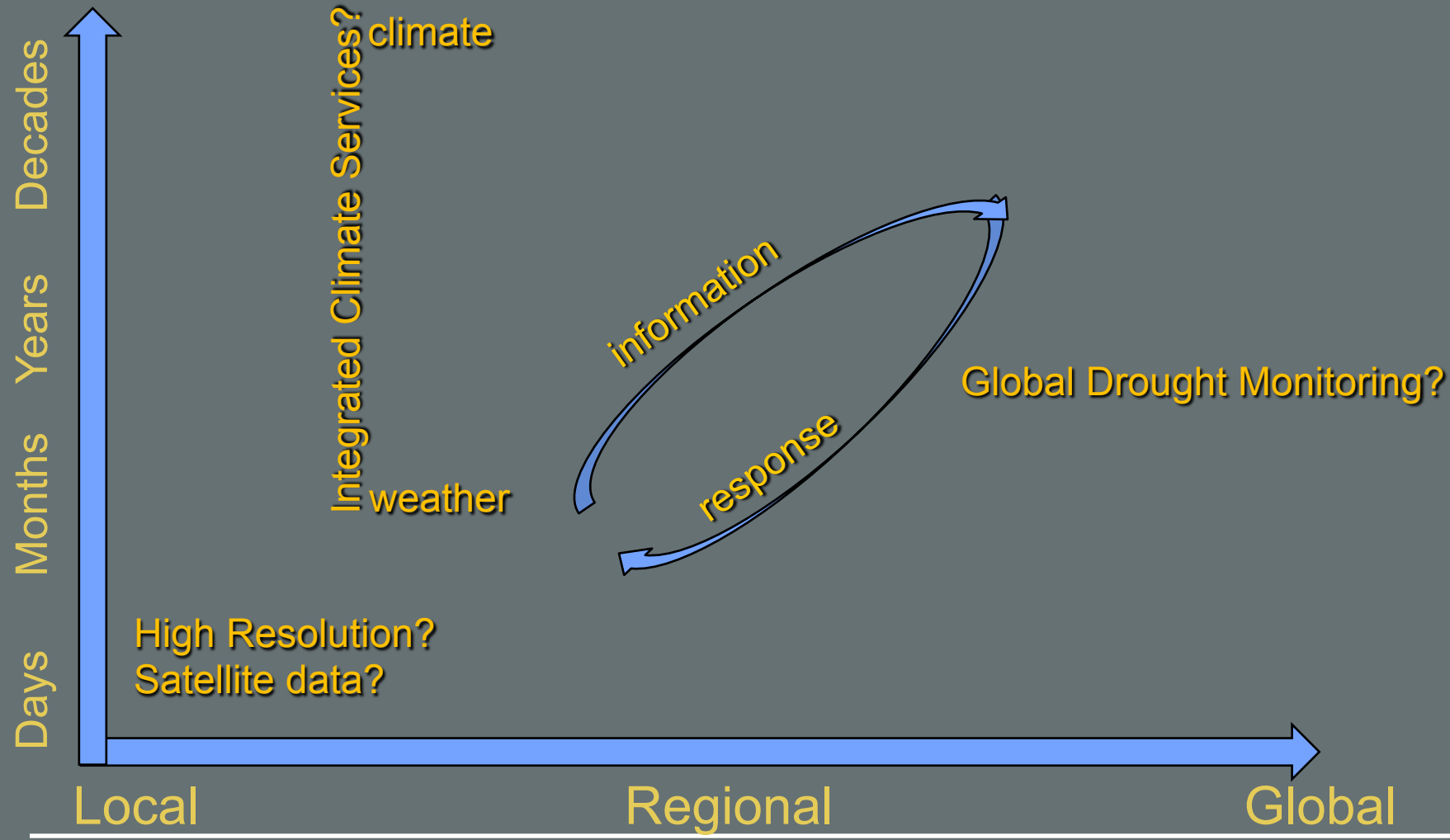
Monitoring across scales



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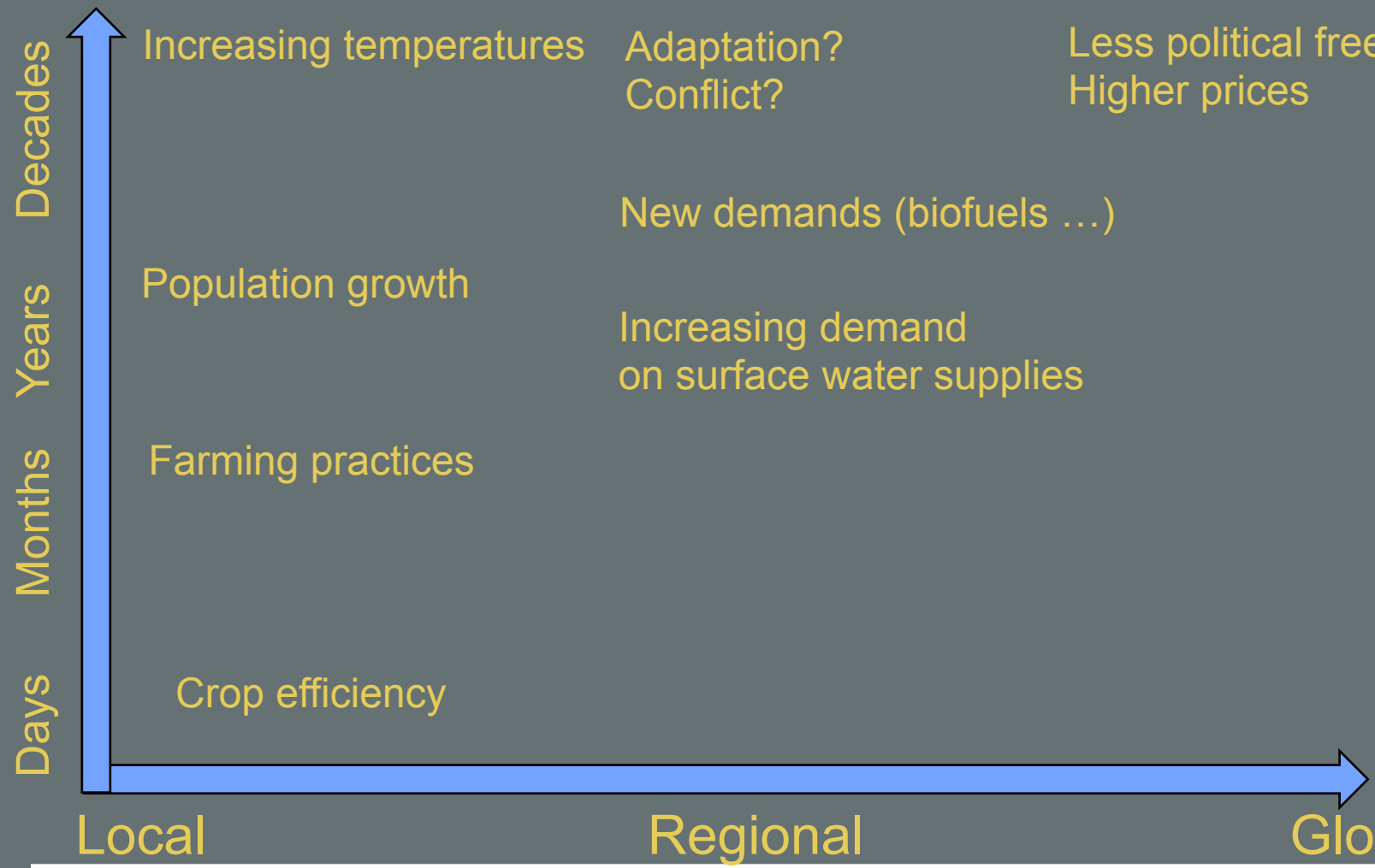
Drought – function of demand



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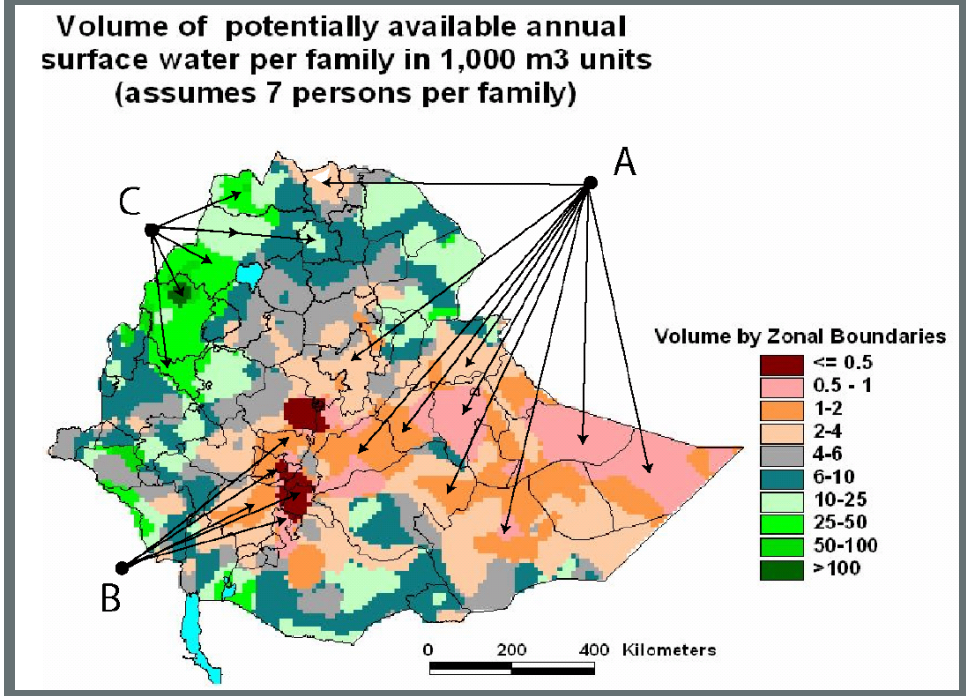
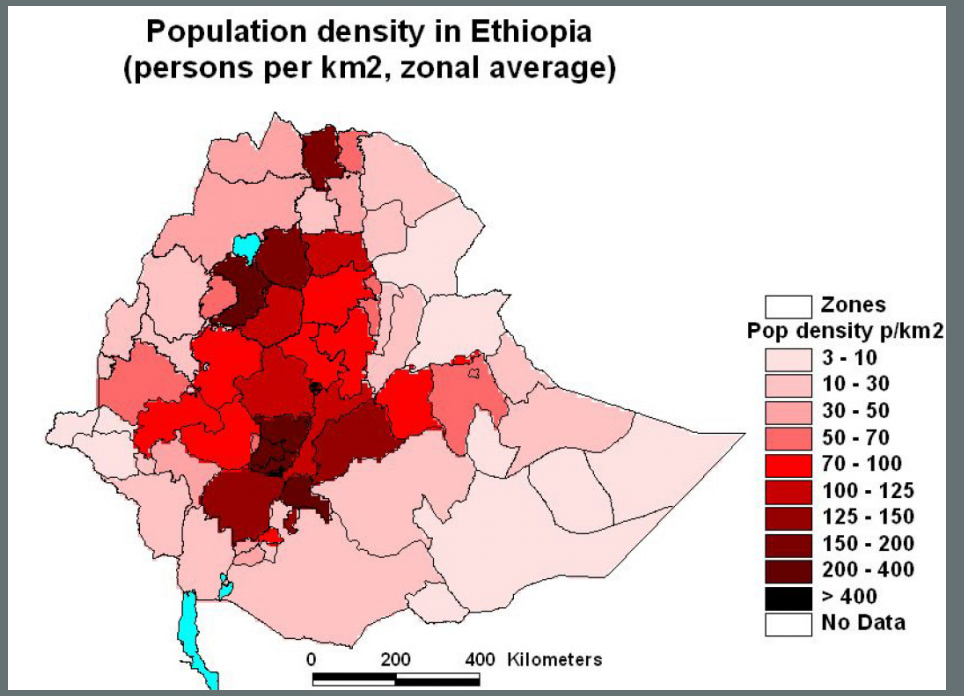
Mapping water demand is important





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Prices communicate risk around the world

FIGURE 1

Number of undernourished people in the world, 1969–71 to 2010

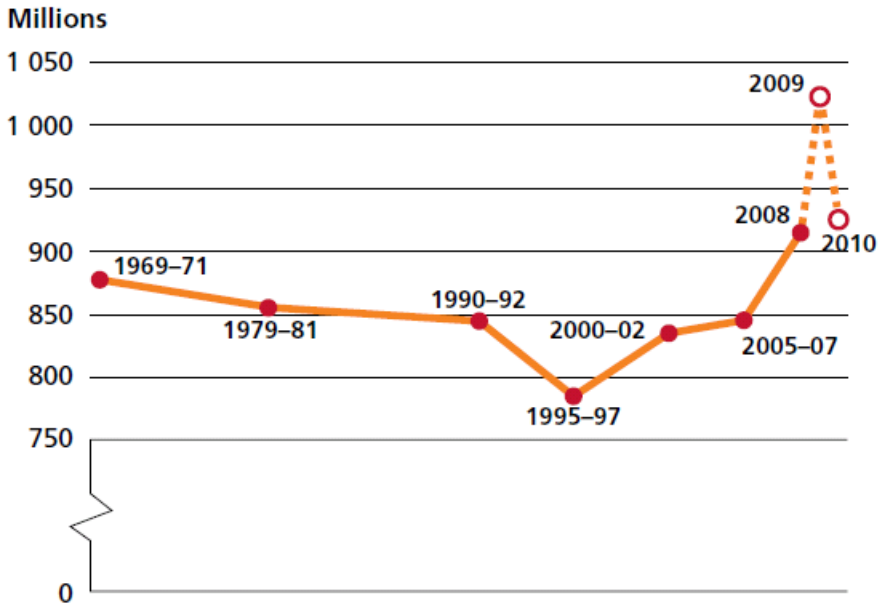
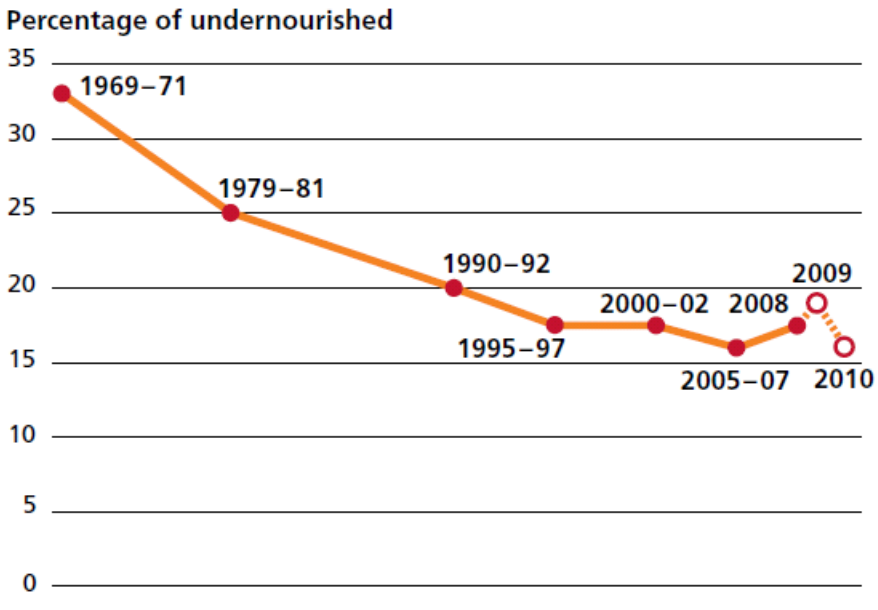


FIGURE 2

Proportion of undernourished people in developing countries, 1969–71 to 2010



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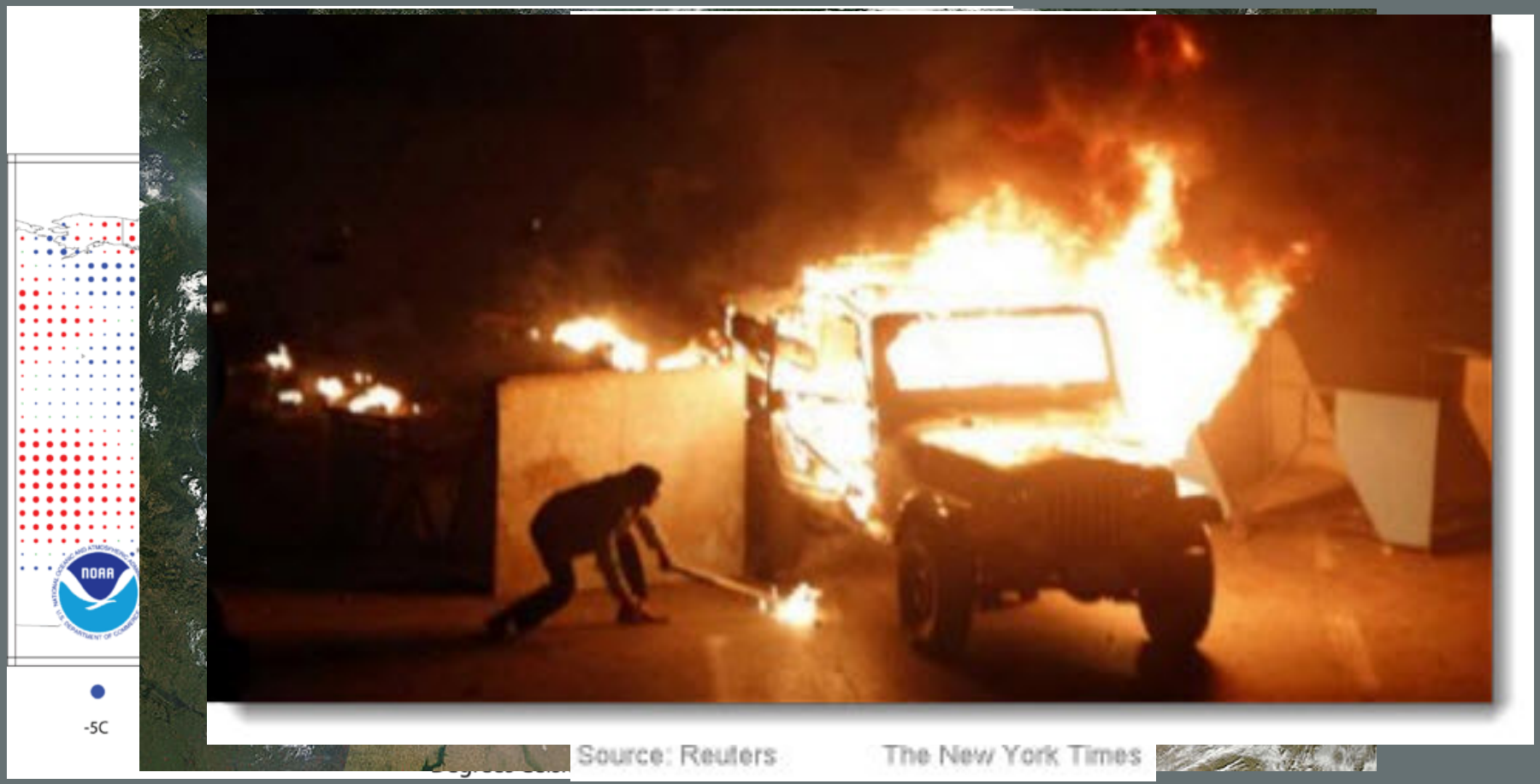
Wildfire: from Russia to Cairo



50% of Russian wheat comes from Egypt

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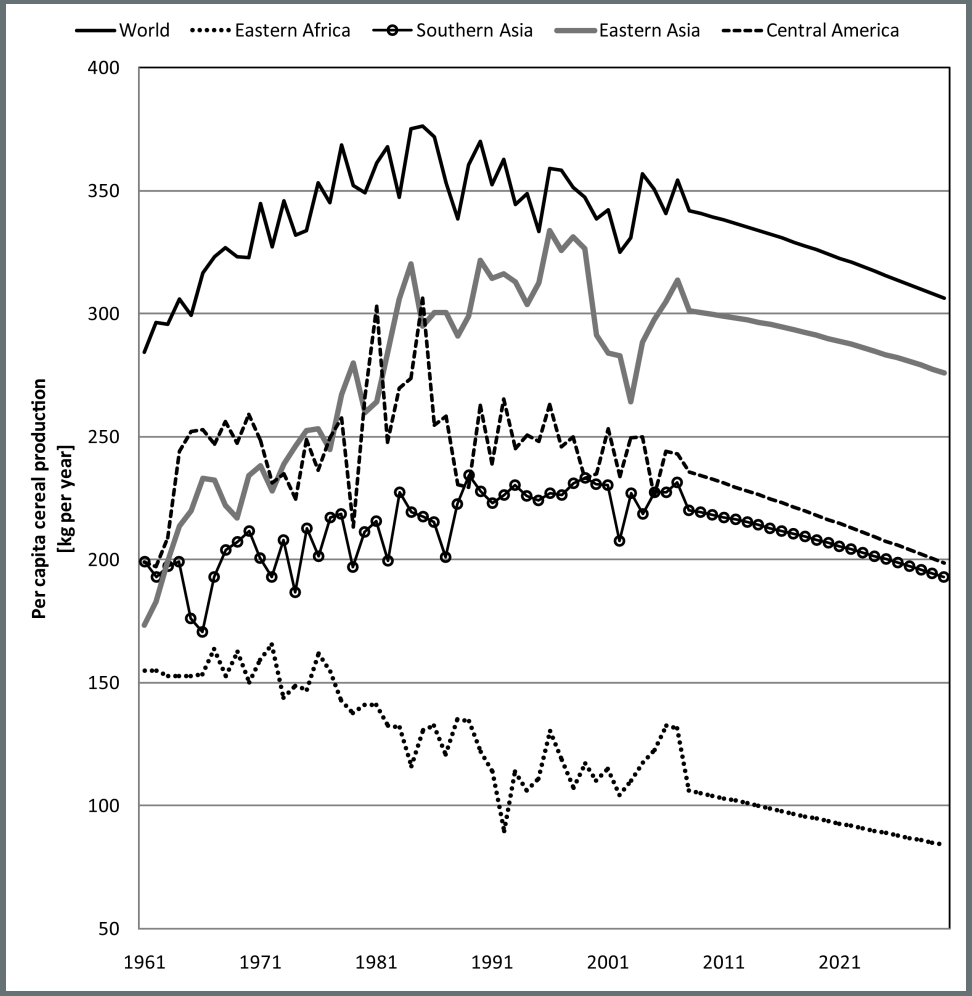
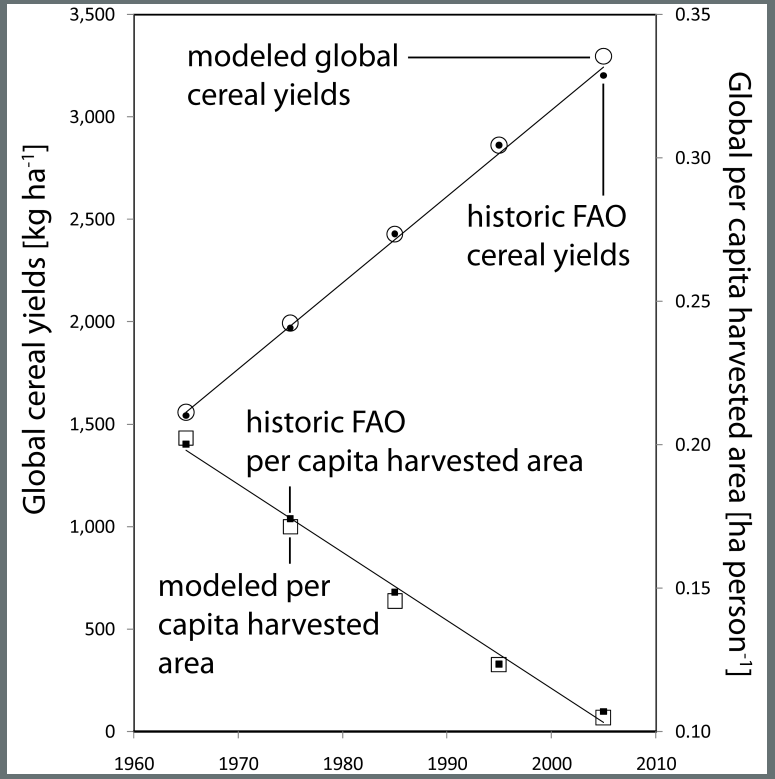
Population growing faster than yields





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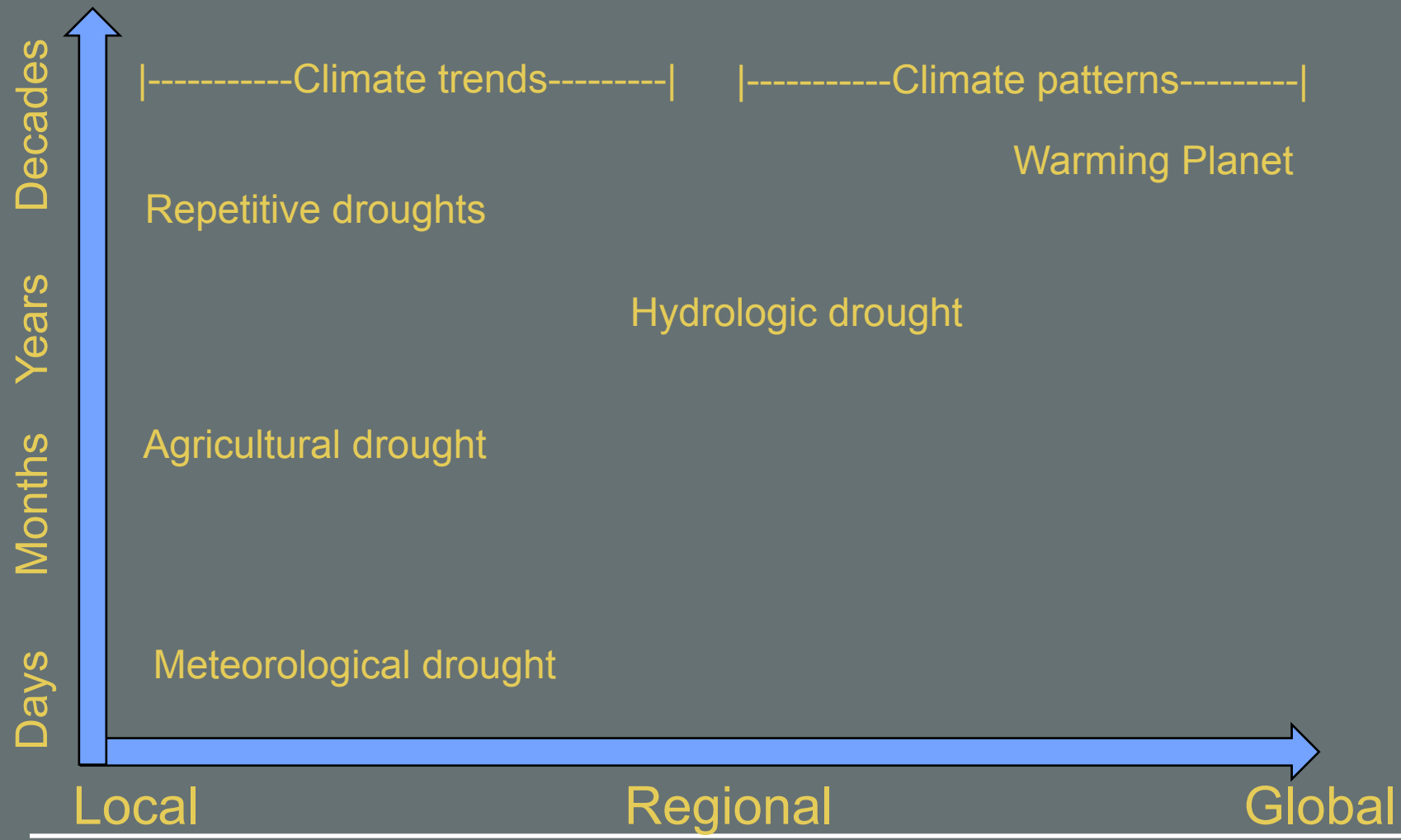
ftp://chg.geog.ucsb.edu/pub/pubs/FoodSecurity_2009.pdf

Drought – function of supply



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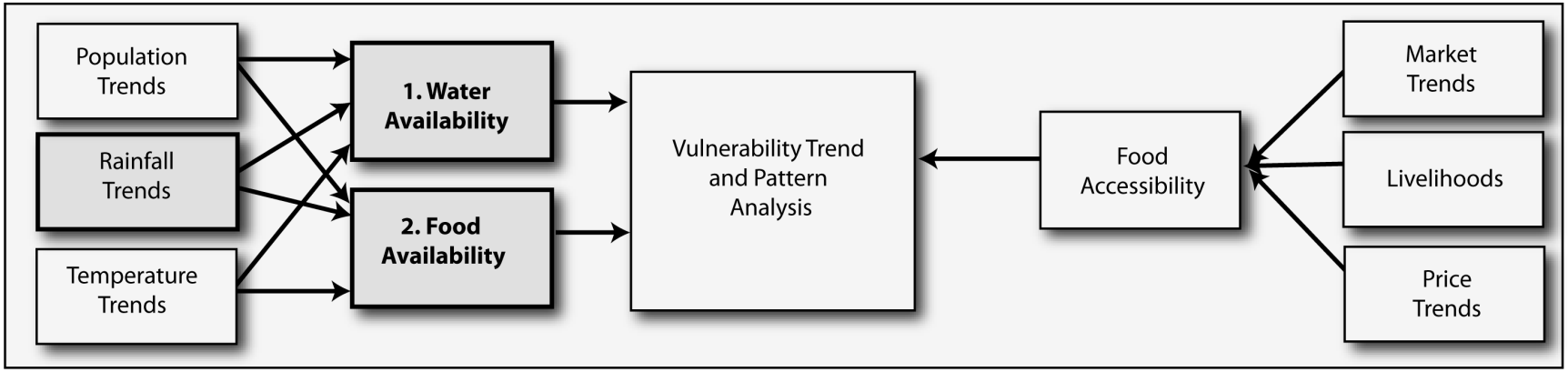
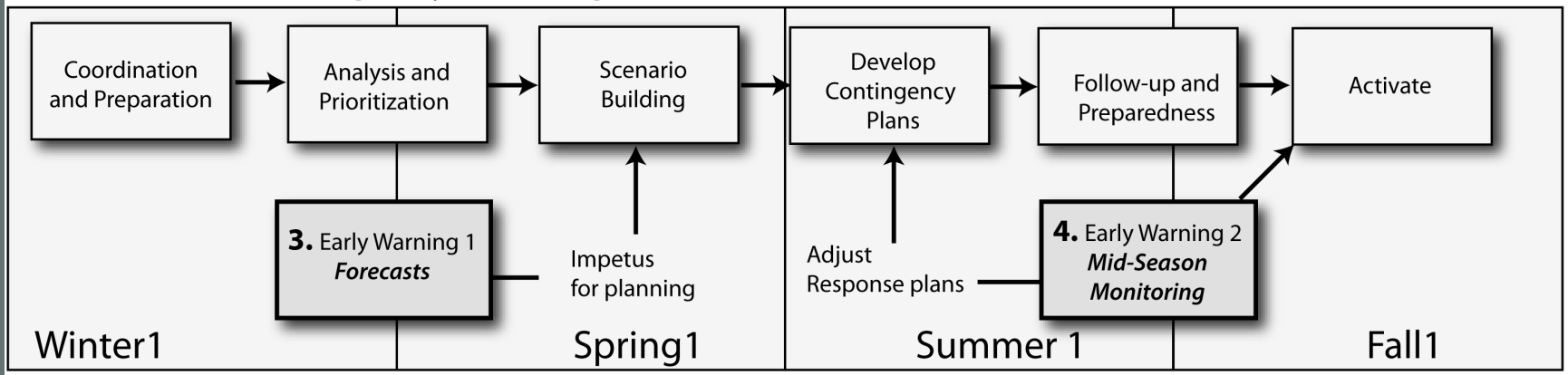
FEWS NET Monitoring Schema

a. FEWS NET vulnerability identification process



b. FEWS NET contingency planning process



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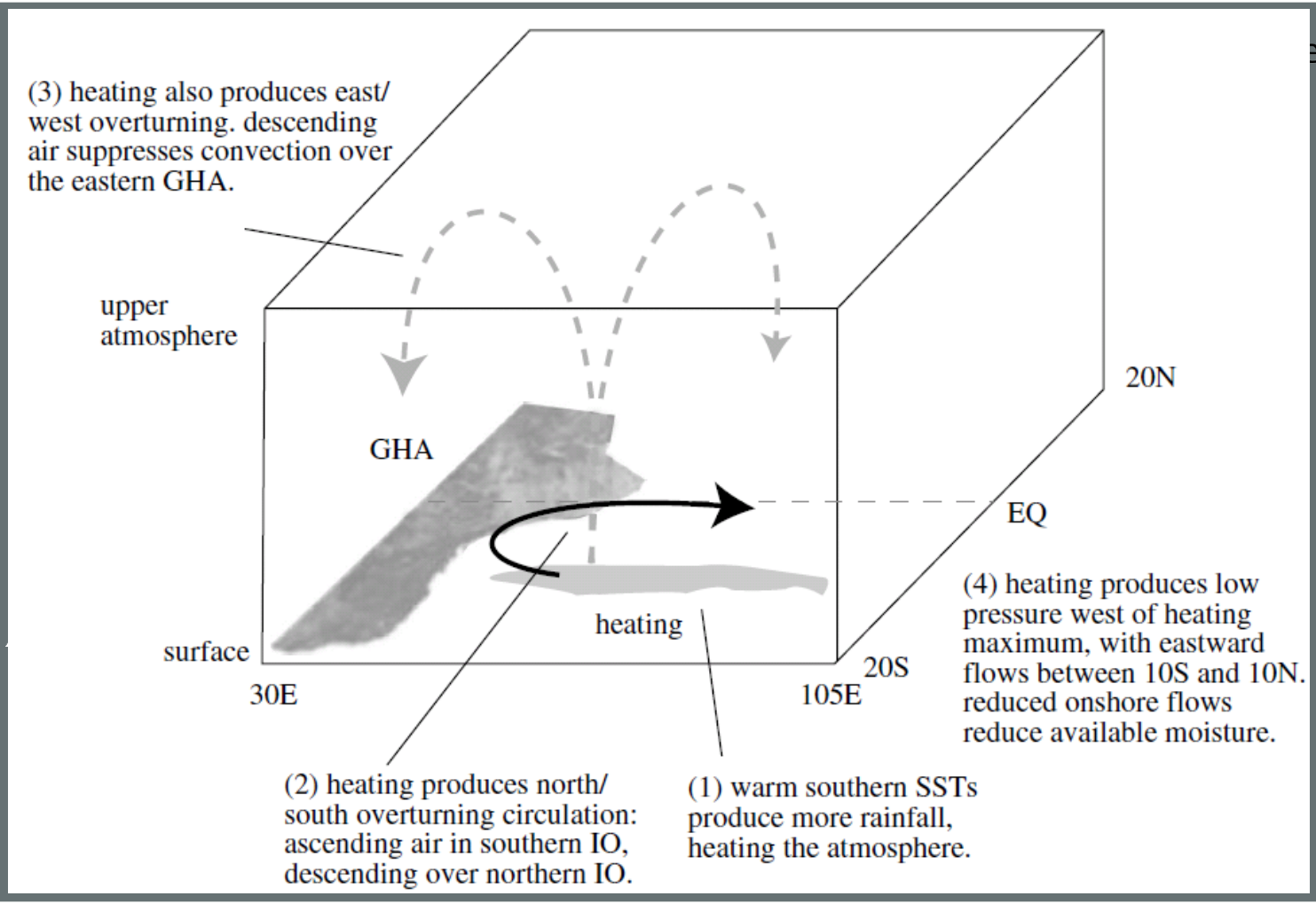
ftp://chg.geog.ucsb.edu/pub/pubs/RealtimeDSS_for_FEWS_NET_final.pdf

Upscaling/Downscaling Climate Trends



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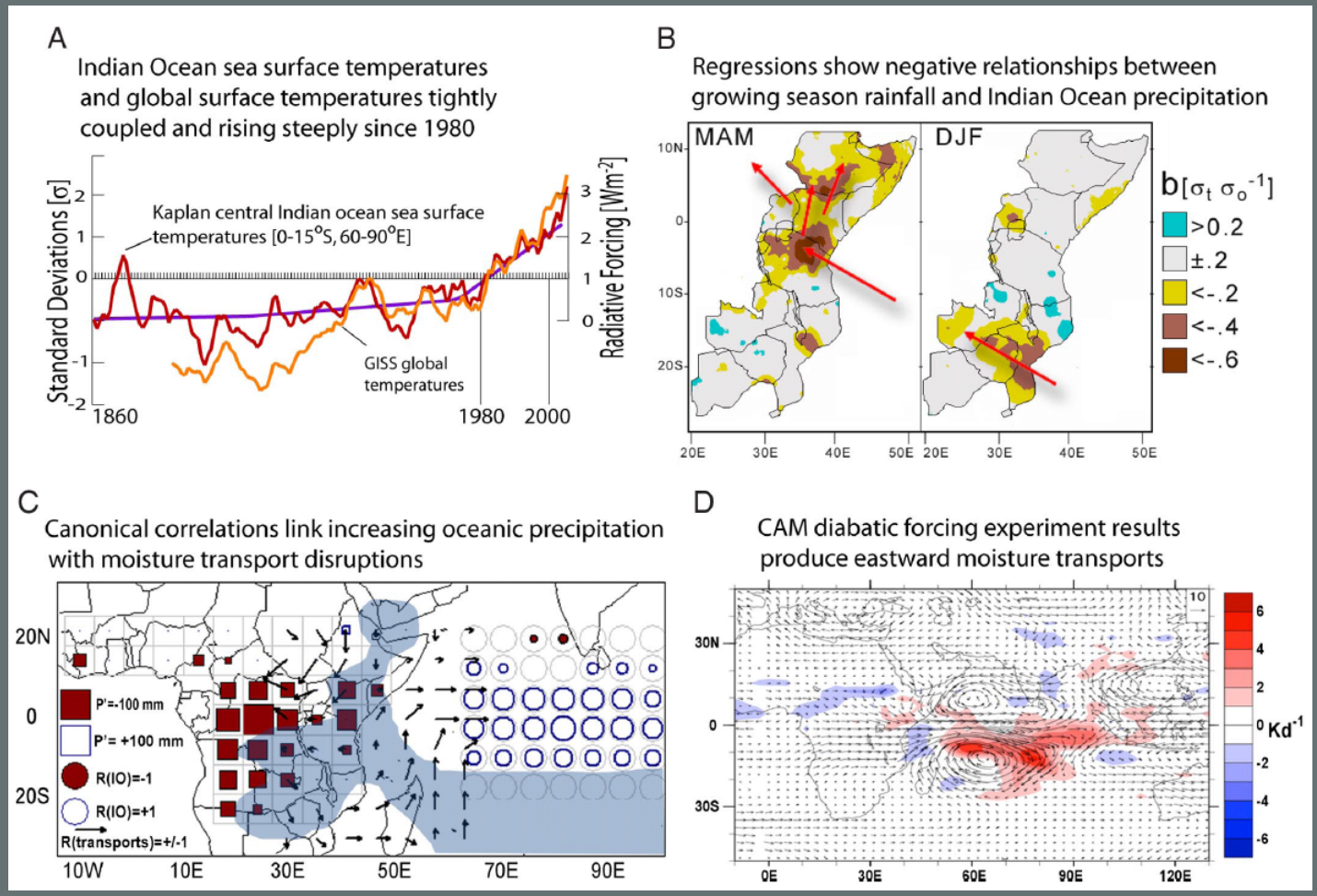
ftp://chg.geog.ucsb.edu/pub/pubs/RoyalSociety_2005.pdf

Warming Indian – East African Drought



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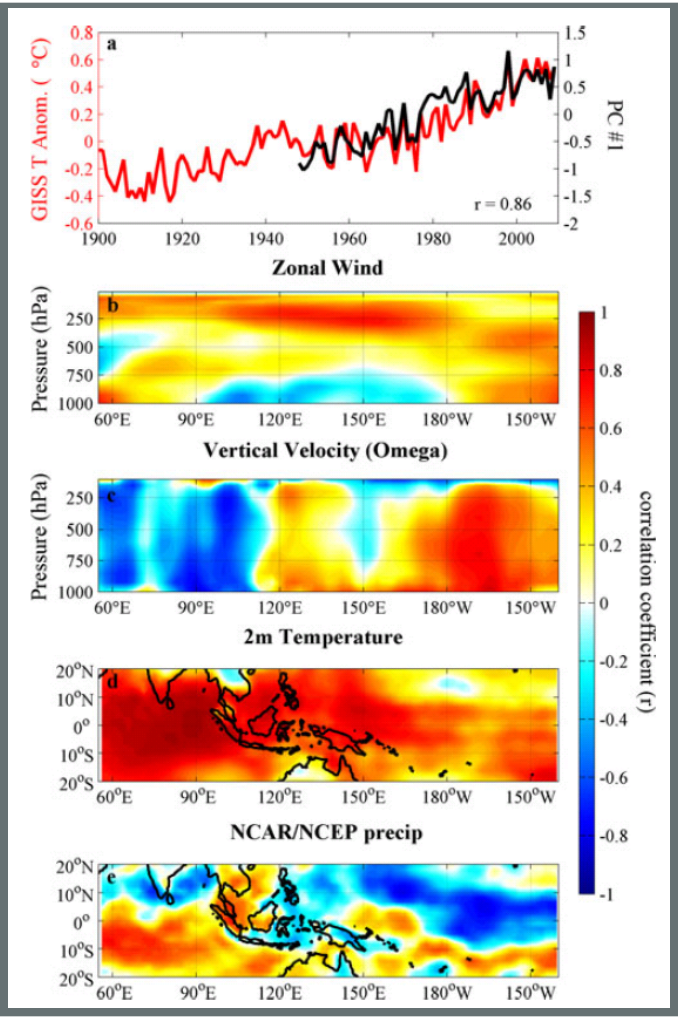
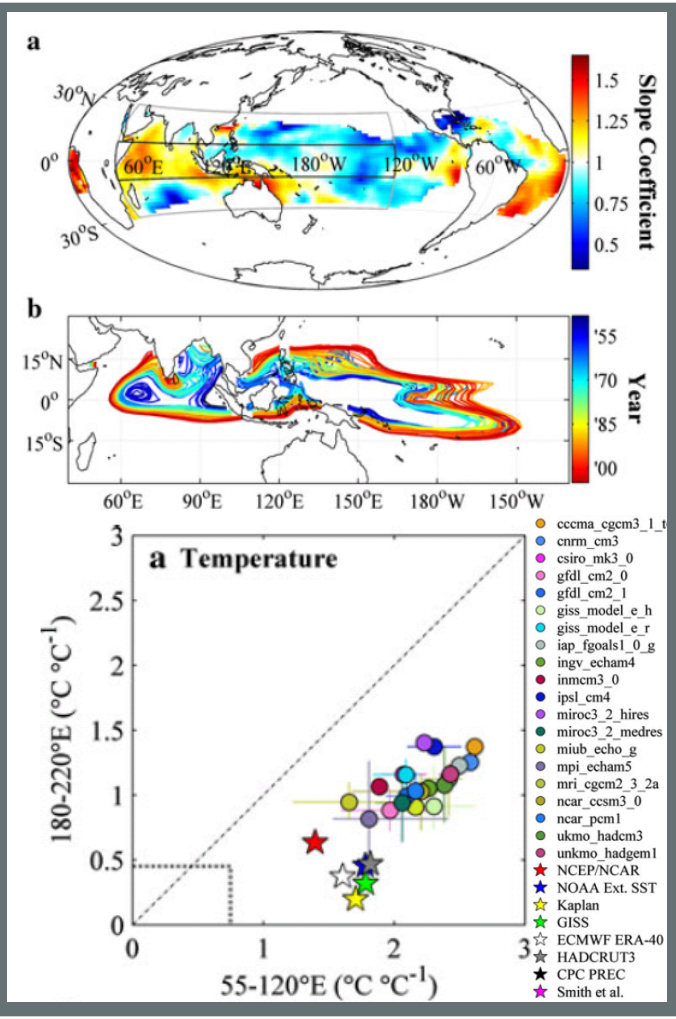
ftp://chg.geog.ucsb.edu/pub/pubs/PNAS_2008.pdf

Westward Extension of the Warm Pool





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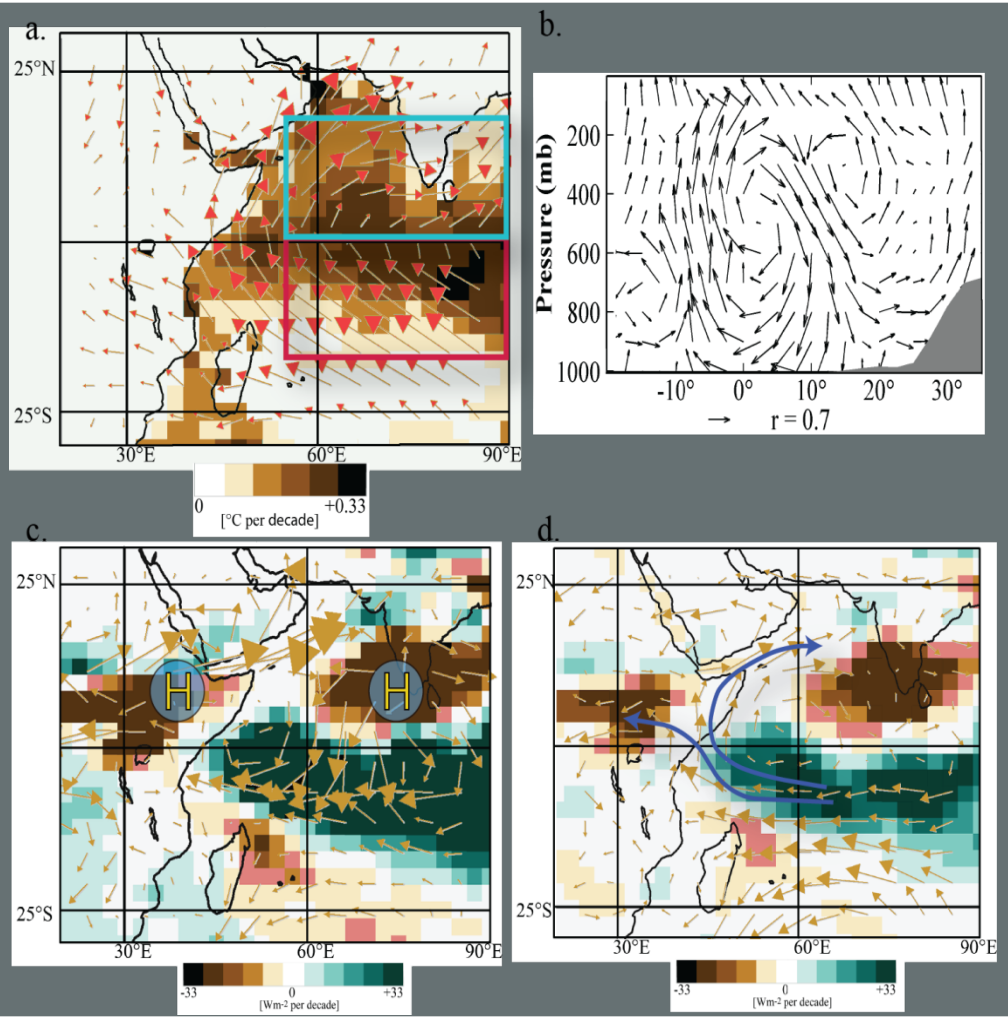
ftp://chg.geog.ucsb.edu/pub/pubs/ClimateDynamics_2010.pdf

Evaporation windows & the Indian Monsoon?



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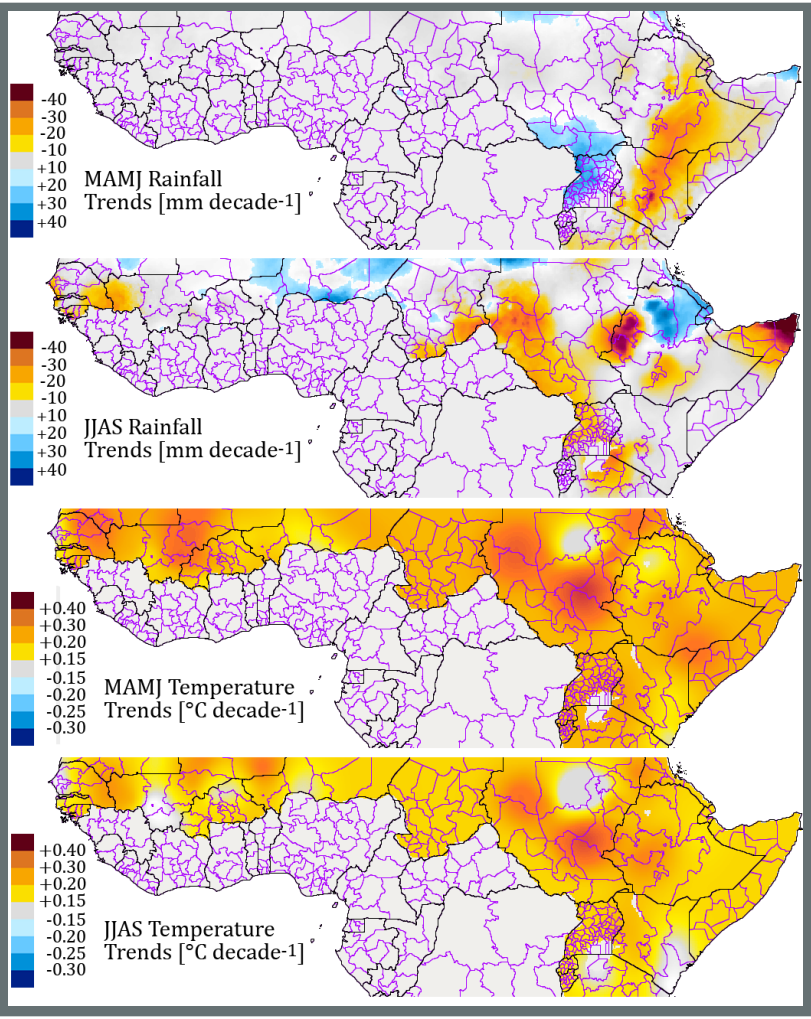
Monitoring Decadal Trends



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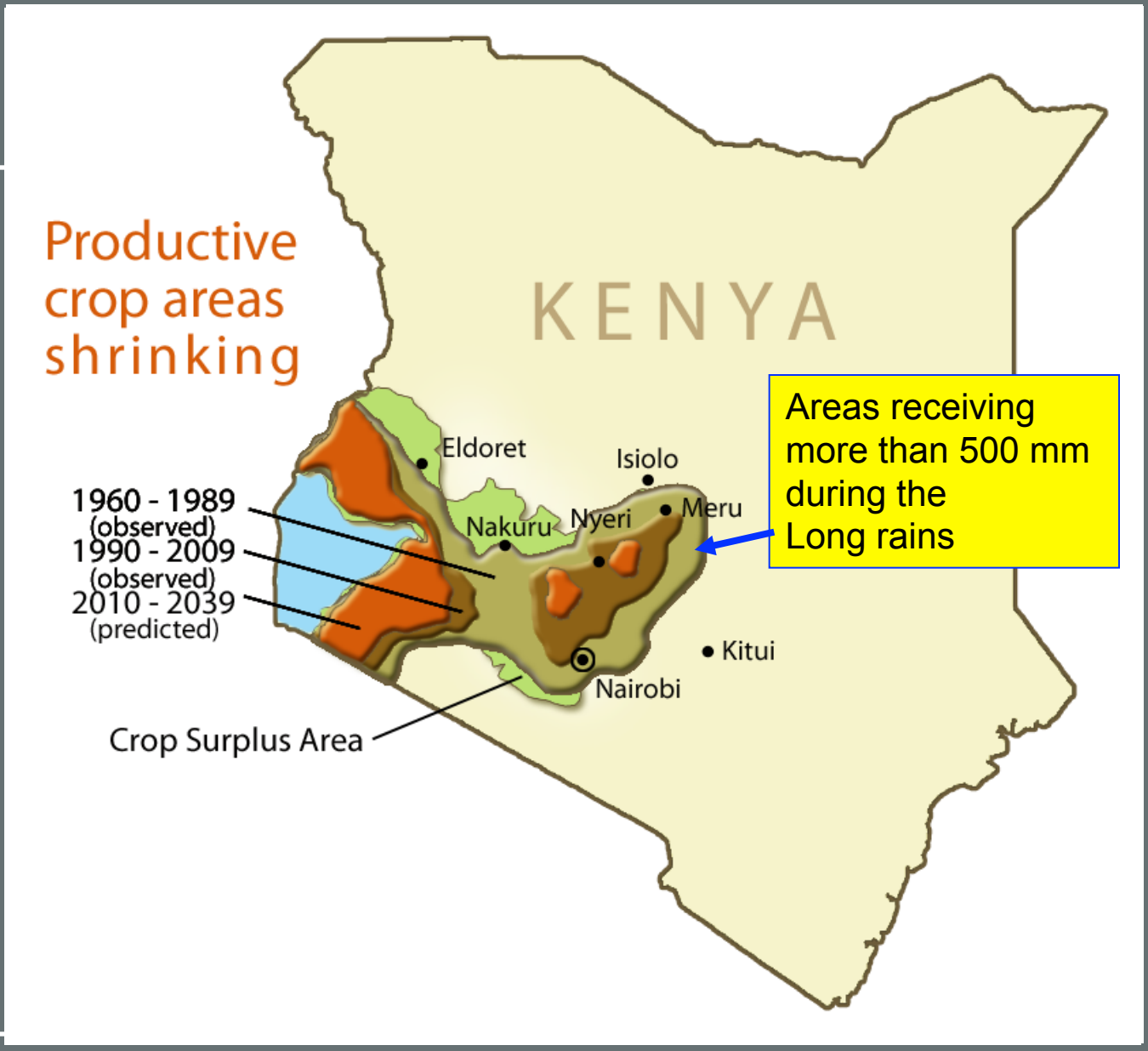
ftp://chg.geog.ucsb.edu/pub/pubs/mapping_decadal_variations.pdf

Shrinking rains caused by a warming Indian Ocean



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http://pubs.usgs.gov/fs/2010/3074/pdf/fs2010-3074.pdf

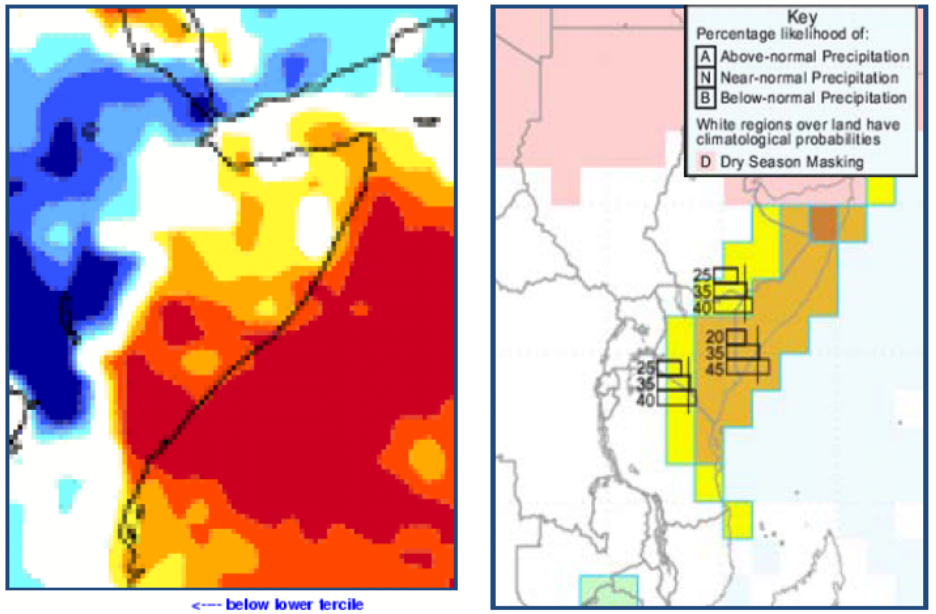
August 2010 – La Nina-based Alert

"The prospects for the 2011 March to May rains are likely to be impacted by La Niña conditions, depending on the intensity and duration of the event. It is significant to note that four of the last six October- November- December La Niña events in East Africa resulted in poor March to May rains the following year."

Figure 2. ECMWF and IRI Forecasts for October-November-December

ECMWF Forecast October-November-December 2010

IRI Forecast October-November-December 2010



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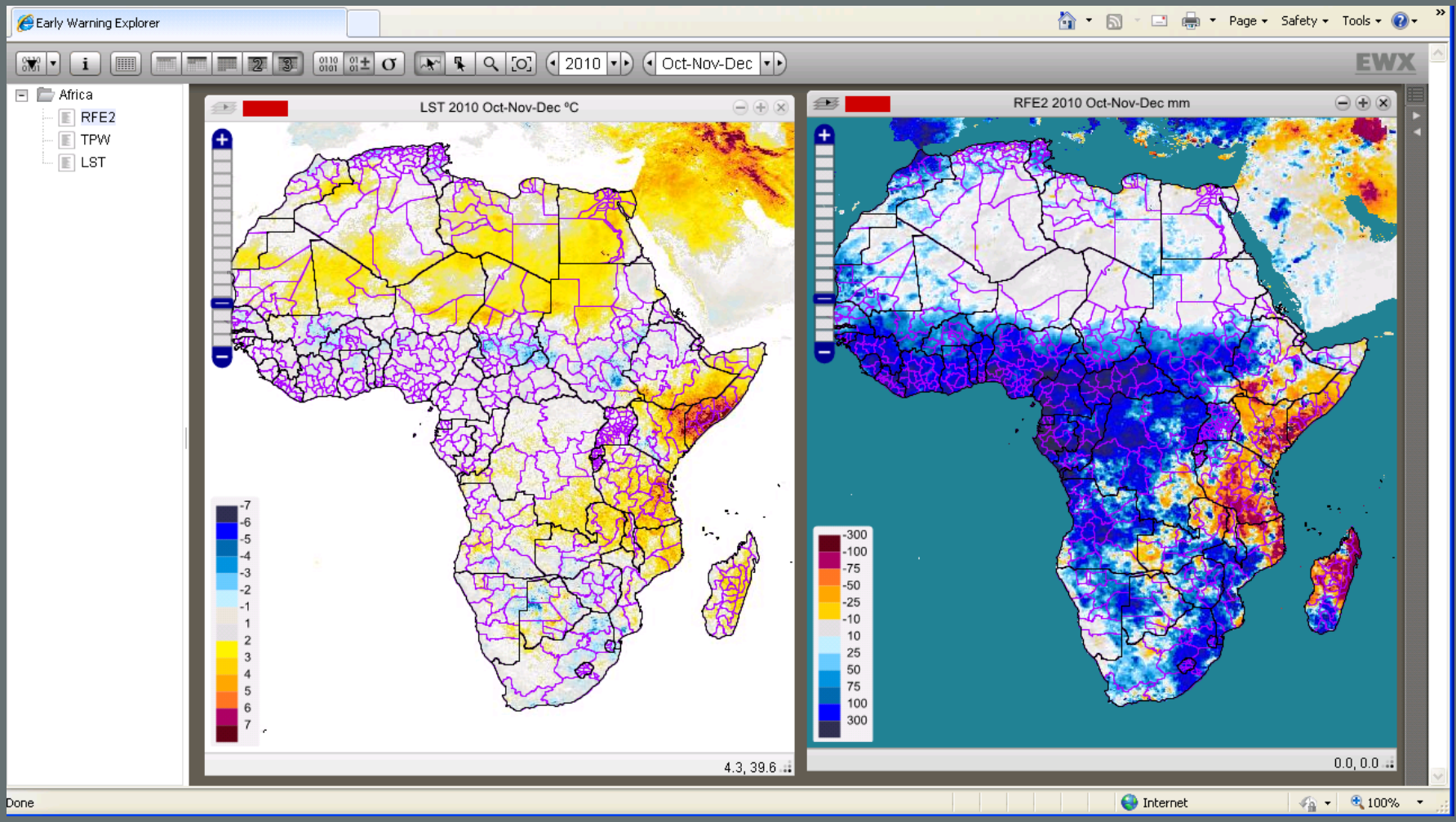
http://www.fews.net/docs/Publications/La_Nina_Brief_East%20Africa_Aug_2010_final.pdf

Early Warning Explorer: OND 2010



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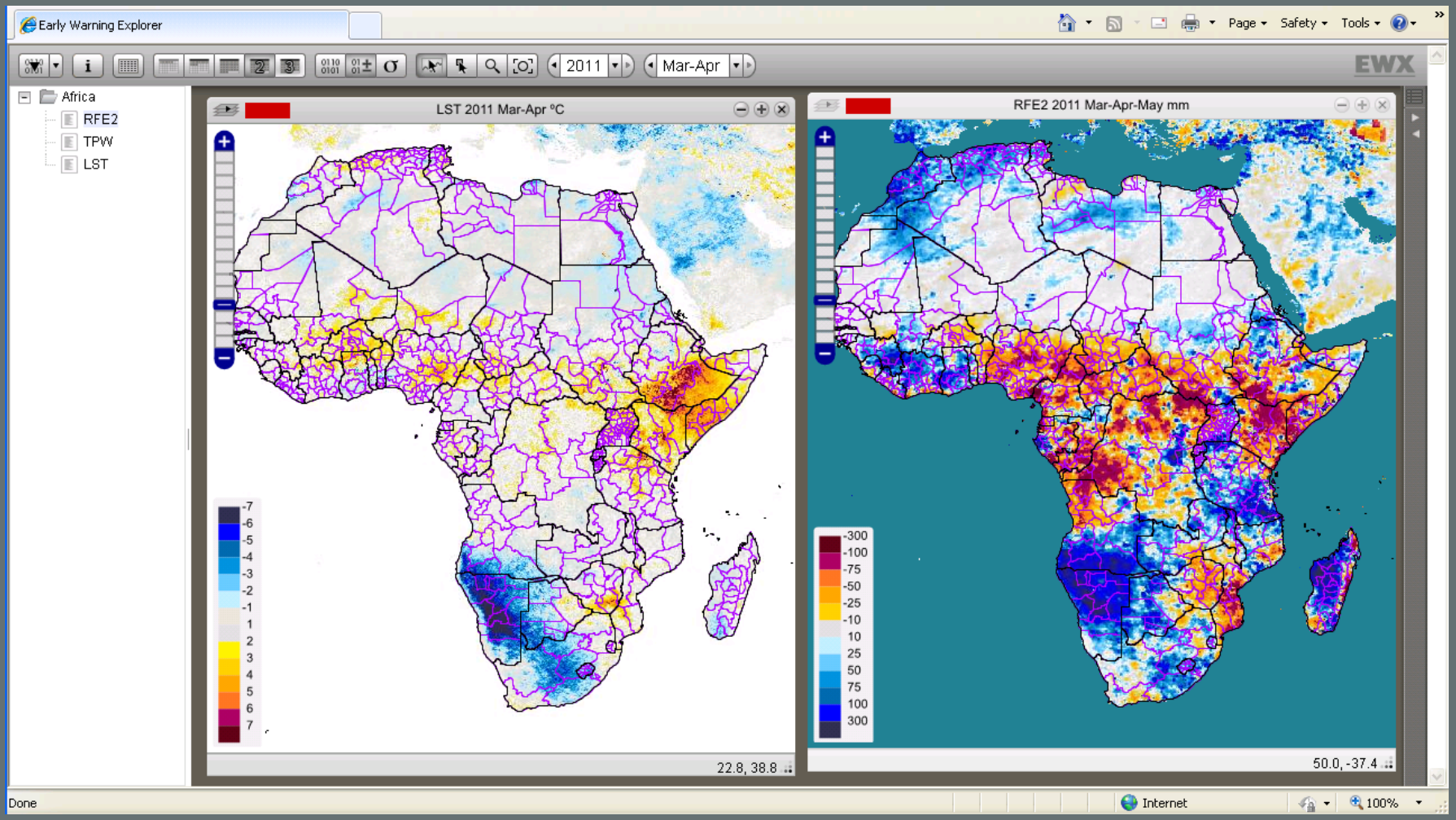
http://earlywarning.usgs.gov:8080/EWX/index.html

Early Warning Explorer: MAM 2011



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http://earlywarning.usgs.gov:8080/EWX/index.html

Historic Context: June 2011

Figure 1. Selected drought-affected pastoral areas of northern Kenya and southern Ethiopia.

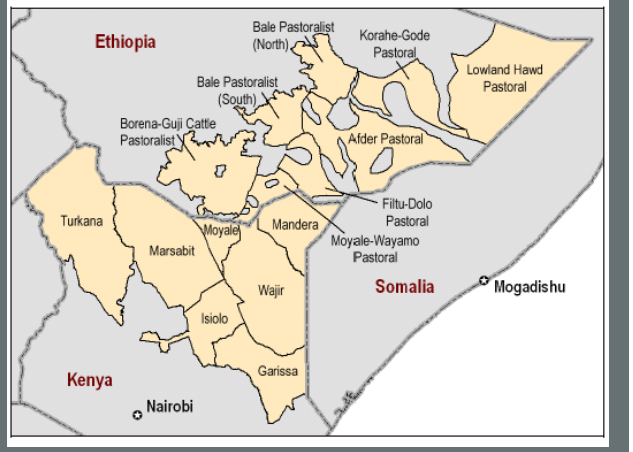

Figure 2. 2010/11 rainfall compared to historical totals since 1950/51 in select pastoral areas of Kenya and Ethiopia

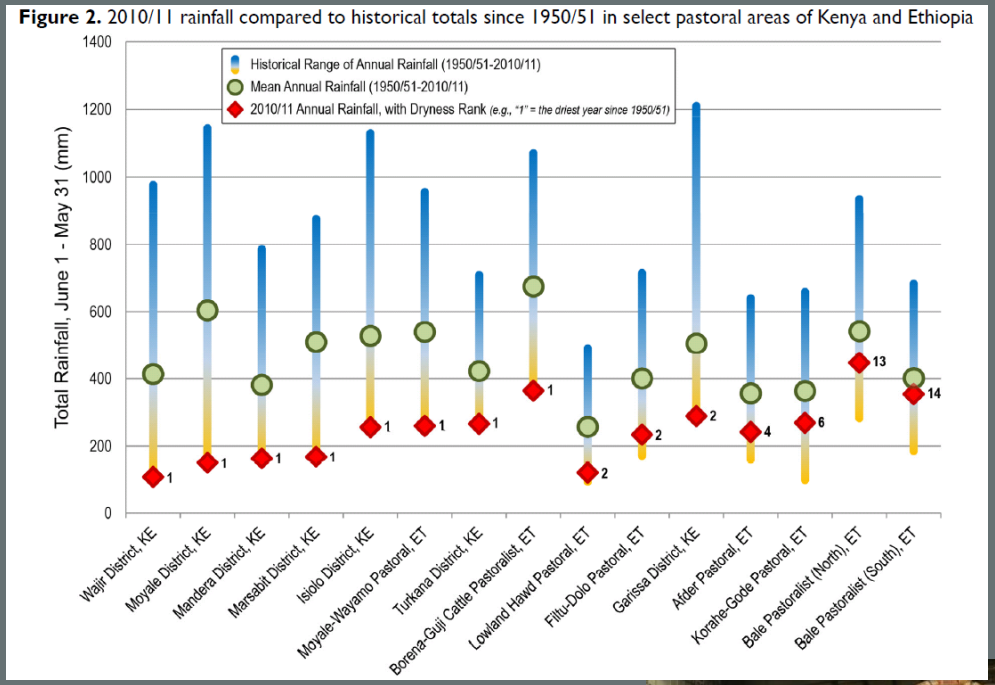

Photo: May 2011, Kenya

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http://www.fews.net/docs/Publications/FEWS%20NET%20EA_Historical%20drought%20context_061411.pdf

Happy Thoughts

- Satellites, computers and software advances provide a tremendous opportunity
- The networked world allows rapid communication
- Climate, hydrologic and crop models allow for integration and understanding

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Concerns

- Demands for water are increasing
- Per capita food supplies decreasing
- Market system exposes billions of urban poor to hydrologic risks
- ‘Enhanced hydrologic cycle” may bring drought to some

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Conclusions

- **Need better integration across time-scales**
  - Are short term responses mal-adaptive?
- **Need better integration across data sources**
  - Convergence of evidence critical
  - Satellites tremendous resource
    - Early-mid season – rainfall/LST
    - Late season – NDVI/AET
  - Weather/climate divide divisive
- **Need better integration across social networks**
  - Policy makers are not using drought information effectively

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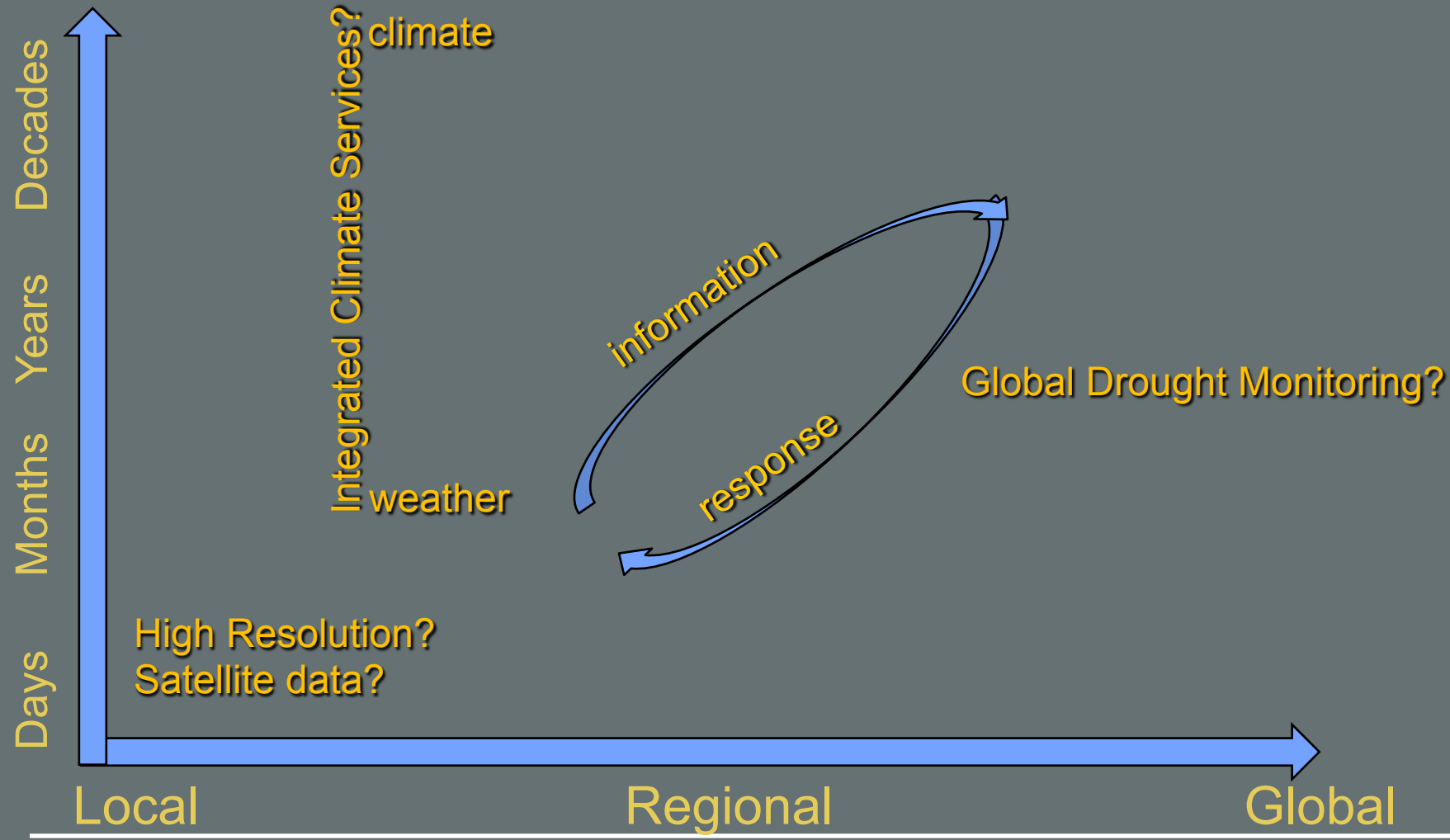
Monitoring across scales



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