“Science exists to serve human welfare. It’s wonderful to have the opportunity given us by society to do basic research, but in return, we have a very important moral responsibility to apply that research to benefiting humanity.” Walter Orr Roberts
Spin, Science and Climate Change

4 Core Conclusions from Climate Science

1. Climate Change is occurring.
2. Main cause is human activity.
3. Changes in climate are already harming humans & the environment.
4. Harm is likely to grow to higher levels w/o extensive Adaptation & Mitigation

Robust results, independent of hacked emails or minor errata in the IPCC report

“Climate Change is undeniable”

“Society has three choices: Mitigate, Adapt or Suffer”

John Holdren (US Science Adviser)
Climate 2.0 - Usable Science for Society

The fundamental question that society is asking of climate science has dramatically changed.

Climate 1.0  Is anthropogenic climate change occurring?
- Classic, low-resolution, global climate modeling (past 40 years)
- After IPCC AR4 findings, the question is now….

Climate 2.0  What is the impact of this climate change on our coupled human & natural systems?
- Magnitude and speed? Direct and indirect impacts?
- Adaptation and mitigation - options & limits?
- Regional/Local focus on “usable” science
- Societal Impacts: GIS, extremes, climate services

Addressing these much more complex, questions requires:
- Vast improvements to existing climate tools (CESM & WRF/NRCM)
- Integrating new approaches, priorities, capabilities,
- New collaborators & partners
Precision WRF: WRF-Hurricane, WRF-Chem, WRF-Health, WRF-Crop

WRF Chem predicting CO concentrations across US based on known emissions and prevailing weather
Regional Climate Simulation for 2046
Multi-decadal Regional Climate Predictions of High-Impact Weather Over North America & the Caribbean

- Global Model: 3 Ensembles from 1950-2060
- 3 ensembles at 36km, 1 at 12 km, specific cases at 4 km.
- Use of statistical downscaling to fill in intermediate periods

Greg Holland
Climate Services:

“The timely production and delivery of useful climate data, information and knowledge to decision makers”

(NRC, 2001)

“Give me information in such a way that I can make decisions at a local level. What does this mean for me in the next 3-5 years”

• Jargon-free, clear,
• actionable,
• expose the uncertainties
• Science-brokers/translator are important

(Pew Report “Lost in Translation”)

“Issued” climate products & processes allow planners to move ahead with major, climate-informed, infrastructure decisions ….and stay out of court.
Climate Services:

“Issued” climate processes and products…..

• Decision makers are being approached by many consultants, but can’t tell good from bad
• How to define these processes and products?
  • What metrics would regions/sectors have for success?
  • Quantification/communication of uncertainty and applicability?
  • Issued ≠ perfect (e.g. NWS weather forecasts)
• WH OSTP/CEQ: not 1 big center, nor many new small centers, -> interface between existing data centers + domain expertise
  • How to connect public data & private sector decision networks?
  • Structure under development, yet decisions are being made NOW
• Strong push to Federate existing data portals
Weather, Climate and Health
Mary Hayden, Andy Monaghan

Uganda: CDC Modeling Human Plague Incidence

Ghana: The WX-Meningitis Project

Phoenix: An Framework of local Vulnerability & Adaptive capacity to Extreme Heat

North America: Aedes aegyti range expansion in the Americas

Mexico: Dengue transects
Extreme Heat Vulnerability Framework

External Drivers
- Macro-level environmental and social perturbations and stressors
- Climate change
- Urbanization/urban development
- Population change

Extreme Heat Vulnerability
- Exposure
  - Climate variability and heat waves
  - Intra-urban distribution of heat
  - Urban land use and urban heat island
  - Quantitative environmental modeled or measured data
- Sensitivity
  - Health and health conditions
  - Socioeconomic and socio-cultural factors
  - Neighborhood stability
  - Quantitative demographic and health data
- Adaptive Capacity
  - Household-level KAP
  - Household resources
  - Social capital
  - Community resources and risk reduction programs
  - Community-based programs
  - Public health education and outreach
  - Public assistance

Impacts: Heat-related mortality and morbidity
Plague cases are associated with wetter areas above the Rift Valley escarpment

- Case and control locations were discriminated based on the following climatic variables (10 yr averages).
  - Total precipitation in February (dry season) (+)
  - Total precipitation in October (wet season) (+)
  - January specific humidity (-)
  - Above 1300 m (+)
- AUC = 0.93

MacMillan et al., in prep

Hayden and Monaghan, NCAR
Thanks! Any Questions?

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