Identifying Users, Diagnosing Understandability Challenges, and Developing Prototype Solutions for NOAA Climate Prediction Center's Temperature and Precipitation Outlooks

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Outline

- Background
- Interview methods
- Goals of the outlook products
- Users of the outlook products
- User decisions
- Ourrent visualization approach
- Next Steps

Background

- Temperature and precipitation outlooks contain significant degrees of uncertainty
- How to best visualize geospatial uncertainty is an open scientific question
- Using decision and visualization science to align user needs and goals with visualization choices







Expert Scoping: Methods

- 8 semi-structured interviews with experts elicited by CPC
 - 5 in-person
 - 3 web conferences using Adobe Connect
- Interviewees were given the opportunity to review interview transcript and elaborate where needed
- Broader themes were found through standard qualitative analysis techniques

Goals of the Outlook Products

Forecast temperature & precipitation

Understood by nonmeteorologists

Useful for decisionmaking

Reliable probabilities

Improve skill

Reduce uncertainty

Users of the Outlook Products

Private Businesses

- Media
- Investing firms
- Farmers
- Utilities

Federal Agencies

- NOAA
- USGS
- DOE
- Bureau of
 Reclamation
- Army Corps of Engineers
- FEMA
- USDA
- USFS National Advanced Fire and Resource Institute

State and Local Level

- State Climate Offices
- Extension specialists
- Emergency managers

Technical, Science Translators, Non-Technical

User Decision Types



Organizational decisions

Personal decisions

Colors

- User does not pay much attention to percentages associated with Probability of Below or Above
- Misinterpretation of probabilities
- 90% probability of above normal temperature ≠ record-breaking heatwave



Meaning of "normal"





White Space and Probability



Three Categories



L3MTO



Next Steps

- Phase 2: Identify End-user Audiences
- Phase 3: Understanding User Needs
- Phase 4: Diagnosis of Understandability Challenges
- Phases 5 and 6: Redesign Visualizations and Test Effectiveness

Phase 2: Identify End-user Audiences

- Focus sectors:
 - Energy
 - Agriculture
 - Emergency management
 - Water resource management
- Identify target end-users through:
 - Phase 1 results
 - CPC recommendations
 - Snowball sampling

Phase 3: Understanding User Needs

Conduct short survey with target end-users One focus group per sector to narrow down to one decision context or type

Conduct focus group with one decision context or type

Phase 4: Diagnosis of Understandability Challenges



Self-reported understandability challenges (Phase 3)

Identify challenges, trade-offs, and major concerns

Dasgupta, A, Poco, J., Wei, Y., Cook, R., Bertini, E., & Silva, C. T. (2015). Bridging theory with practice: An exploratory study of visualization use and design for climate model comparison. *IEEE transactions on visualization and computer graphics*, *21*(9), 996-1014.

Phases 5 and 6: Redesign Visualizations and Test Effectiveness

- Diagnose visualization problems
- Collaborate with CPC to redesign climate outlooks
- Test/retest redesigned outlook visuals

High-Level Take Home Messages

- 1. Participants articulated a consistent set of goals for the outlooks
- 2. Ourrent outlook products are not well understood
- 3. By using decision support science methods we can identify solutions so earth system data and projection products are understood and useful for decision-making

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