Seeing the world through a political lens:
The connection between weather and climate change perceptions and beliefs

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Research Question:
What drives individual beliefs about anthropogenic climate change?

• Example studies
  – Recent weather links to global warming beliefs (Egan & Mullin, 2009)
  – Weather, particularly winter season, link to perceived effects of climate change in certain US regions (Hamilton & Keim, 2009)

• The role of perception and interpretation?
  – Causal attribution

• How do these views play into individual perceptions of environmental risk?
Outline of presentation

• Theoretical framework
  (cultural theory of risk)
• Our model
  – Three stages of modeling
• The data
  – Survey
  – Meteorological
• Model results & analysis
Alternative explanations for risk perceptions

• What explains emphasis on particular kinds of risks?
  – Technical: probability x consequence
  – Ideological: emphasize risks that are consistent with views on the role of government
  – Cultural: emphasize risks that are consistent with preferred ways of life
Ideological Explanation of Perceived Climate Risk

• **Left**: preferred role of government is expansive; climate risks justify extensive governmental interventions, hence in accord with left-of-center ideologies, embraced

• **Right**: government should be minimalist, interventions rare; climate risks justify too much government, hence are subject to skepticism, minimized
Cultural Explanation of Risk Perceptions

Cultural orientations are derived from a person’s degree of group orientation ("group"), and preferences concerning social distinctions ("grid") in society.

High group, low grid – egalitarians

- This orientation fears unrepresentative concentrations of power and authority (e.g., private corporations or secretive government).
- Egalitarians prone to view the risks posed by such bodies as threatening their way of life.
- Climate change therefore provides an archetypal risk for egalitarians.
The surveys

• Small portion of larger project
• Questions cover several areas of risk concern, including nuclear, pollution, and climate hazard.
  – Responses geocoded
    • Zip & Fips
  – Three years of data (2007 - 2009)
    • Total ~4500 participants
  – Surveys taken largely in May
  – Multimodal – internet and telephone data collection
Questions most relevant to this research, from the survey

• **CC beliefs**: In your view, are greenhouse gases, such as those resulting from the combustion of coal, oil, natural gas, and other materials causing average global temperatures to rise?

• **Weather perception**: In your personal experience, over the past few years have average temperatures where you live been rising, falling, or staying about the same as previous years?

• **Environmental risk**: On the scale from zero to ten, where zero means no risk and ten means extreme risk, how much risk do you think global warming poses for people and the environment?
Meteorological data

- NCEP NCAR Reanalysis 2.5 degree grid spacing (Kalnay et al. 1996)
- Match zip/fip to nearest grid point as representative region
- Raw obs: daily avg 2m temperature
- Deviation schemes used to match perceptions
  - (Prior week avg - 3 yr avg)
  - (Prior year avg - 3 yr avg)
- Optimal at 3 years in both, relatively poor fit at just one year
- Show decreasing correlations toward LTM: individuals are answering the question we ask!
- These were the two highest correlations, but they imply answers stemming from completely different interpretations of baseline weather states.
Model 1: Temperature perception

- Actual Weather
- Perceived Weather
- Demographics
Model results:
Factors predicting perception of weather (temperature trend)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Transformed coefficient</th>
<th>Significance level</th>
</tr>
</thead>
<tbody>
<tr>
<td>Week-3yr T</td>
<td>1.042</td>
<td>**</td>
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<tr>
<td>Yr-3yr T</td>
<td>1.445</td>
<td>***</td>
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<tr>
<td>Gender</td>
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<tr>
<td>Age</td>
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<td>Income</td>
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Significance codes: 0 '****' 0.001 '***' 0.01 '*' 0.05 '.' 0.1 ' ' 1

-Inclusion of both temperature trend measures
Model of beliefs regarding anthropogenic climate change

- Social/Political (Egalitarian, Ideology, Partisanship)
- Perceived Weather
- GCC Beliefs
## Model Results:

**Factors predicting climate change beliefs**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Estimated coefficient</th>
<th>Significance level</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Intercept)</td>
<td>2.597</td>
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<td>Temperature Perception</td>
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<td>Week-3yr T</td>
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<tr>
<td>Yr-3yr T</td>
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<td>Income</td>
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<tr>
<td>Egalitarianism</td>
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</tbody>
</table>

Significance codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Multiple R-squared: 0.225, Adjusted R-squared: 0.2232

F-statistic: 125.6 on 10 and 4324 DF, p-value: < 2.2e-16

- Wash out influence of ‘real weather’ measures
- Note regarding education level
Model of environmental risk beliefs
Model results:
Factors predicting perceived level of environmental risk

<table>
<thead>
<tr>
<th>Variable</th>
<th>Estimated Coefficient</th>
<th>Significance level</th>
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<tbody>
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<td>Global CC Belief</td>
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<td>Week - 3 yr T</td>
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</table>

Significance codes: 0 '****' 0.001 '***' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Multiple R-squared: 0.5045, Adjusted R-squared: 0.5032

F-statistic: 398.2 on 11 and 4303 DF, p-value: < 2.2e-16
Conclusions

• Primary factors predicting:
  – Weather perception
    Two measures of temperature trends, gender, education, age, income
  – Beliefs about climate change
    Temperature perception, democrat, ideology, egalitarianism
  – Environmental risk
    Temperature perception, global climate change beliefs, gender, education, democrat, ideology, egalitarianism

• Relationship between models
Future work

• Fully explore interplay between weather perception and climate change belief

• Different manipulations of meteorological data, in an attempt to more closely relate to weather perceptions

• Introduction of moisture variables to all stages of analysis, explore interactions with temperature

• Examine trends by year and region
Thank you for your attention!

Questions?

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NCEP North American Regional Reanalysis
2m Air Temperature (K) Composite Anomaly 1979–2001 climo 1979–2001 climo

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May 2005 to Apr 2007
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May 2006 to Apr 2008