Designing Interactive Graphics for Validating and Interpreting Storm Track Model Outputs

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Context

- Willis Research Network
- Climate scientists
  - advise insurance industry on atmospheric risk on the basis of their simulated storm tracks
  - wanted to produce video clips to illustrate particular scenarios
- Visualisers
  - asked to produce a tool to enable them to do this

The user-centred process

- Original remit quite narrow
- Prototypes
  - Initial prototype provided by users (a video clip)
  - Regular prototype versions provided
- Iterative rapid prototyping
  - process of prototyping, feedback from users, modification and rapid turnaround
- Prototype tidied up and became final ‘product’

The impact

- Fulfilled their needs
  - could capture videos to help illustrate talks
- But… could see data exploratory potential
  - highly responsive and interactive, helping assess natural variability
  - lightweight portable software, easy to share with peers and use live to an audience
  - said they learnt a lot from using the tool and they identifies issues to further address

Next phase

- To design and build a tool that helps scientists address research questions
  - validate the storm tracks
  - study the impact of atmospheric conditions on storm activity
- Need to incorporate research question gathering into the prototyping process

Research questions

- We asked for a list of
  - question
  - rationale (why is it interesting)
  - example statement
- We are using these to inform the design
- Choose research questions that lend themselves to visual analysis

Research question

- “How does SST affects location/intensity of storms?”
  - “The **27C ocean temperature isotherm** highlights the **region where tropical cyclones form** revealing the importance of warm sea surface temperatures for tropical cyclone development and evolution. This **region is much larger** in the West Pacific than in the Atlantic.”

Research question

- “Which conditions lead to cogensis/coevolution (and divergence)?”
  - “It appears that occurrence of areas of **persistent higher than average sea surface temperatures** are conditions that are favourable to the **cogenesis of a train of tropical cyclones**.”

Research question

- “What is the correlation between SST, NAOI and simulated storm activity?”
  - “When there is a strong positive NAO, **more storms recurve in the North Atlantic** and subsequently a **higher proportion of TCs make ET than under negative NAO conditions**. There are also **more storms that make landfall** in **both** the US and the UK. During negative NAO conditions, **more storms make landfall in the Caribbean region**.”

Implications for design

- Incorporating conditions is clearly important… but quite complex comparisons
  - space/time windows be ill-defined (and % within)
  - temporal comparison are important
  - relative measures important - deviation from “normal”
  - teleconnections
- Need simple and interactive interface
- Need to cope with 1.5Gb data
  - 18,602 tracks (968,014 data points) and monthly conditions over 150 years

Conclusion

- Prototyping and involving users important
  - success in phase 1, but narrow remit
  - users saw the exploratory potential
- Scope the tool - choose appropriate RQs
  - Virtue of VA is fast, responsive, rapid enquiry
  - Ask for specifics - examples of statements
- Spatial/temporal comparison over ill-defined windows