Controlling Mechanisms Of Extreme Precipitation Events

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Background

• Extreme Precipitation Events (EPEs):
  • Hazards: major flooding, erosion, landslides
  • As climate changes: more intense and frequent

• IMERG: database of EPEs over CONUS
  • Global Precipitation Measurement satellites

• MERRA-2: many meteorological variables
  • Observational data and model simulations

Controlling Mechanisms of EPEs

1Pierce (SSAI), 2Zhou et al. 2019, 3Gelaro et al. 2017
**Process**

- **Goal:** correlate characteristics of EPEs with meteorological variables
  - **Characteristics:** duration, total volume, total area, propagation, etc.
  - **Variables:** specific and relative humidity, wind speed, temperature, etc.
  - **Areas collected:** relative to event duration
    - 0 – 6 hrs, 6 – 24 hrs, > 24 hrs
  - **Times collected:** 5 time steps

![Diagram showing time steps and areas collected]
Approach

• Python!
  • Locate and characterize EPEs in MERRA-2
  • Compute seasonal trends in variables
  • Within Discover supercomputer
• Inputs: IMERG EPE statistics, MERRA-2 data
• Outputs: data files, maps of event variables, scatter plots of averages
Locating EPEs

IMERG: Spring 2017, Event 15

Controlling Mechanisms of EPEs
Locating EPEs

IMERG: Spring 2017, Event 15

Event 15 (04/04 – 04/06)

Controlling Mechanisms of EPEs

MERRA-2
Characterizing EPEs

Spring 2017
Long events (> 24 hrs)

- No clear relationships
- Next steps:
  - Optimize code
  - Run code on many seasons at a time
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Next step:
Put EPEs in context of global circulation changes

Map: average E wind in spring since 1980
Contours: slope of spring trend since 1980
Wind Speeds

Seasonal averages over CONUS

- Slight trends in summer and fall wind speeds
- Decreasing propagation of shorter EPEs
Conclusions

• Developed codes that can:
  • Locate EPEs, collect variables, and plot them
  • Collect seasonal trends in wind speeds
• Future work: determine correlated variables
  • Many variables and events to work with!
• Wind speeds:
  • Seasonal variability and EPE propagation
Acknowledgements

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References


Thank you!

Questions?