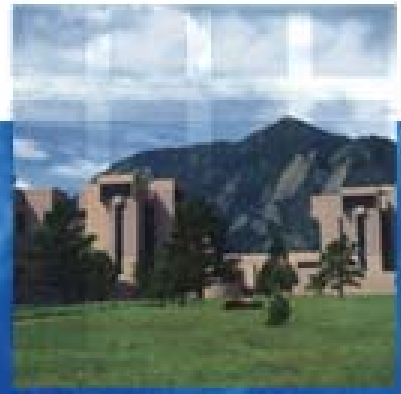
NCAR



Climate 2010

High Performance Network Planning Workshop

Gary Strand

National Center for Atmospheric Research

Climate 2010

The past

- Two, sometimes three components
- Low resolution, spatially and temporally
  - Atmosphere
    - ~500 - 800 km grid (think Montana), 9 vertical levels
  - Ocean
    - 200 km by 200 km grid (1/2 Maine), 20 vertical levels
  - Sea ice (maybe)
    - Same grid as ocean, simple dynamics
- 100 years of model time is ~50 Gigabytes
- Data distribution uncommon, slow, and painful

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The present

- ~Four interactive components
- Higher resolution, spatially and temporally
  - Atmosphere
    - 230 km grid (W Virginia), 18 vertical levels
  - Ocean
    - 100 km grid (2x Delaware), 40 vertical levels
  - Sea ice
    - Same as ocean grid, fully dynamic
  - Land surface
    - Same grid as atmosphere
- 100 years of model time is ~1 Terabyte
- Data distribution common, ESG will help

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5 years from now

- Five or more interactive components
- Still higher resolution, spatially and temporally
  - Atmosphere
    - 30 km grid (4x DC), 60 vertical levels
  - Ocean
    - 10 km grid (1/2 DC), 40 vertical levels
  - Sea ice
    - 10 km grid, or less
  - Land surface model, fully dynamic vegetation
  - Carbon cycle model
  - Atmospheric chemistry
  - Preliminary observational data assimilation
- 100 years of model time is ~100 TB
- Data distribution common, pain free

Climate in 2010

- Several (six, seven?) interactive components
- Yet still higher resolution, spatially and temporally
  - Atmosphere, ocean, sea ice
  - Fully dynamic vegetation
  - Carbon cycle
  - Atmospheric chemistry
  - Biochemistry
  - Full assimilation of observational data
  - Econometric models
  - Population growth and land use change models
  - Solar processes
- 100 years of model time is at least ~1/2 PB
- Widespread data distribution mandatory

Climate in 2010

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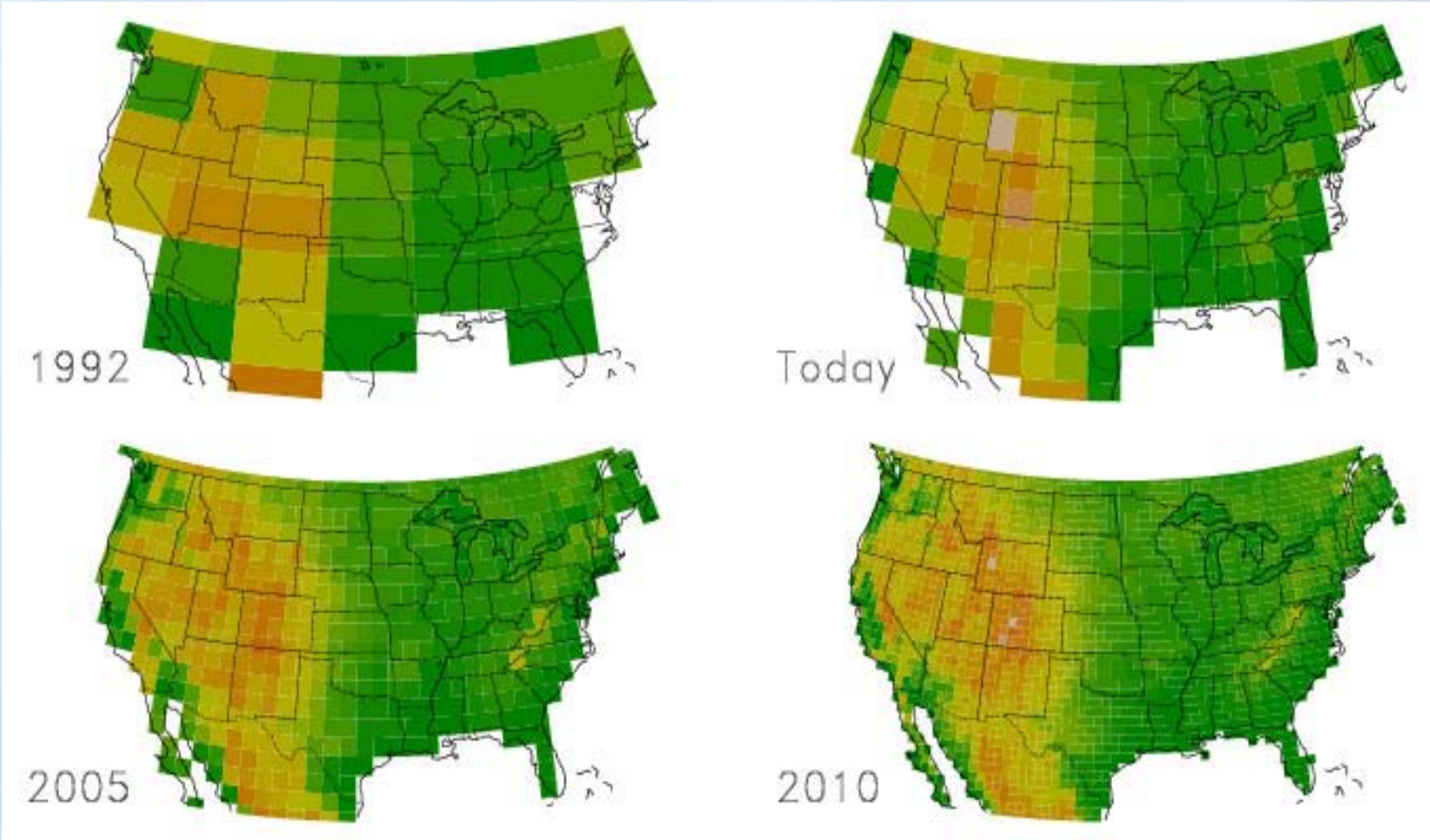
A graphic illustration



Climate in 2010

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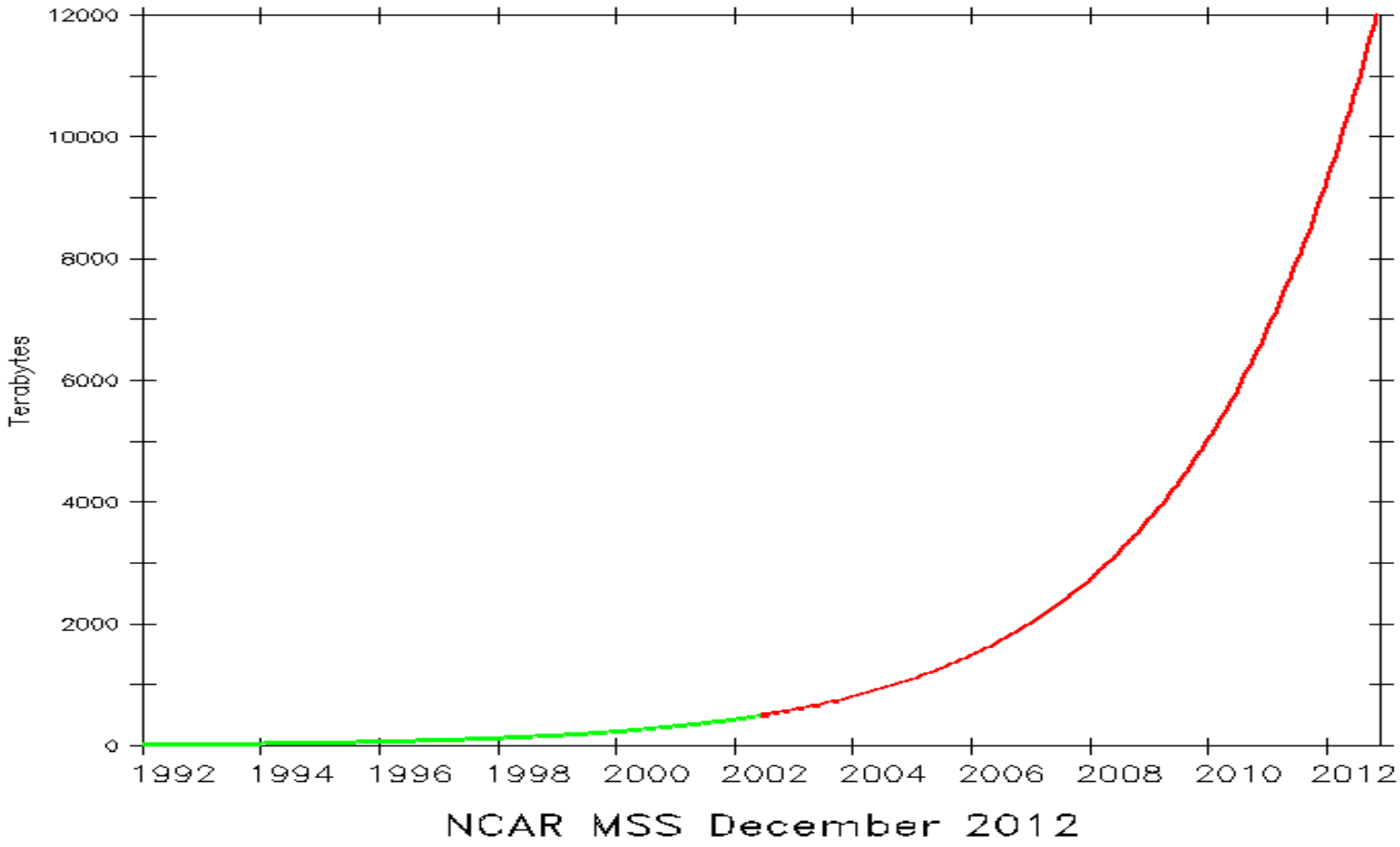
And one more…



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Conclusions

- Climate models have evolved steadily, but that evolution will become more rapid in the future
- Generated data volumes have, and will, increase exponentially
- Widespread data distribution is required for analysis, visualization, and assessment

…All of which mean:

- All aspects of network infrastructure **must** keep up if the science is to progress

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The End