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U.S. DEPARTMENT OF ENERGY

High resolution CAM5.1 simulations

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With contributions from
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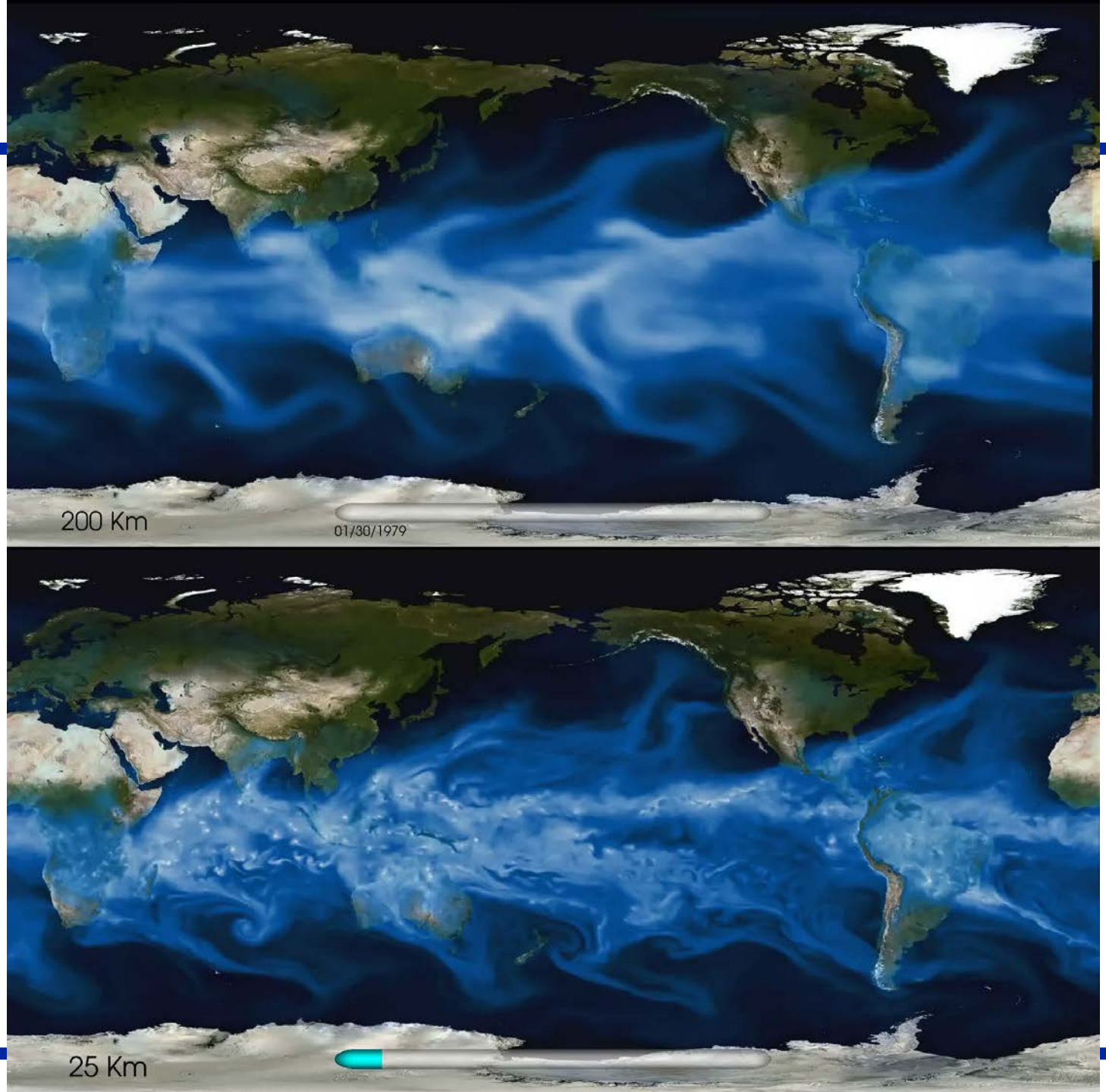
0.25^{o} CAM5.1

- Work in progress!
  - –The first simulation is not finished yet
  - –1979-2005 is complete.
  - –AMIP protocols
  - –Standard release version 5.1 with prescribed aerosol forcing. Input deck from Julio,
  - –My principal motivations are to quantify hurricane statistics in a changing climate.
    - Follow on to a CAM2.2 study at 0.5^{o}
  - –I am also interested in other extreme weather statistics.
  - –Much analysis remains.



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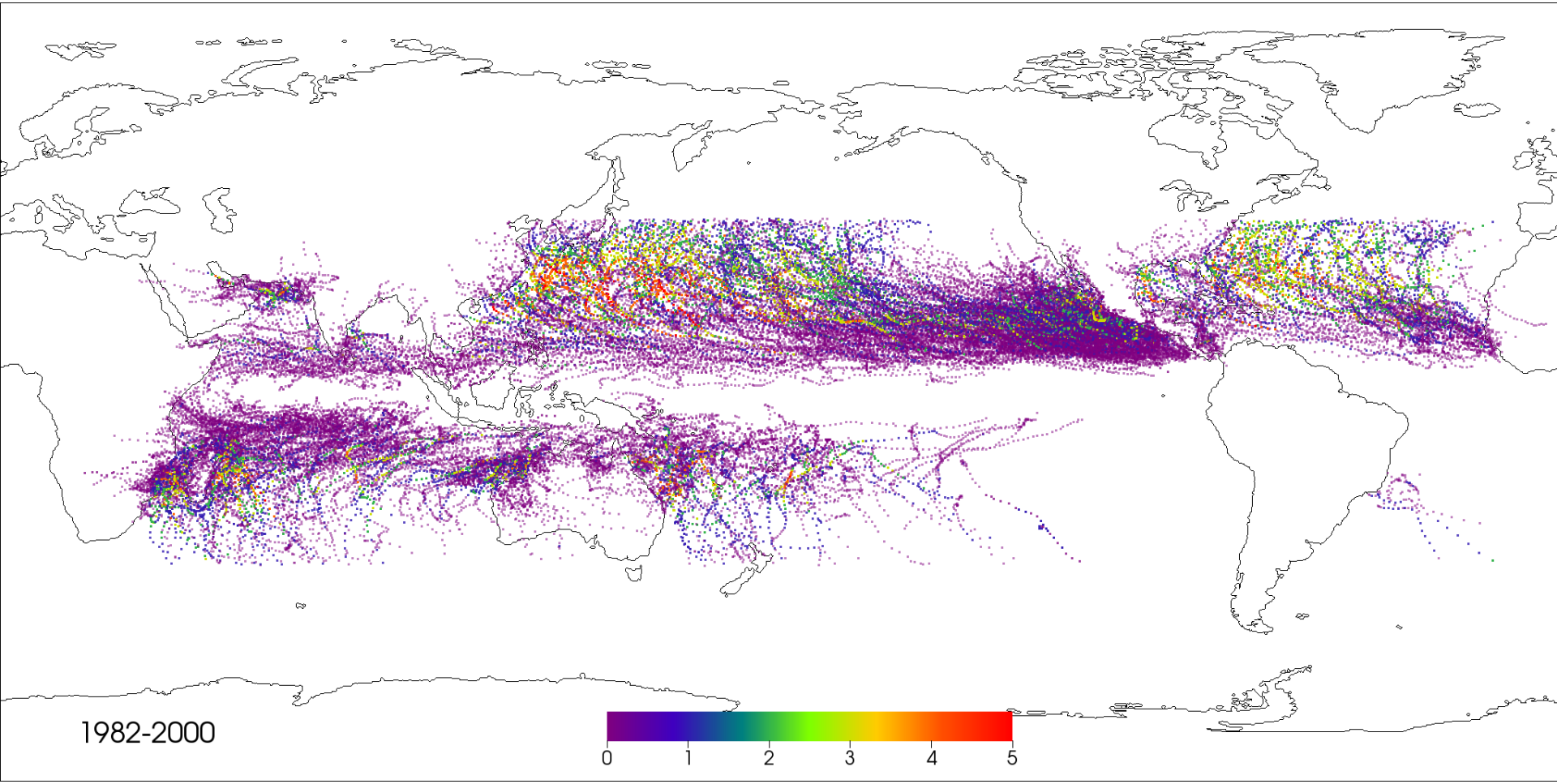
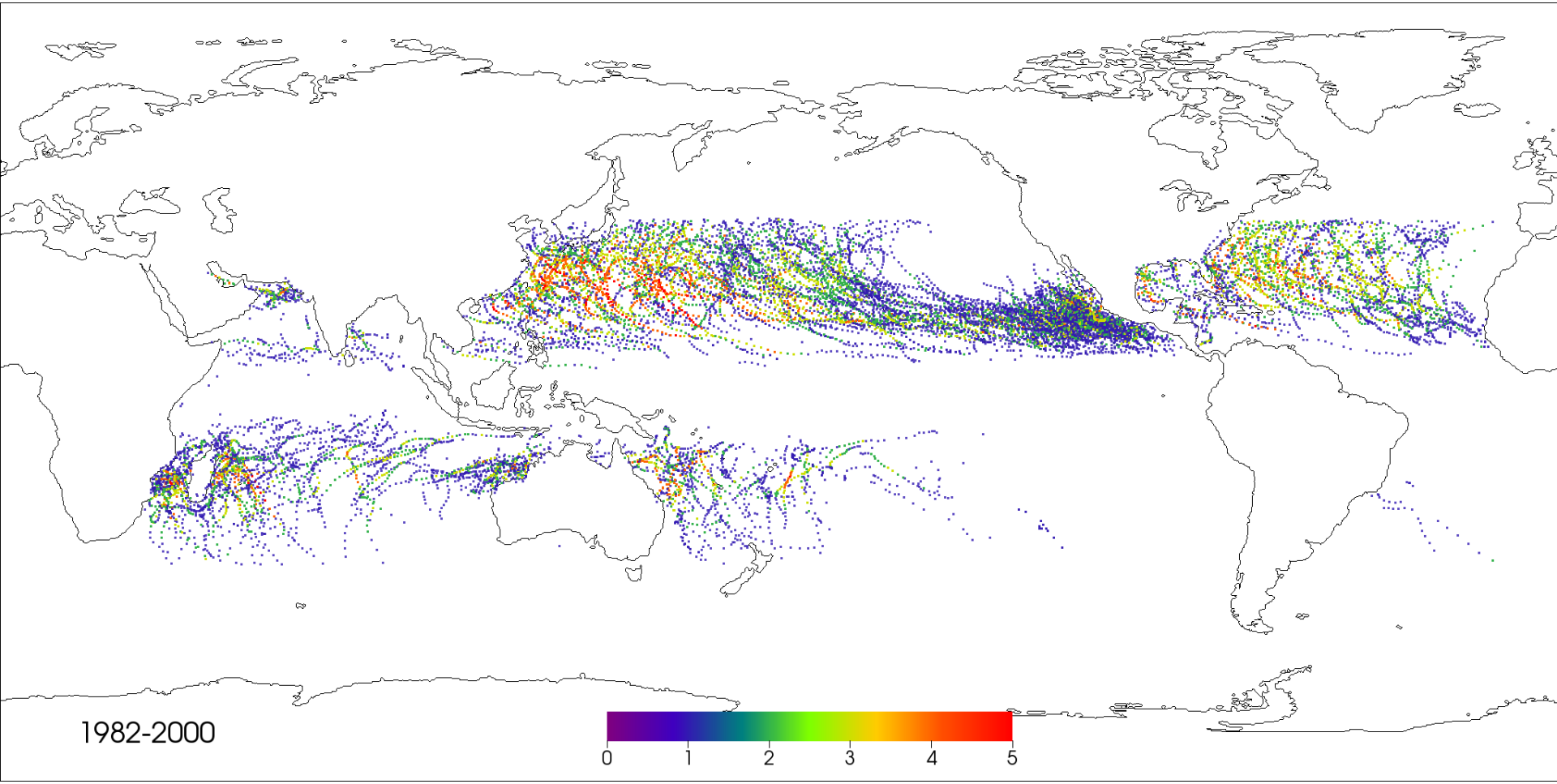
Tropical cyclone tracking

- Prabhat has rewritten the GFDL tracking code
  - C++/mpi
  - Parallel over time, 2 wall clock hours per year on 365 processors.
  - 1982-2000 required 10TB of data reads.

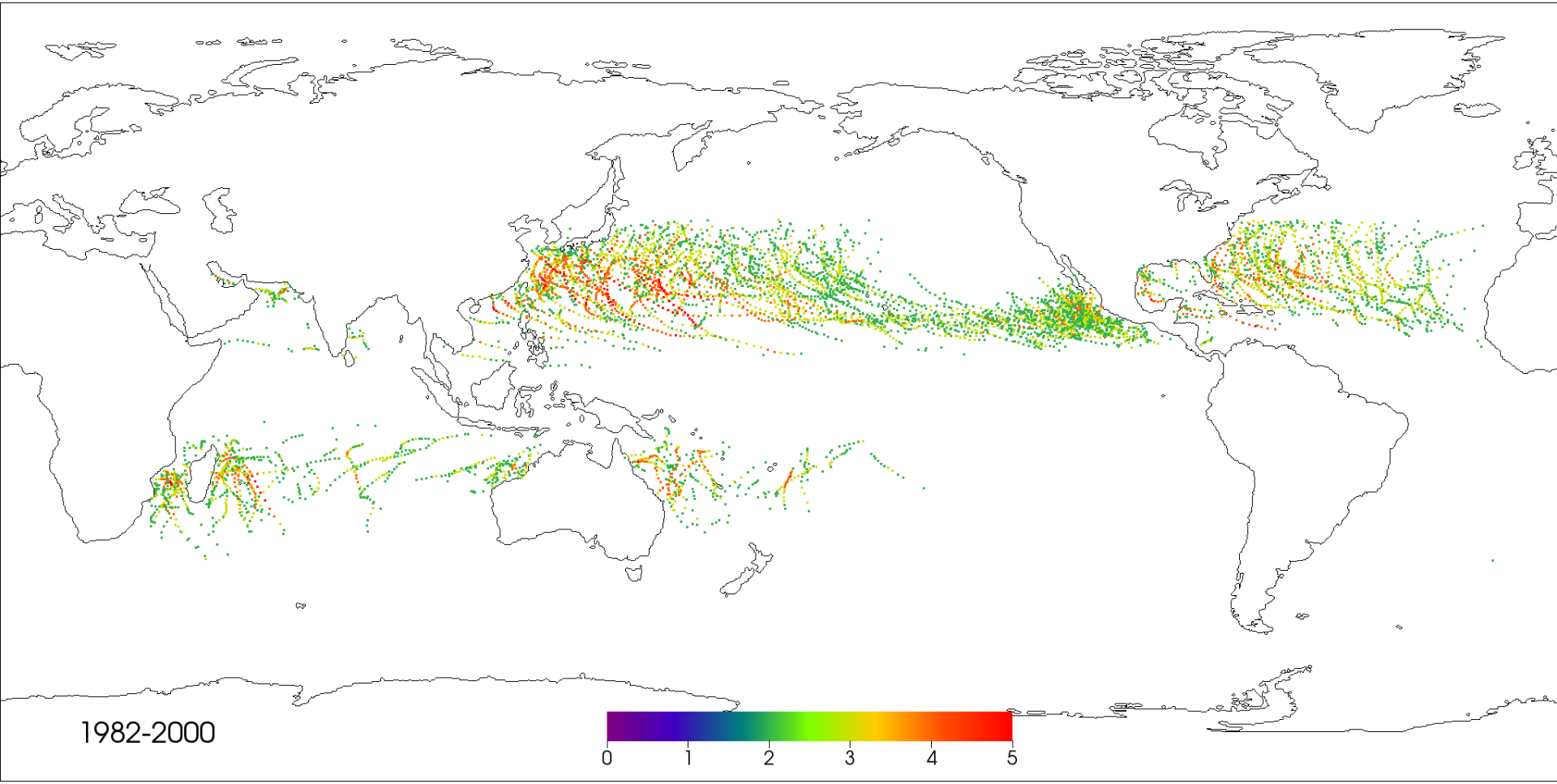
Tropical storm-Category 5



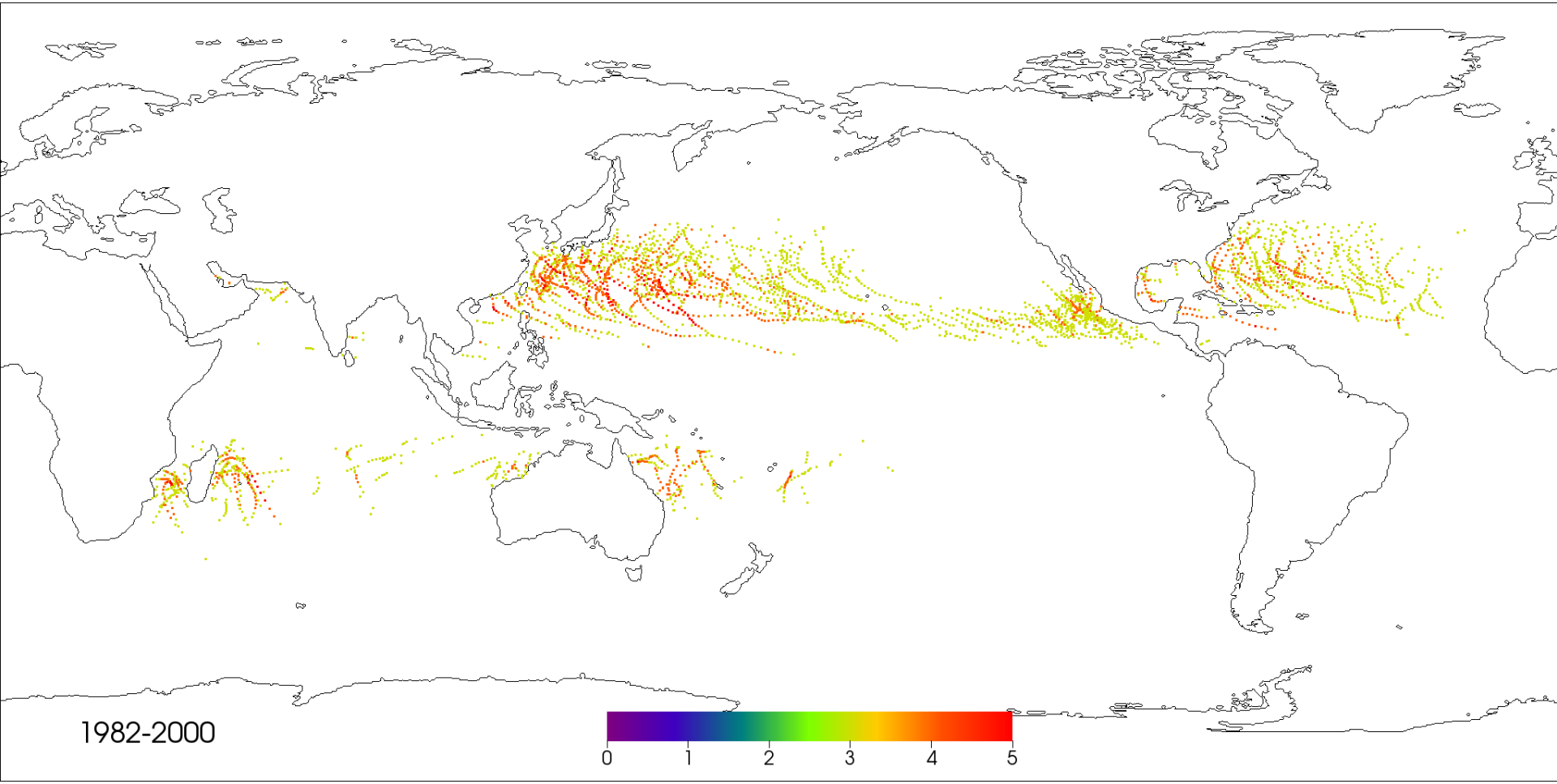
Categories 1-5



Categories 2-5



Categories 3-5



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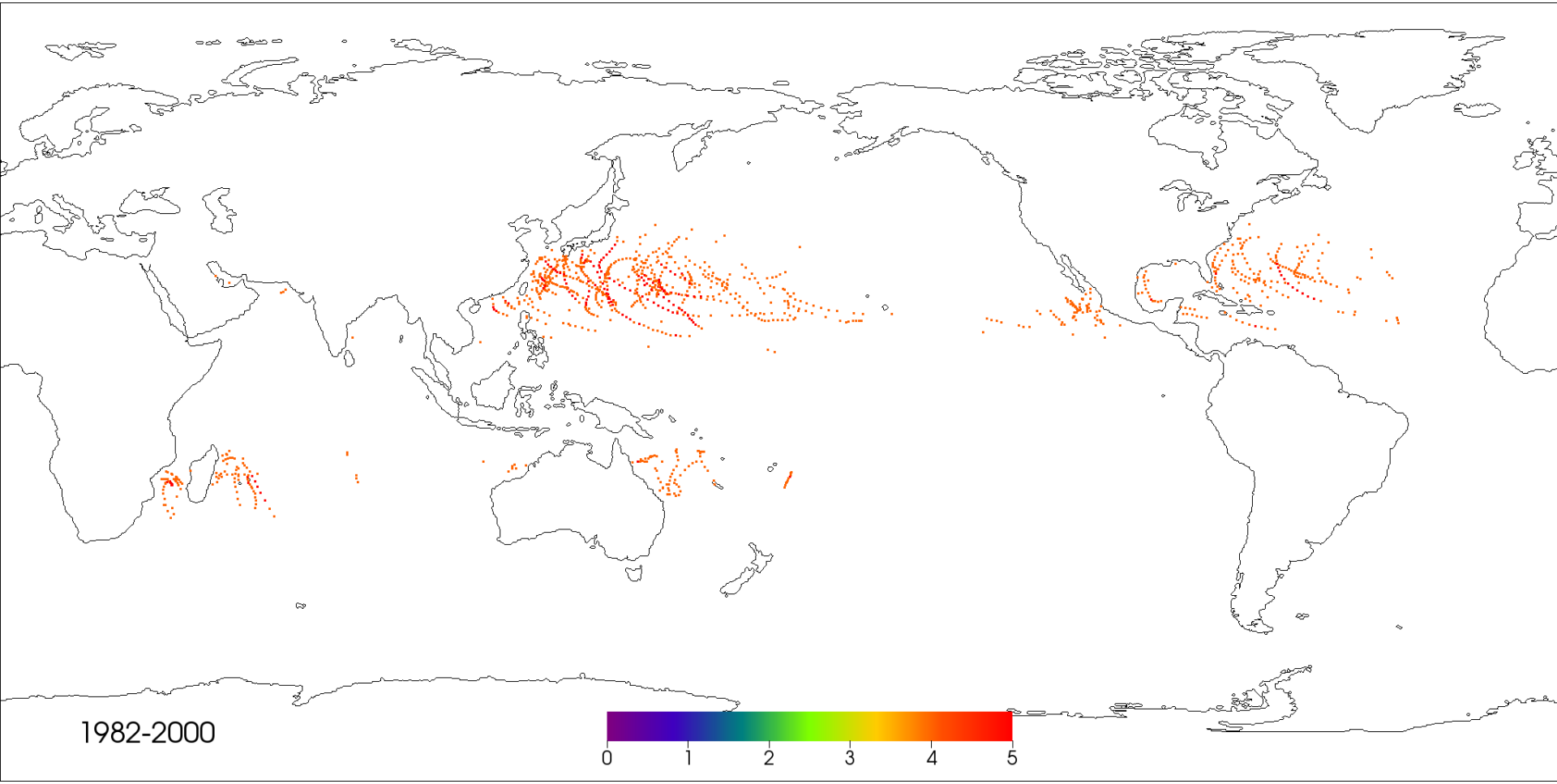
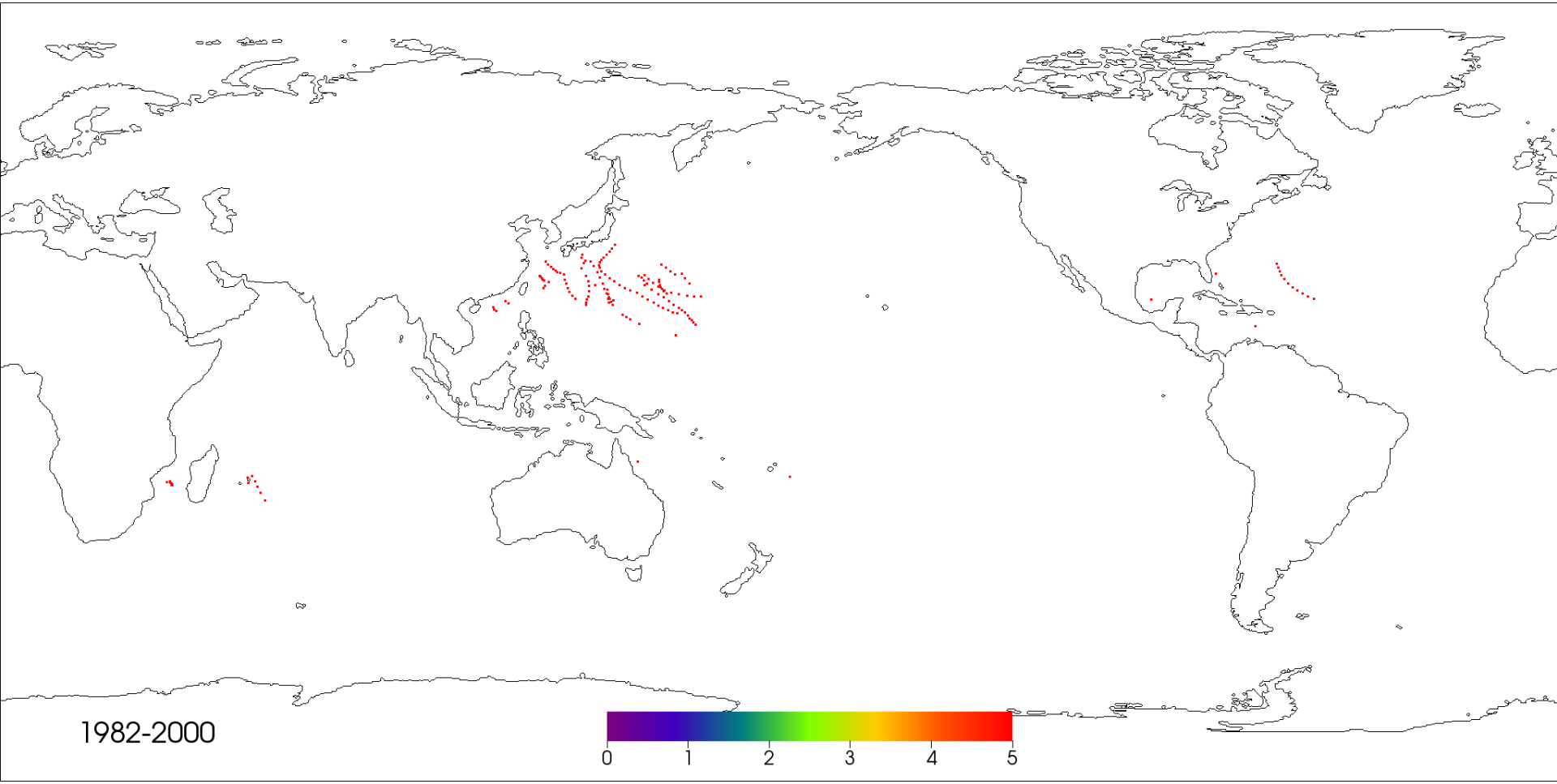


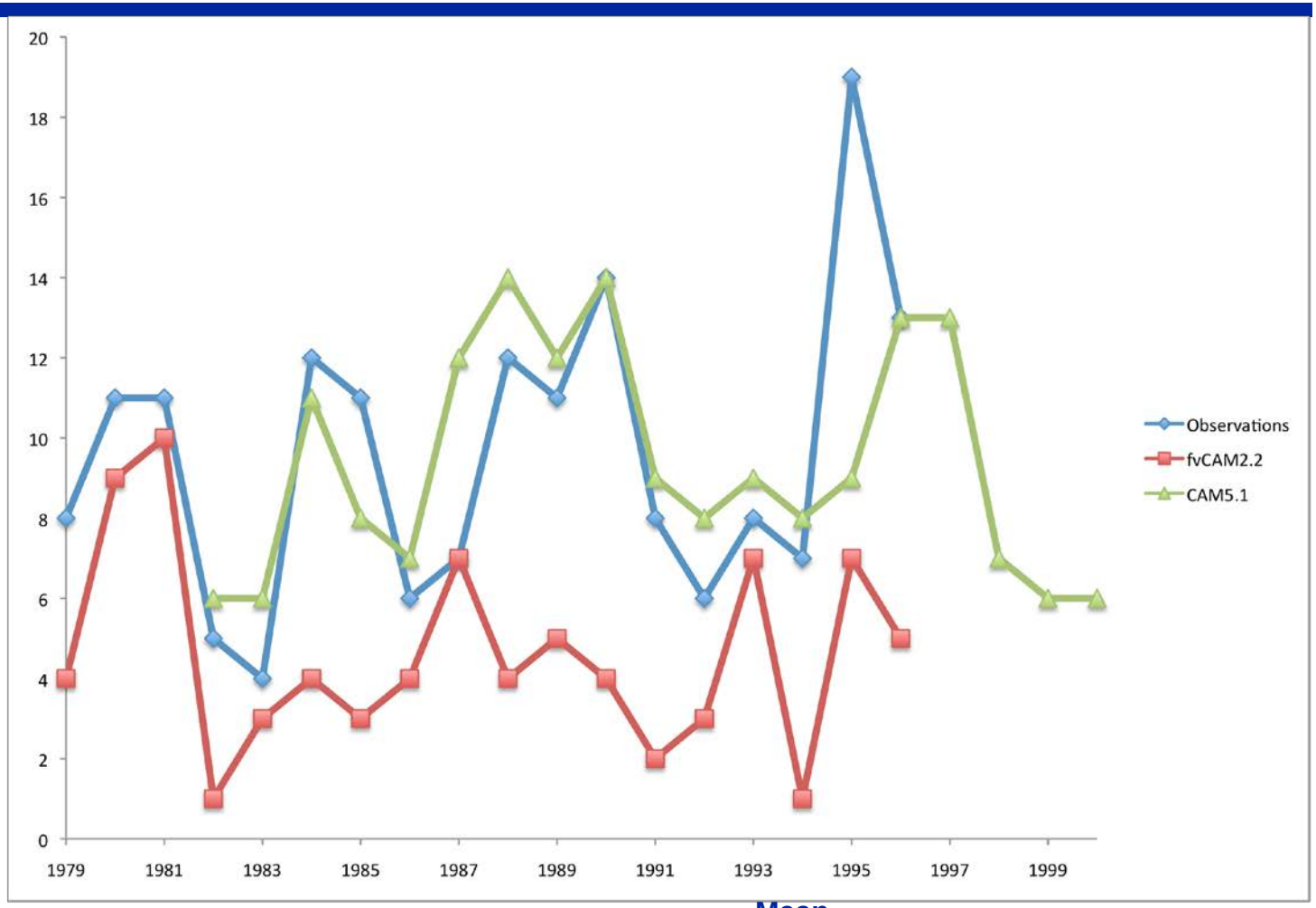
Category 5



Global TC / year

- total TC
  - –cam5.1 **84±9**
  - –observations **87±8**
- total hurricanes
  - –Observations **49±7**
  - –cam5.1 **52**
    - cat1 **21**
    - cat2 **5**
    - cat3 **12**
    - cat4 **7**
    - cat5 **1.5**

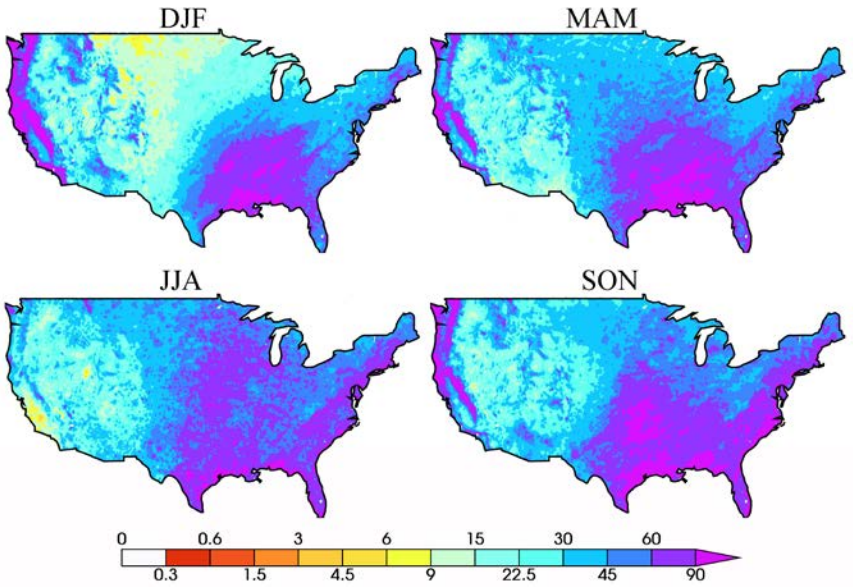
Atlantic TC per year



- **Correlations with observations**
  - **fvcam2.2: 0.46**
  - **cam5.1: 0.59**
- **Mean**
  - **Observations 9.6**
  - **fvcam2.2 4.6**
  - **cam5.1 9.3**

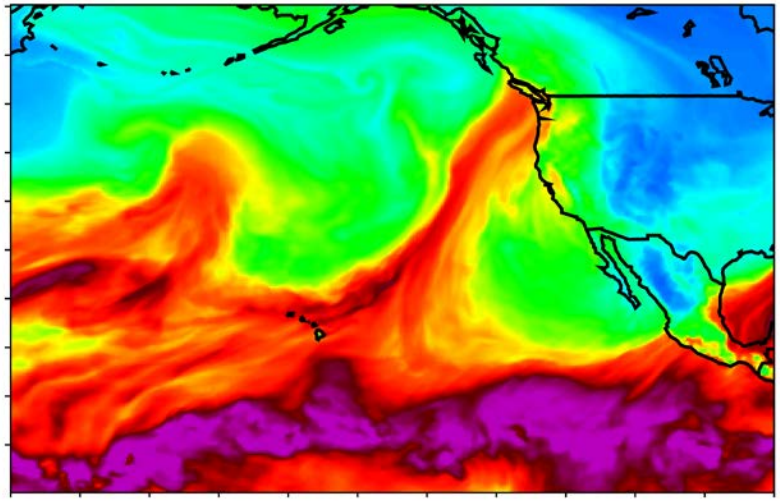
Extreme precipitation

- **Observations**

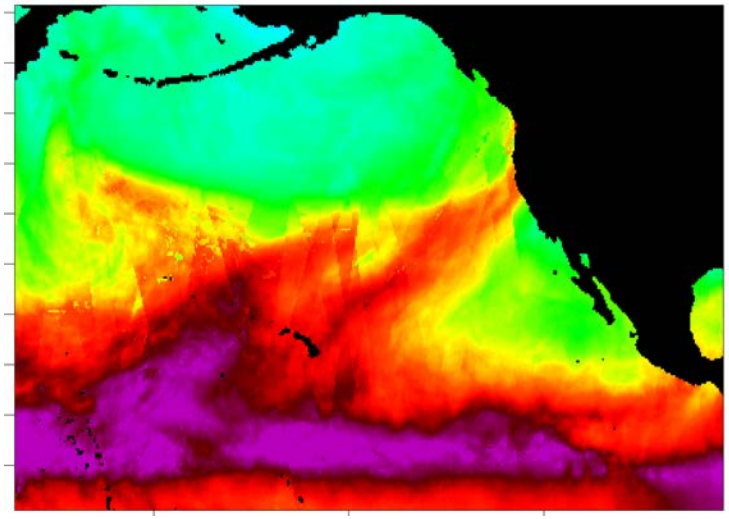


- **CAM5.1**

Atmospheric Rivers



A cam5.1 event

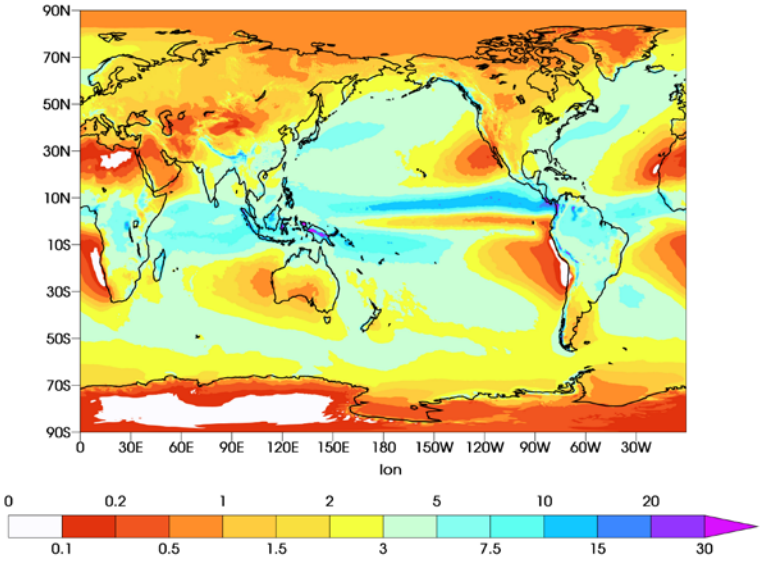


An actual event

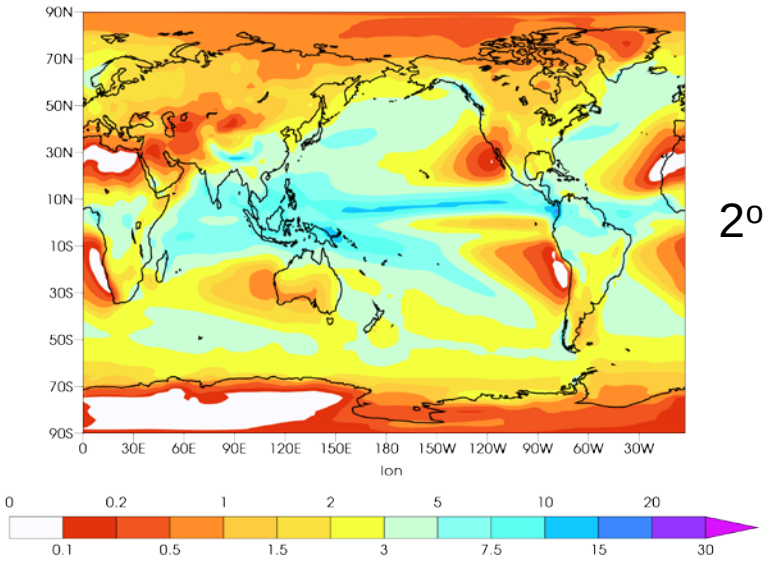
- **See Prabhat's poster on Thursday for the detection algorithm details based on these images of total precipitable water.**
- **Quantification of cam5.1 atmospheric river statistics is underway.**

Annual mean precipitation

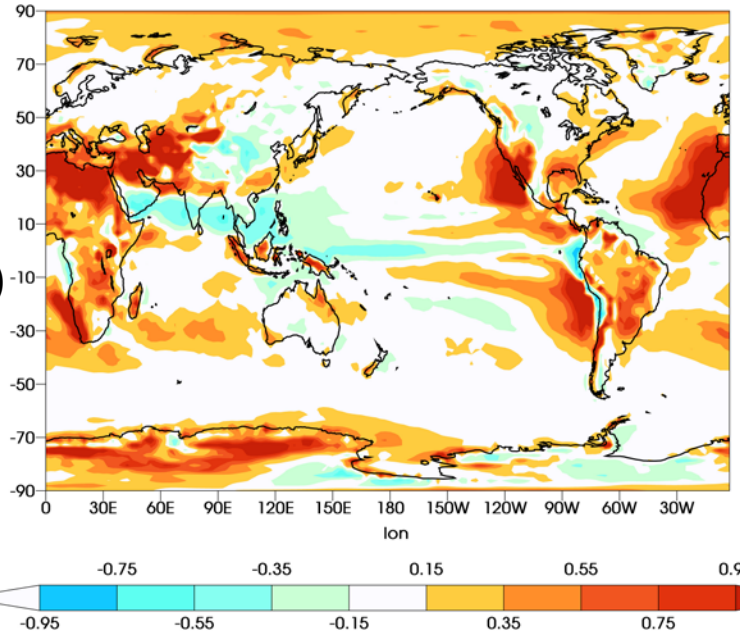
0.25º



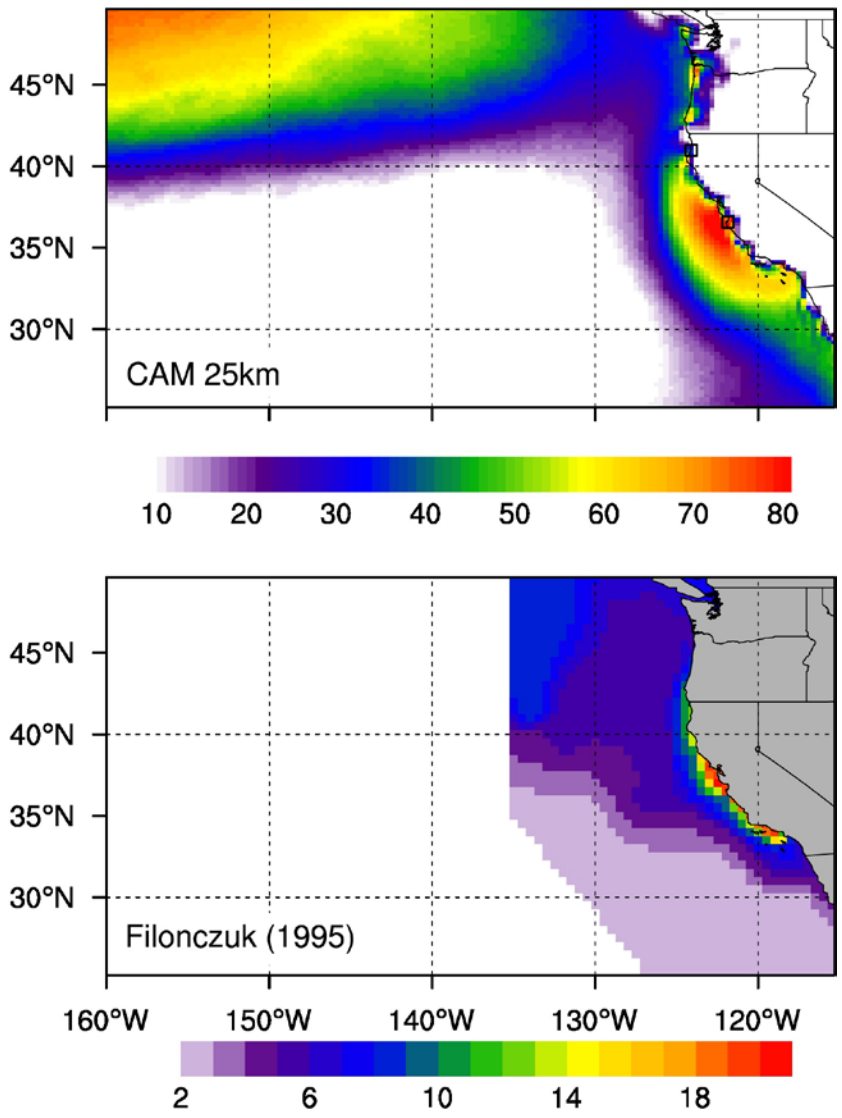
2º

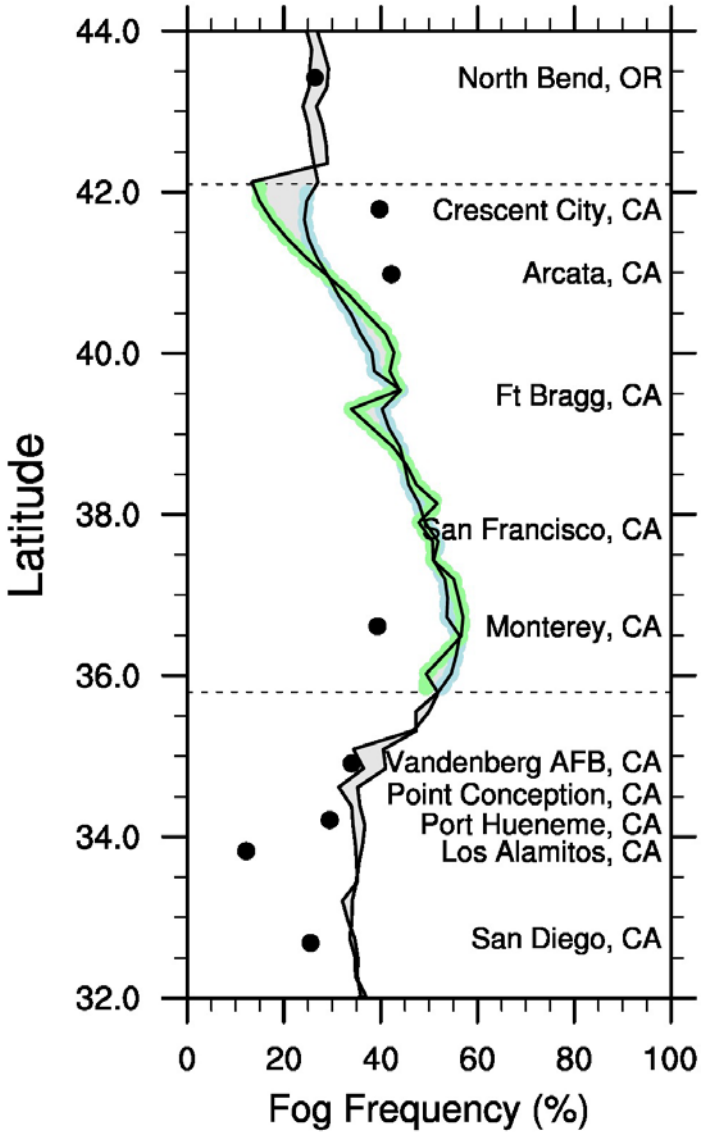


High res– low res (fractional difference)



Coastal Fog (courtesy Travis O'Brien)





Summary

- 25km global CAM5.1 integrations are quite feasible
  - –185,000 processor hours per simulated year
  - –Large datasets present analysis challenges
  - –>100TB of output. Call me…
- Weather details, especially in the extreme, are more realistic than at standard resolutions.
- General circulation patterns do not change a lot.
- Hurricane statistics are very good.
- Stay tuned!
  - –Much more to come.
  - –Future time slice experiments.
    - US Clivar hurricane working group

Thank You

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