DOE/UCAR Cooperative Agreement
Regional and Global Climate Modeling Program

Uncertainty in future regional sea level rise due to internal climate variability

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GRL, 40, doi:10.1002/gl50531. Early view online.

CESM Workshop 2013

NCAR is sponsored by the National Science Foundation

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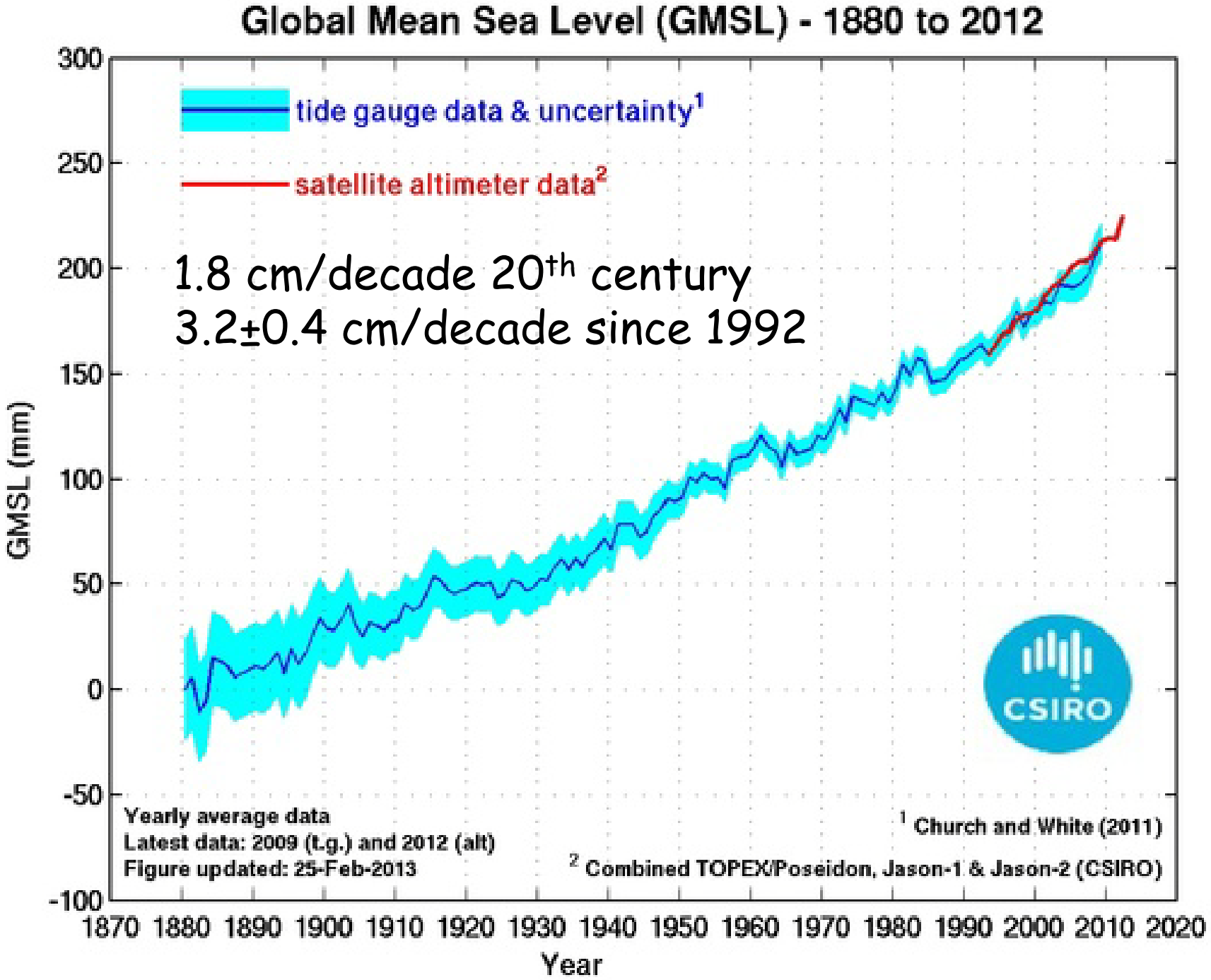
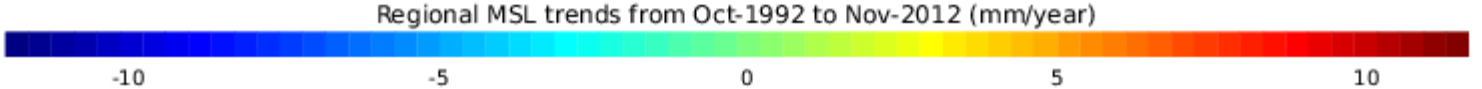
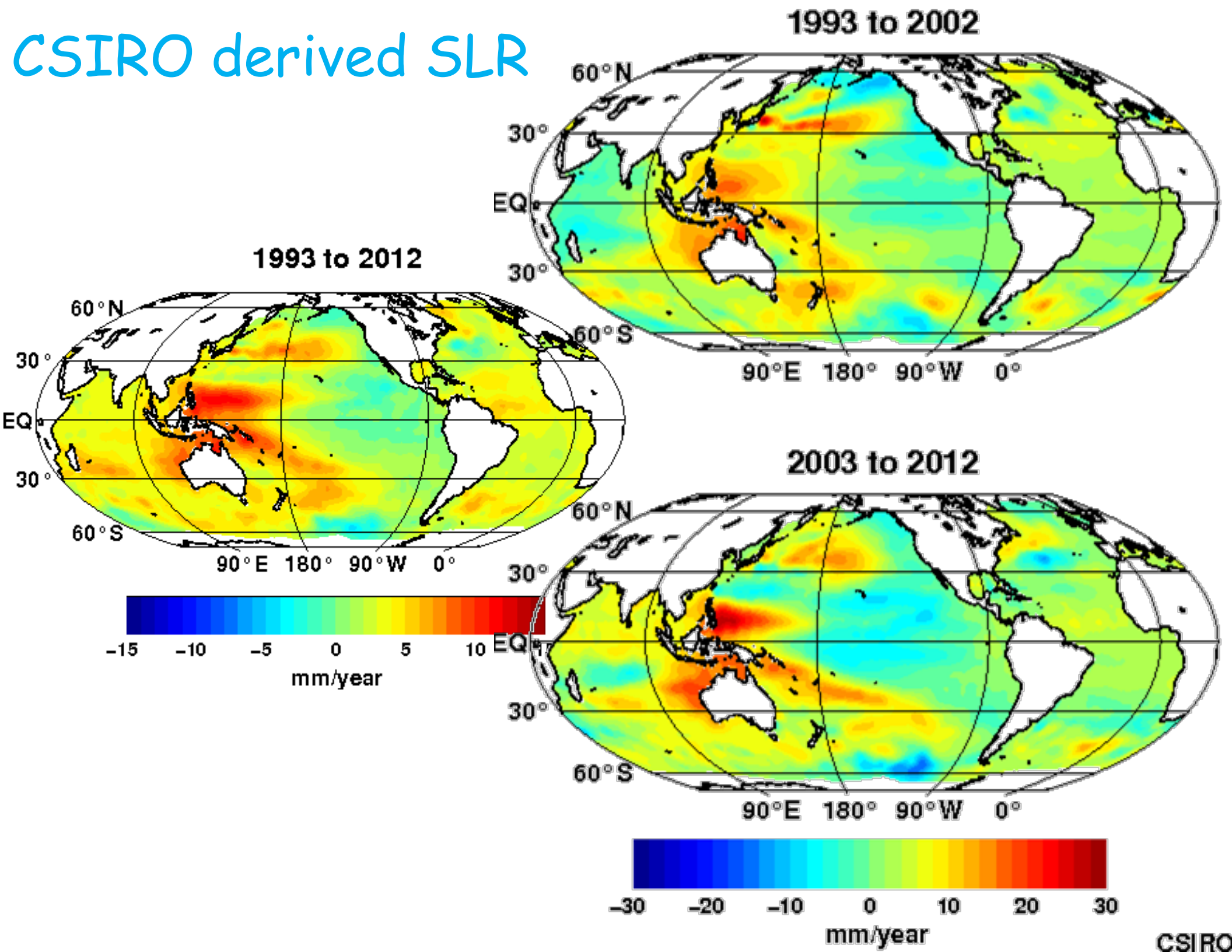


Mean Sea Level (cm)



CSIRO derived SLR

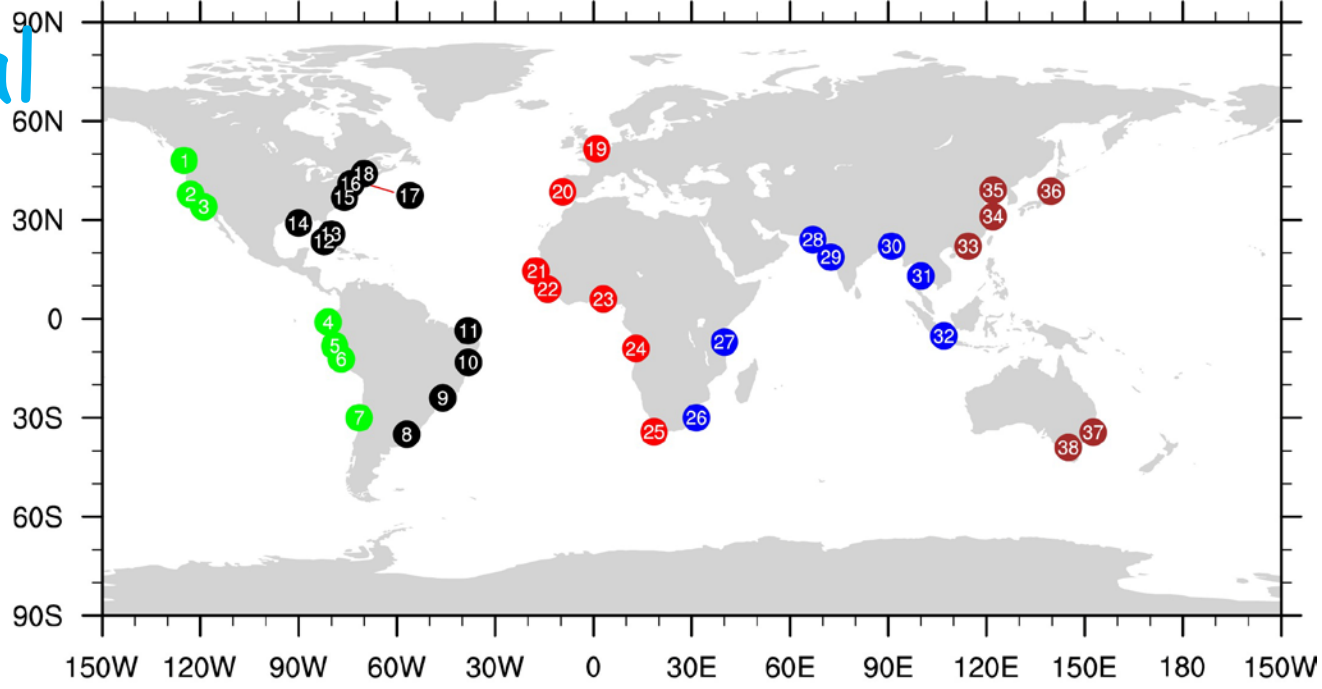


Model and experiments

CCSM3: CAM3 at T42 resolution, POP at 1 degree, CLM3 and CSIM5

40 ensemble simulations under SRES A1B scenario.
Each ensemble member begins at the end of the same 20th century CCSM3 simulation, and is subject to the identical GHG, stratospheric ozone, solar, and aerosol forcings during 2000-2060.
In these simulations, the initial ocean, sea ice and land states are identical, but the initial atmospheric conditions are perturbed by selecting atmospheric states on different days between December 1999 and February 2000 from the 20th century simulation.
Note: Perturbing the ocean initial state may increase the uncertainty sampled here.

Projected regional SLR in selected coastal cities in 2041-2060 relative to the mean of 1980-1999



Global mean: 10.6~11.1 cm

1 Vancouver : 1.0~9.4 cm

2 San Francisco: 4.4~9.6 cm

Boston: 17 10.2~20.8 cm

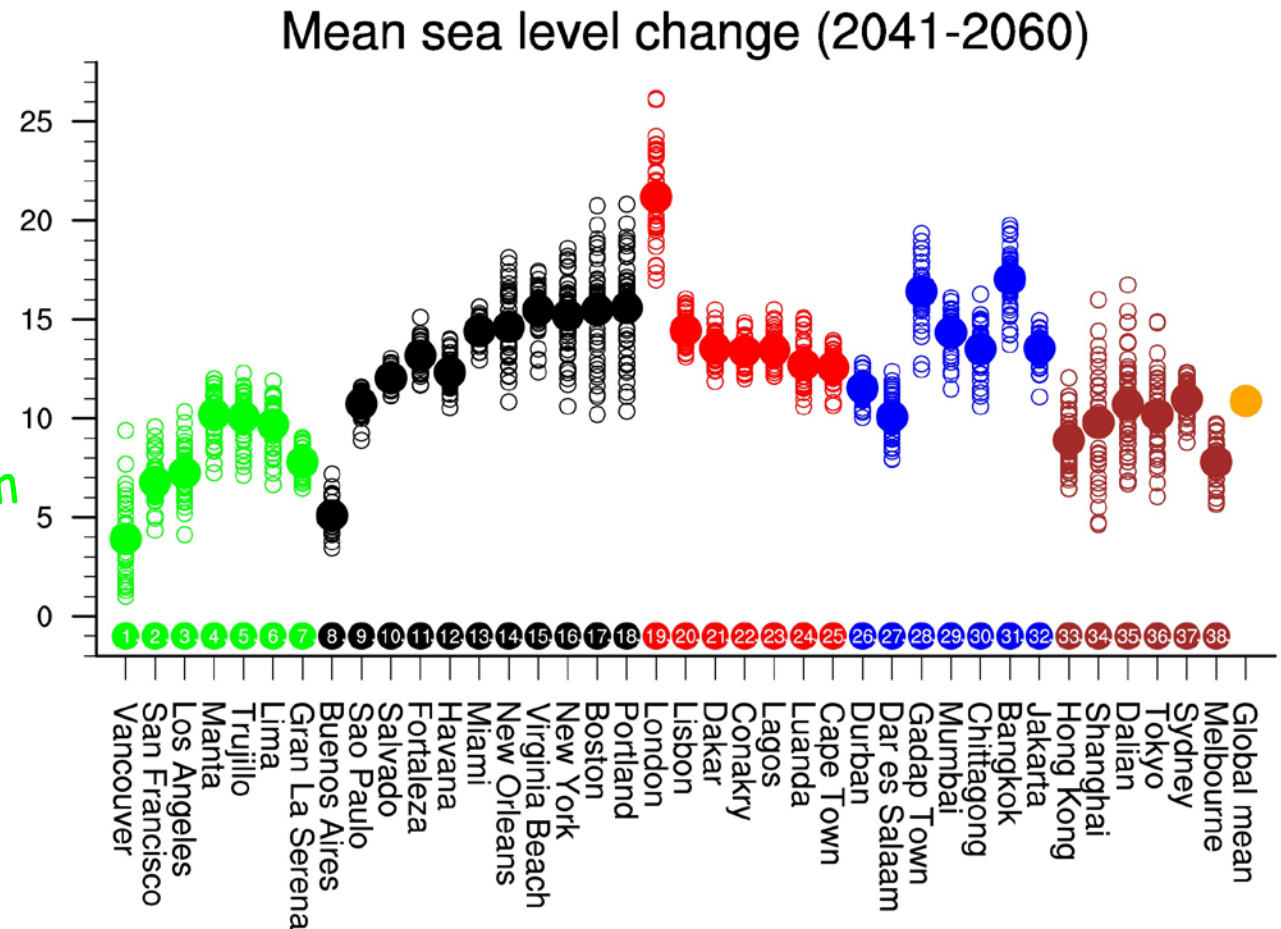
34 Shanghai: 4.6~16.0 cm

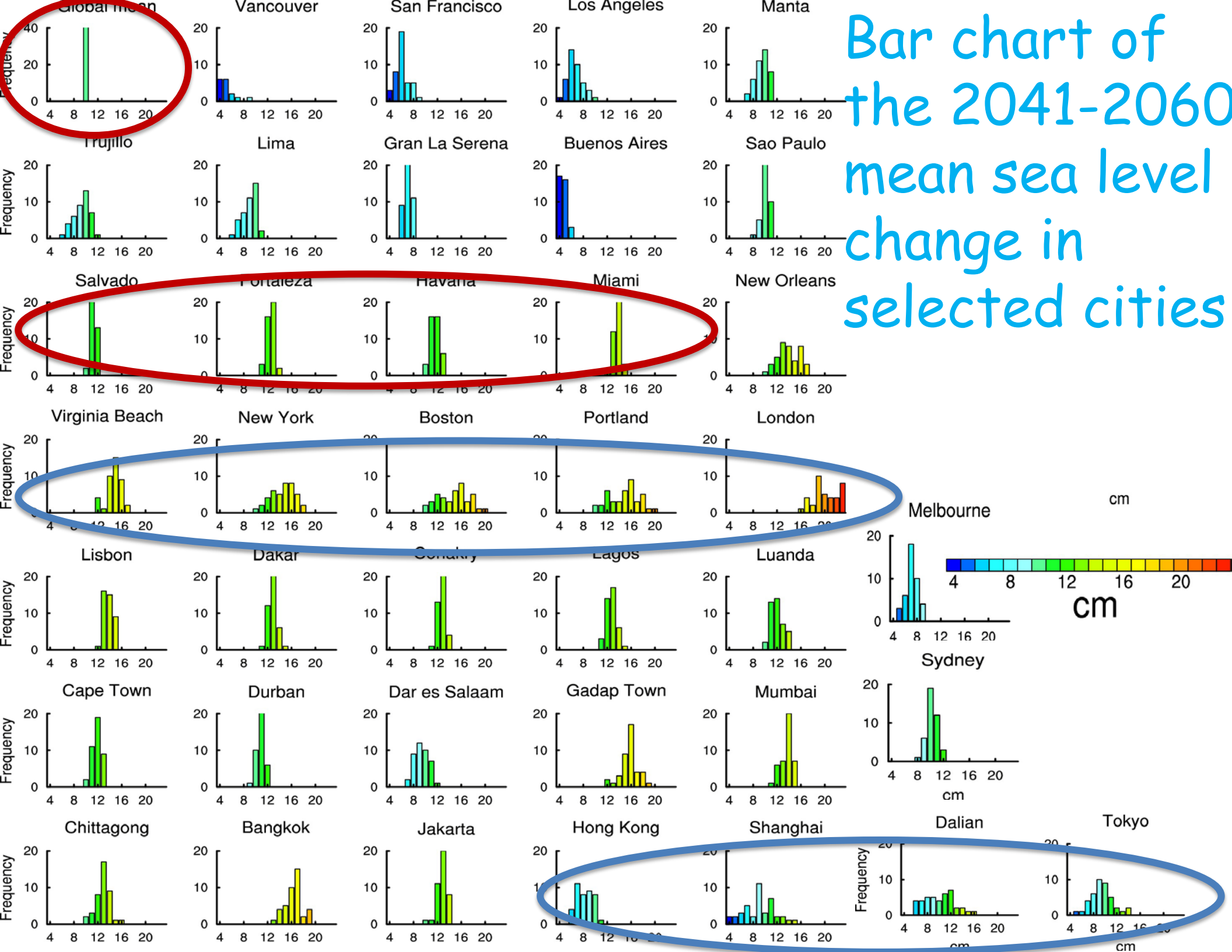
21 Dakar: 11.9~15.5 cm

32 Jakarta: 11.1~15.0 cm

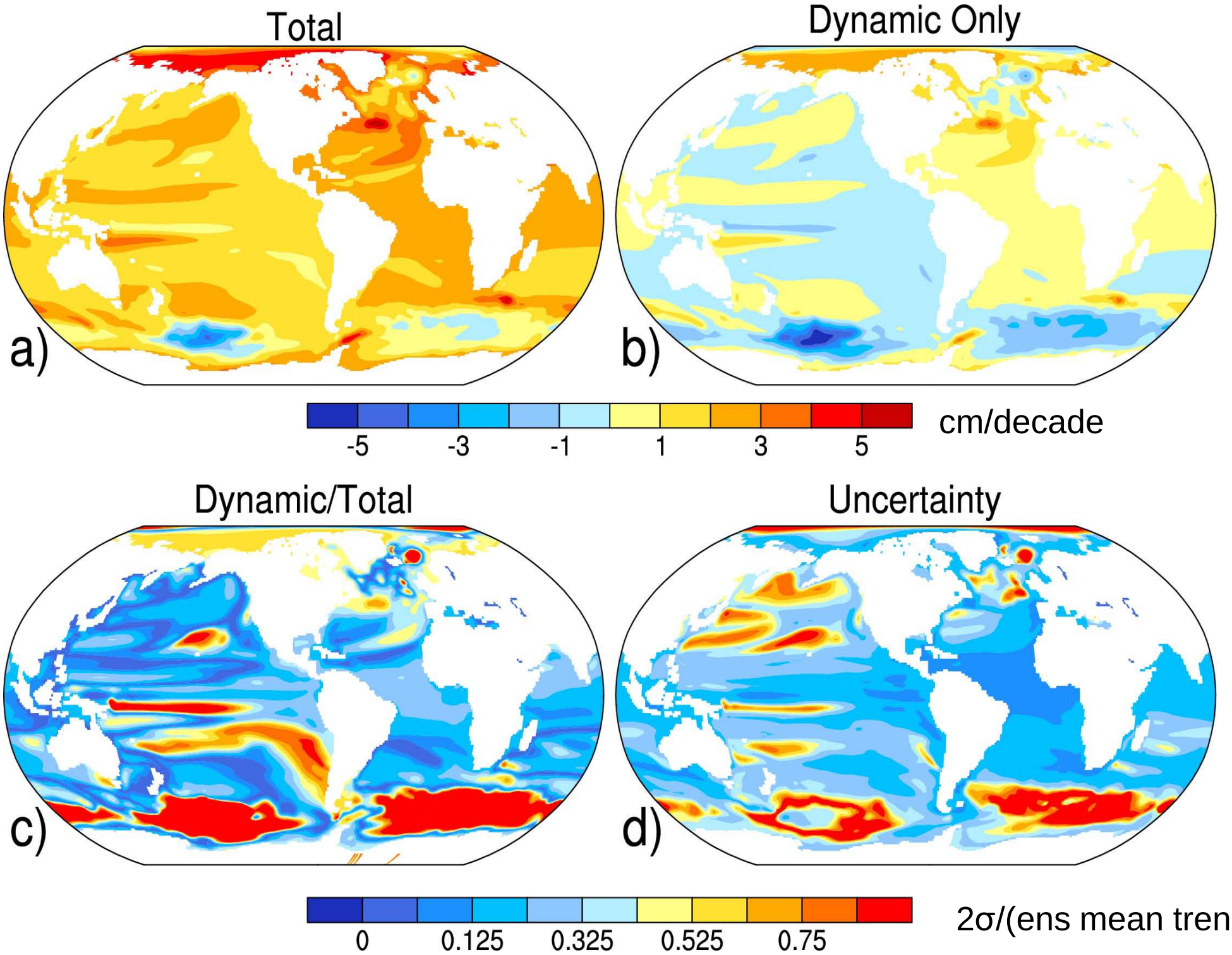
Durban: 10.0~12.8 cm

26

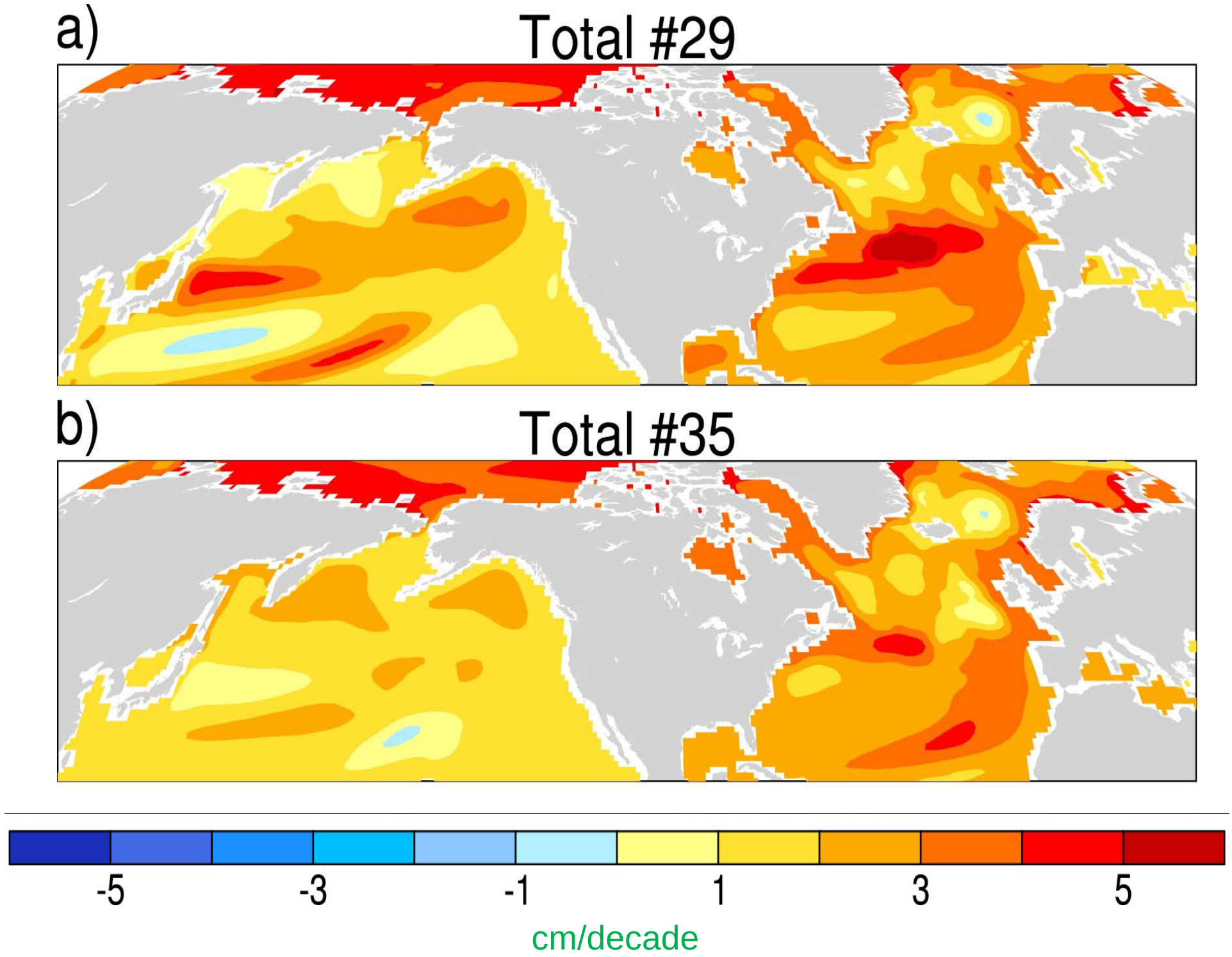



Global mean
Vancouver
San Francisco
Los Angeles
Manta
Trujillo
Lima
Gran La Serena
Buenos Aires
Sao Paulo
Salvado
Fortaleza
Havana
Miami
New Orleans
Virginia Beach
New York
Boston
Portland
London
Lisbon
Dakar
Conakry
Lagos
Luanda
Cape Town
Durban
Dar es Salaam
Gadap Town
Mumbai
Chittagong
Bangkok
Jakarta
Hong Kong
Shanghai
Melbourne
Sydney
Dalian
Tokyo
Frequency
cm
Bar chart of the 2041-2060 mean sea level change in selected cities

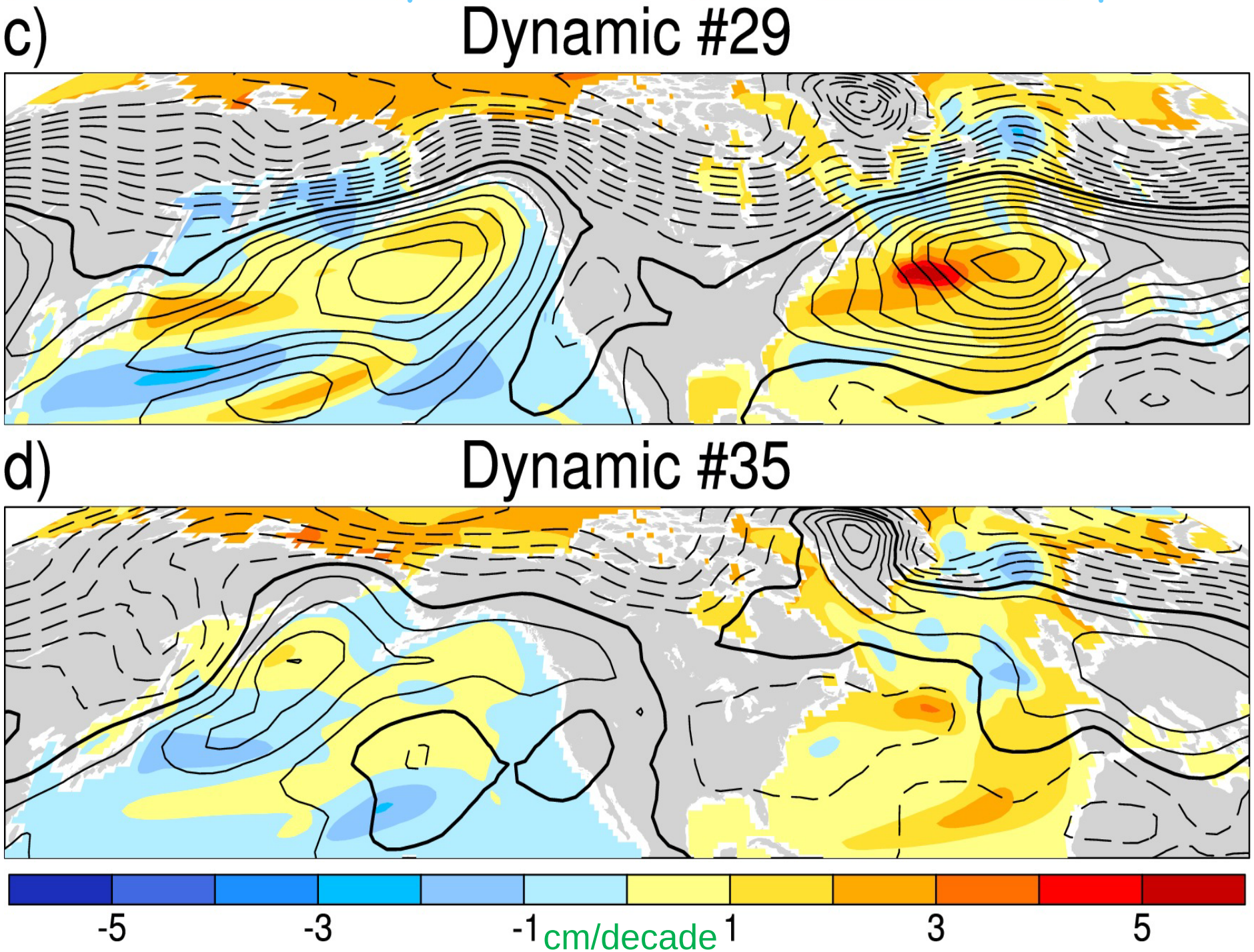
Decadal SLR trend, ratio of Dynamic and Total, Uncertainty



Decadal trend of thermosteric + dynamic sea level



Decadal trend of dynamic sea level and sea level pressure



Contour interval for sea level pressure trend is 0.1 hPa/decade

Summary

1. The global mean SLR is primarily controlled by the ocean's heat uptake under global warming scenario.
2. Regional SLR can be significantly different from the global mean.
3. Variations of the regional SLR can be very large depending on the location.
4. Changes of the regional SLR are affected by both wind-driven and buoyancy driven ocean circulations.
5. Caveat: Here we do not include the eustatic SLR due to loss/buildup land-based ice.