

State of Knowledge: Impact of Sea Level Rise

- Broad spectrum of impacts
 - Geophysical (land loss, shoreline erosion, encroachment of ocean threatening estuaries/bays/rivers, increased susceptibility to storm surges, longer ice-free periods, change in energy balance)
 - Biological (stress to systems already stressed; changes in temperature-related physiology, species redistribution/loss, coastal ecosystem redistribution/loss, coral reef loss, loss of habitat for fisheries)
 - Societal (coastal population [40% w/in 100km of shore], economy and infrastructure [much of ~\$50 trillion global economy], loss of agricultural land, increased vulnerability from storms, costly protective measures, saltwater intrusion, increased period of ice-free navigation)

Key Processes: Sources of 1-2 mm/yr SLR

Some changes from Arctic
Many extra-Arctic

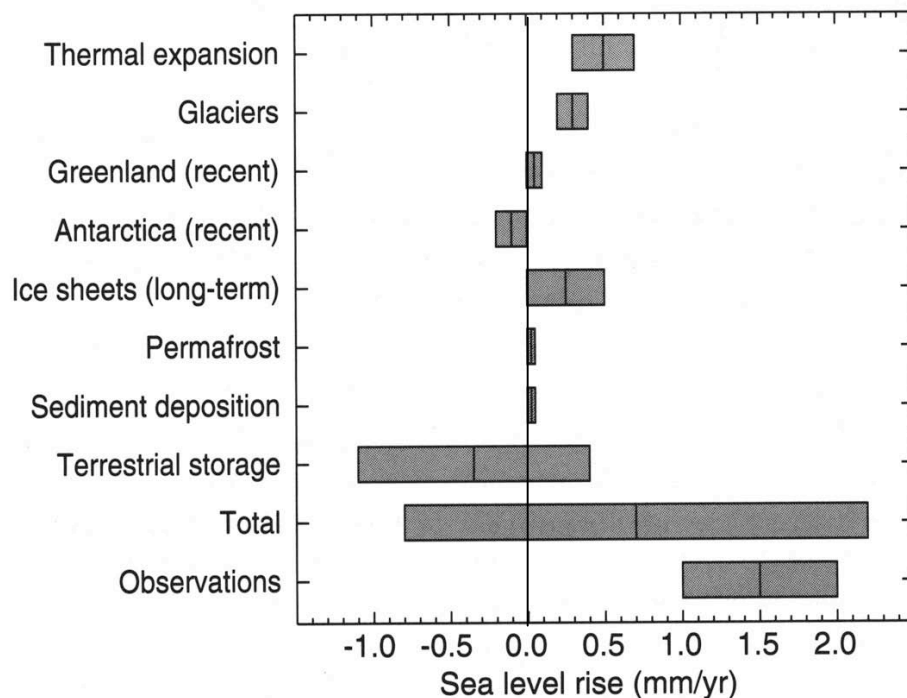


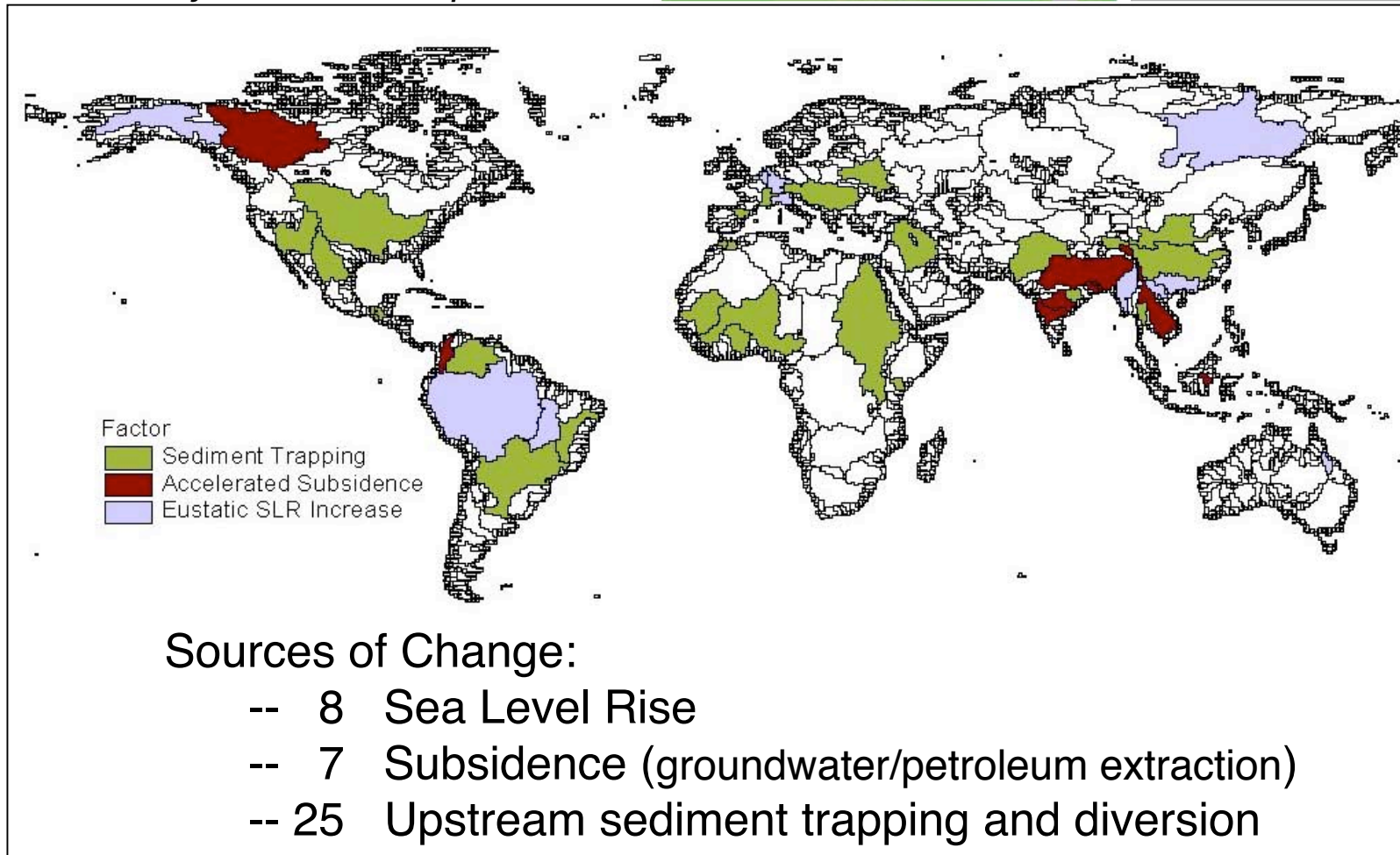
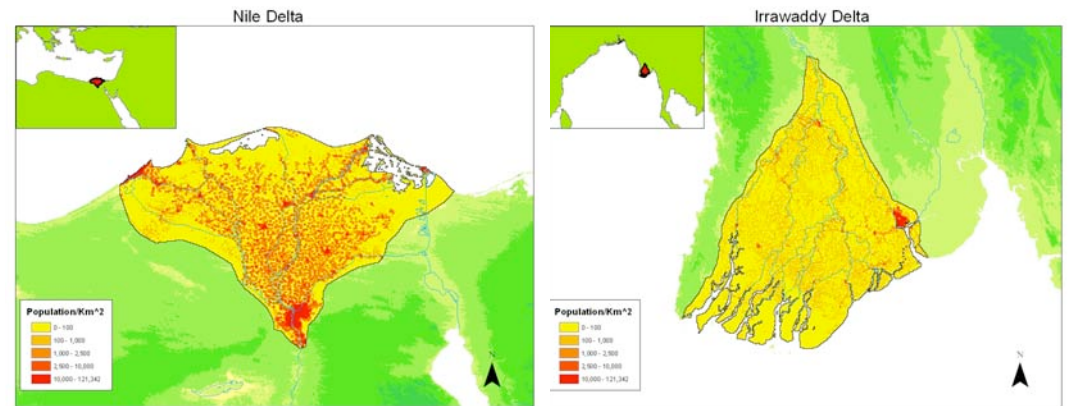
Figure 11.9: Ranges of uncertainty for the average rate of sea level rise from 1910 to 1990 and the estimated contributions from different processes.

- Site/region-specific & complex interactions...f(deformation of geoid, glacial rebound, temp., “system memory” + more “modern” changes)
- No acceleration noted
- Steric effects (thermal expansion, changes in salinity [0.2m volume])
- Melting of mountain glaciers ([0.5 m volume])
- Ice sheets (Greenland [6m volume]; Antarctica [65m volume]).
- Non-climate factors (extraction of fossil groundwater [+ influence] , reservoir filling behind dams [- influence]; [4m volume])

Deltas Under Threat

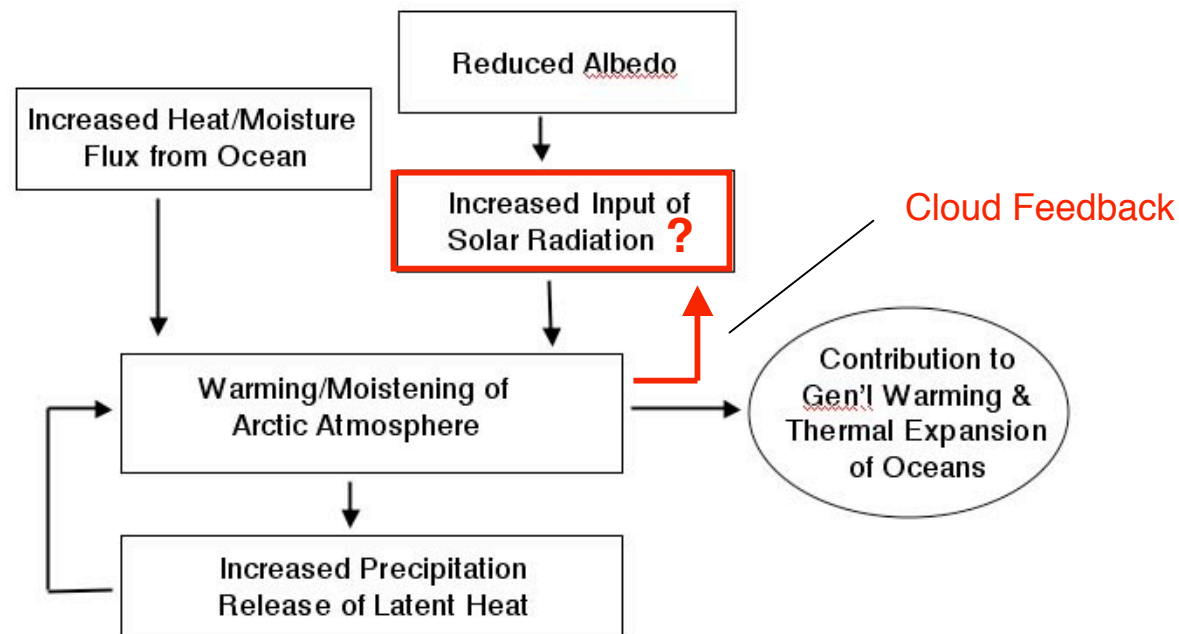
Sea Level Rise Only Part of the Story

Historical Analysis of 40 Sample Basins



Issues Critical to This Synthesis

- Isolate Arctic vs Extra-Arctic Forcings
- In Arctic, the ffw processes could be relevant:
Assume reduction in sea ice cover/thickness:



- Degree to which this is a positive/negative feedback remains an open question