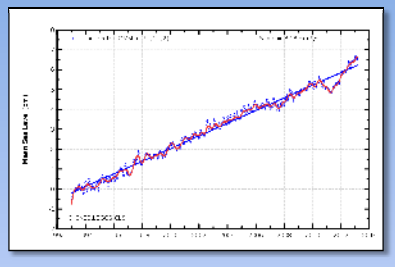
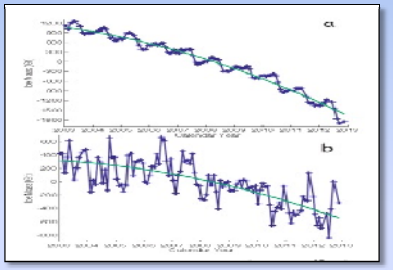
Data-based Sea Level Rise Predictions for the Decades Ahead

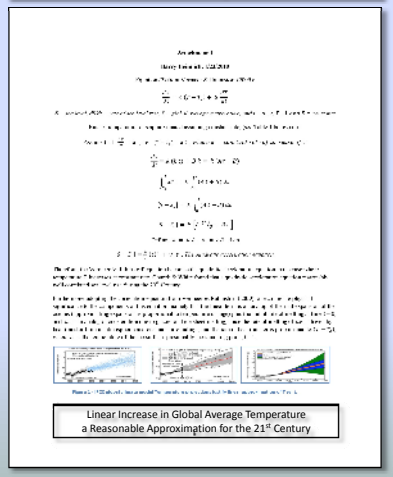
Barry N. Heimlich and David B. Enfield

Recent Satellite Altimetry and Gravimetric Data





Mathematical Derivation of Quadratic Equation



Summary

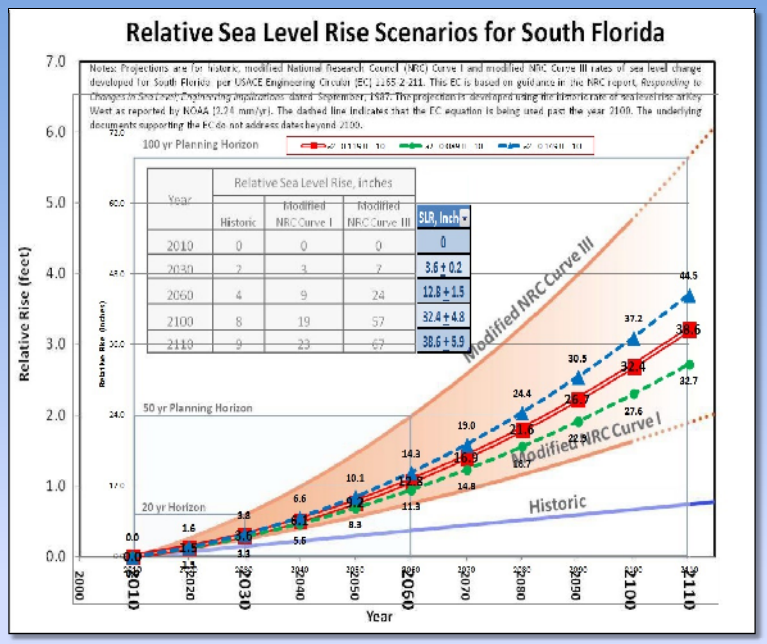
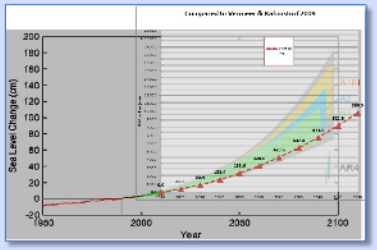
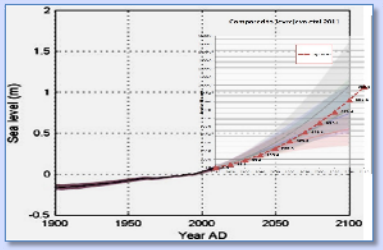
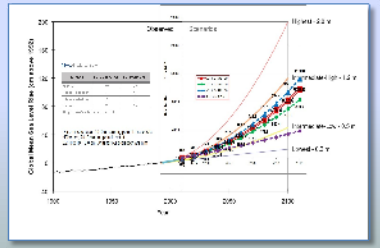
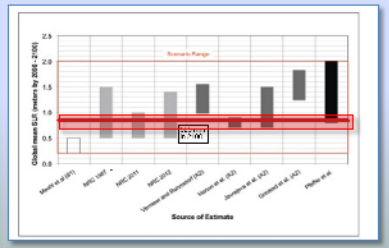
- Sea level rise is projected by extrapolating recent satellite topographical and gravimetric data.
  - Using quadratic acceleration equation (see derivation).
  - Coefficients of quadratic equation estimated from recent satellite altimetry (Topex/Jason) plus SLR equivalent of gravimetric (GRACE) satellite mass loss for Greenland and Antarctica Ice Sheets (GAIS).
- Global average sea level is on track to rise 32" (823mm) by 2100 over 2010 levels.

Projected Sea Level Rise Above 2010		
Year	**mm**	**inches**
2030	90	3.6 ± 0.3
2060	325	12.8 ± 1.5
2100	823	32.4 ± 4.8
2110	980	38.6 ± 5.9

- Projection is below mid-range of recent published projections.
- Projection is below mid-range of South Florida Regional Compact/USACE guidance.
- GRACE mass loss portends ten-fold increase in SLR acceleration.

Ten-fold Increase in SLR Acceleration Anticipated	
20th Century	0.013 mm/yr^2
Predicted (based on observed GAIS acceleration)	0.132 mm/yr^2

- Significant increase in acceleration not yet observed in sea level rise.
- Probable time lag of at least 10 years between ice sheet melt and global average SLR.
- Time required to redistribute ice sheet melt by ocean currents.



Comparisons with Published Projections