

MIAMI-DADE COUNTY FINAL OFFICIAL MINUTES Miami-Dade Sea Level Rise Task Force

Overtown Transit Village North
701 N.W. 1st Court
2nd Floor Training Room
Miami, Florida 33128

March 19, 2014
As Advertised

Harvey Ruvin, Clerk
Board of County Commissioners

Christopher Agrippa, Director
Clerk of the Board Division

Maryse Fontus, Commission Reporter
(305) 375-4906



**CLERK'S SUMMARY AND OFFICIAL MINUTES
MIAMI-DADE COUNTY SEA LEVEL RISE TASK FORCE
MARCH 19, 2014**

The Miami-Dade County Sea Level Rise Task Force (Task Force) convened a meeting on Wednesday, March 19, 2014, at the Overtown Transit Village North, 701 N.W. 1st Court, Miami, Florida, at 1:00 p.m. Present were Honorable Clerk of Courts Harvey Ruvin, Task Force Chairman; and members Dr. David Enfield, Ms. Sara Fain, Mr. Arsenio Milian, and Mr. James Murley; (Mr. Willard T. Fair and Mr. Jorge Gonzales were absent).

In addition to the Task Force members, the following staff members were present: Ms. Nichole Hefty, Chief, Office of Sustainability, Planning Division, Miami-Dade Department of Regulatory and Economic Resources (RER); Ms. Lisa Klopp, Sustainability Program Assistant, Office of Sustainability (RER); Assistant County Attorney Christopher Angell; Ms. Elizabeth Soto, Executive Assistant, Clerk of Courts; and Deputy Clerk Maryse Fontus.

I. Welcome and Introductions

Chairman Ruvin noted the presence of a quorum. He announced that Mr. Fair and Mr. Gonzales were out of town, and would therefore be unable to attend the meeting. He thanked those members of the audience who attended the meetings regularly, and asked whether everyone had the link for the website.

Captain Dan Kipnis, a member of the audience, pointed out that the link did not work, and Chairman Ruvin said that he would have it verified.

II. Presentation by John Englander, Oceanographer, Consultant and Author

Chairman Ruvin noted today's (3/19) speaker, Mr. John Englander, had established himself as a major expert on sea level rise. He said that Mr. Englander had recently published a book on the subject, entitled "High Tide

on Main Street,” which had been distributed to each Task Force member. Chairman Ruvlin noted Mr. Englander had served as the President of the Cousteau Society. He indicated that after the presentation, the Task Force members would have a discussion on their recommendations.

Chairman Ruvlin recalled that the Task Force heard presentations from the Water Management District, Miami-Dade Water and Sewer Department, Swiss Re, the Southeast Florida Regional Climate Compact, and a presentation on the recommendations of the previous MDC Climate Change Advisory Task Force. He said the Task Force members wanted to ensure that those prior recommendations were implemented.

Mr. Englander thanked the Chairman for the opportunity to explain sea level rise, noting he travelled extensively to explain this subject. He congratulated the Task Force members for taking the time to reflect on this subject and help transform policy on this revolutionary phenomenon. Mr. Englander pointed out that the challenge was to use the science to help the community adapt to sea level rise, while circumnavigating the political rhetoric, and the economic concerns.

Mr. Englander said that he did not wish to repeat any of the information already provided, noting he would like to present the wider view of the issue, and paint the big picture, as this would help put the issue in a different context. Mr. Englander noted he also wanted to discuss the impacts of sea level rise on communities.

Mr. Englander pointed out that high tides were not a futuristic scenario; they were happening once a month. He indicated that the extreme tides were the advance notice for what would happen with routine high tides.

Mr. Englander noted in the past people believed that the sea level would remain the same throughout history. He said that according to the global average ratio, for every foot of sea level rise, the shoreline moved inland 300 feet; however, in South Florida, this phenomenon was more pronounced because the terrain was very flat. Mr. Englander stressed that sea level rise was permanent, and the level of the sea would not go down for centuries, and perhaps for 1000 years.

Mr. Englander presented a slide depicting the ravages caused by Hurricane Sandy in New Jersey on October 29, 2012, noting it produced mostly a storm surge, with a moderately extreme tide; however, the topography caused the water to accumulate, through a phenomenon that he described as topographic amplification.

Mr. Englander said that sea level rise could be compared to the tortoise running towards the finish line, in that the slow but unstoppable change would eventually surpass the effects of extreme tides and storms; even if people were perfectly successful at their mitigation efforts, sea level would still rise due to the excess heat already stored in the ocean. He pointed out that Miami was not the only city that was vulnerable, as there were entire cities that were two and a half feet above sea level.

Mr. Englander presented a slide depicting the impacts of sea level rise in Seattle, and Australia, which experienced sunny-day flooding. He said that San Francisco Bay had 250 square miles of filled land that would be flooded this century, because it was about two and a half feet above sea level. He noted everywhere around the globe, cities were built on the coast on the premise that the level of the sea was stable; now all of these cities were vulnerable.

Mr. Englander presented the myths relating to sea level rise:

- Melting polar ice cap was the primary reason;
- Being “green” and sustainable could stop sea level rise;
- Technology could stop all sea level rise;
- Sea walls could protect South Florida;
- It was “just a natural cycle” not caused by humans; and
- It was similar to storm surge and extreme tides.

Mr. Englander said that the polar ice cap had been frozen for 3 million years, and when he studied it, there was no possibility that it would melt in our lifetime. He pointed out that ice was melting because the oceans and the atmosphere were warmer. Mr. Englander stressed that it was possible to move heat, but not to create cold. He noted it was not possible to cool the oceans, because it would take energy to move heat. Mr. Englander said that if Greenland were to melt entirely, the level of the sea would rise

by 24 feet globally, though this could not happen this century. In contrast, if all of the world's glaciers were to melt, it would only add a couple of feet to the level of the sea. He noted thermal expansion of sea water was the greatest source of sea level rise in the last century; however, this was now being overwhelmed by the melting of the glaciers and Greenland.

Mr. Englander presented the following sea level facts:

- Sea level reflects long-term average global temperature and the amount of ice on lands;
- Sea level has changed little in 6,000 years;
- 100,000 year natural cycle (the ice ages) moves sea level approximately 350 feet up and down;
- Sea level was currently moving slowly up, and this would continue for centuries, eventually rising ten feet and more; and
- We have not just accelerated climate change, but we have now changed the direction of the natural cycle.

Mr. Englander presented a slide depicting Florida through time, which showed that the State had less land 120,000 years ago, and much more land 18,000 years ago due to changes in sea level that directly resulted from warmer or colder eras, and the changes in the glaciers and ice sheets.

Mr. Englander presented a slide depicting sea level rise in the 20th century, noting the global average sea level had increased 8 inches since 1880; however, sea levels along the U.S. East Coast and Gulf of Mexico were rising much faster, as the sea rose 46 inches in New Orleans, 30 inches in Virginia Beach, 14 inches in New York, and 12 inches in Miami. He said that the rate of local sea level rise varied depending on both global and local factors, including currents, ocean floor topography, variations in ocean density, and land uplift or subsidence due to geological reasons or human activities.

Mr. Englander noted sea level was due to the following primary factors:

- The amount of ice frozen on land;
- Thermal expansion of sea water;
- Land uplift/subsidence;
- Currents, e.g. Gulf Stream; and

- Soil retention, dams, and groundwater.

Mr. Englander said that back in the ice age, 20,000 years ago, North America and Europe had two miles of ice, and as the 10,000 feet of ice melted, it produced almost 400 feet of sea level rise globally. As a result, noted Mr. Englander, since the last ice age, the world had experienced a post-glacial sea level rise. He pointed out that it was not a constant rise, and for the past 6,000 years, the sea had maintained approximately the same level.

Mr. Englander presented a slide depicting the interaction between CO₂ concentration, global temperature, and sea level over the years. He said that it showed four ice age cycles, noting temperature, sea level and CO₂ concentration peaked together. He said that this pattern had been fairly regular for the last several million years. Mr. Englander noted CO₂ was a heat-trapping gas with amazing powers of insulation. He explained that over the last millions of years CO₂ had a natural cycle of 180-280 parts per million (PPM); but in recent years, it had risen to 400, while the temperature and the level of the sea also rose.

Mr. Englander said that, in addition to the rising CO₂ levels, there were two other clues that this phenomenon was caused by humans, and was not a natural cycle. One clue was the disappearance of polar ice caps. The second clue was that the very long-term correlation of sea level and global average temperature was approximately 20 meters per degree Celsius or 35 feet per degree Fahrenheit; a degree and a half Fahrenheit of global average temperature increase had occurred and this would indicate that in the next few thousand years there would probably be 50 feet of sea level rise. Mr. Englander said, however, that the indications were that somehow the earth would adjust.

Mr. Englander pointed out that the Intergovernmental Panel on Climate Change (IPCC) projected that there would be 10 to 32 inches of sea level rise by 2100; however, in the fine print they acknowledged that those figures excluded a few important factors that could greatly increase sea level rise. Those projections did not include the impact of methane, a powerful heat trapper, and the West Antarctic glaciers, due to uncertainty about what the amounts from those two sources might be, said Mr. Englander. He noted, when asked about the known range of sea level rise,

the National Climate Assessment experts said there could be between 8 inches and 6.6 feet, based upon a survey of experts and peer reviewed literature.

Mr. Englander noted the first IPCC report in 1990 had a range of sea level rise projections; then the IPCC released updated projections 12 years later. He pointed out that the actual sea level was at or above the projections, which tended to be on the low side.

Mr. Englander said there were three reasons for the uncertainty regarding the actual sea level rise this century: the earth was warming faster than in hundreds of millions of years; it was not known how our energy would be produced in the future, which would affect the level of carbon emissions and the degree of warming; and there were tipping points that could not be forecast based upon recent history. For example, he noted, thousands of scientists were studying the Pine Bay Glaciers because ice shelves were breaking off from these glaciers, and they were located in the area on Antarctica that was warming the most quickly.

Mr. Englander said that because of the factors he just described, no one knew exactly how high the level of the sea would be in 30 years. It was widely accepted that there would be three feet of sea level rise, he noted; however, it was not known how soon. Therefore, he recommended that the County design for three feet of sea level rise to be more resilient towards storms, noting this would be sufficient for a generation.

Mr. Englander presented a slide depicting the Netherlands case, noting the Dutch were leaders in dealing with coastal flooding and claiming land from the sea. He said that in 1953, a storm broke through a levee, killing 1835 people; subsequently, the Dutch developed a system of coastal defenses. However, noted Mr. Englander, by the late 1990s they realized that they had to change their design criteria because of sea level rise; they now plan on spending a billion dollars a year on coastal defenses for the rest of the century.

Mr. Englander stressed that visionary, bold thinking could transform a city, and presented a slide of Vlissingen, a town in the Netherlands, depicting

the efforts of the residents to deal with sea level rise, North Sea storms and extreme tides.

Mr. Englander highlighted the following facts from his presentation:

- Storms + tides + sea level rise = vulnerability now;
- After years of stability, sea level was rising and would continue rising for centuries;
- It was possible to slow down sea level rise, but it was not possible to stop it;
- Inches could make a difference;
- It was important to know the risk, plan and adapt; and
- It was important to plan for three feet, as official estimates were low.

Mr. Englander noted there was a silver lining to sea level rise. Firstly, he acknowledged that this was sobering information, but it provided decades of notice. Secondly, he said, we did our best when challenged, but we had to face the challenges; it was crucial that we reduce the heat, and adapt to rising sea levels. Thirdly, noted Mr. Englander, sea level rise was not simply an environmental issue, but also a financial issue, a real estate issue, and it could transform our priorities. He said that it was time to think of future generations, as what happened in our lifetime would affect them.

Mr. Englander ended his presentation with the following recommendations:

- Inform, and build support for a 30-year plan;
- Confront sea level rise squarely. Don't hide from it. Adapt to three feet;
- Have a risk assessment done to guide our priorities. Some assets can be protected with engineering or be elevated; some will eventually have to be abandoned;
- Initiate a carefully-tiered series of engineering studies and plans to lay out the realistic options and how to phase them in; and
- Establish an institute to be a global center of excellence, working with local universities, and non-profit organizations; this would attract ideas, tourism, and business.

Mr. Englander noted Miami was ground zero for sea level rise, so it would be reasonable to establish a global sea level rise institute here. He announced that he was partnering with Mr. Chester, an Attorney who was present at the meeting, to establish a sea level rise adaptation institute in Miami. He indicated that discussions were on-going with Florida International University (FIU) regarding this institute. Mr. Englander noted governments, the scientific community, the business community, academics and residents would have a role to play in this matter, but he said that it was important to create a neutral ground to innovate at a practical level.

III. Discussion/Public Comments

Mr. Murley congratulated Mr. Englander for his presentation. He pointed out that the institutional structures in the United States were different from those in the Netherlands; and the Dutch government operated differently from the U.S. government.

Chairman Ruvlin noted the Task Force was going to begin formulating its recommendations, and one of them would be for the County to have a robust capital improvement plan to keep Miami resilient through 2050. He said this presented a procurement challenge, and asked Mr. Englander if he had any ideas regarding such a plan.

Mr. Englander noted this was similar to his recommendation regarding a carefully-tiered series of engineering studies and plans to lay out the realistic options for sea level rise. He pointed out that the Task Force was the first tier, and there would be a series of steps, including a study and a risk assessment, before the ultimate plan was implemented.

Mr. Englander informed the Task Force members that a seminar would be held in Fort Lauderdale on April 25th, 2014, on the financial and legal aspects of adapting to sea level rise.

Mr. Murley noted there was an inconsistency between recommendations 1 and 5. He pointed out that if the institute was housed within a non-profit organization, it would be difficult to obtain the support of the government for a 30-year plan. He said he was concerned that these recommendations

were not aimed at understanding the institutions that were dealing with this issue, and were instead too focused on conducting studies.

Mr. Englander said he believed in an apolitical think-tank. He reiterated that this amount of sea level rise had not occurred in 120,000 years; it came about because some actions were undertaken without thinking through the ramifications. He stressed that this was the generation that could understand this issue for the first time in human history, and had the opportunity to react and re-design.

Chairman Ruvlin noted Mr. Murley was pointing out that perhaps the institutional capacity and structure to deal with this issue did not currently exist.

Mr. Murley pointed out that there were models that could be followed; for example, what was done in the Everglades.

Mr. Terry Murphy, a member of the public, said he believed that housing an institute outside County government would delay the process. He noted, as the Miami-Dade County Planning Division coordinates the Comprehensive Development Master Plan (CDMP), and has the ability to formulate regulations, it would be ideally suited to house a sea level rise institute.

Chairman Ruvlin suggested that a consortium of coastal engineering firms be hired to develop a robust capital improvement plan. He said that the Task Force would have to propose a number of doable recommendations. Mr. Englander noted he believed that 30 years was a doable timeframe. A discussion ensued about the level of sea rise that should be adopted for planning purposes.

Captain Kipnis pointed out that the City of Miami Beach had adopted 2.7 feet of sea level rise over 30 years, and had adapted its engineering design criteria accordingly.

Mr. Englander suggested that it would be best to adopt 3 feet for clarity.

Ms. Fain expressed her appreciation for Mr. Englander's presentation. She noted the Task Force had heard a number of presentations, and Mr. Englander's presentation tied all of the issues together: mitigating carbon emissions, making recommendations, and informing the public. She said that while it did not appear that the Task Force was the most appropriate body to address carbon mitigation, it would have to propose a plan, and it would then have to build the commissioners' support for that plan.

Chairman Ruvin noted Mr. Englander's book was a wonderful contribution to frame the issue. He said that his presentation would be downloaded to the Task Force's website.

IV. Approval of Meeting Minutes

Chairman Ruvin called for a motion to approve the minutes of the March 7th, 2014, meeting of the Task Force.

It was moved by Ms. Sara Fain that the minutes of the March 7th, 2014, Sea Level Rise Task Force meeting be approved, as presented. This motion was seconded by Mr. Arsenio Millian, and upon being put to a vote, passed by a unanimous vote of those members present.

V. Extension of Meeting

It was moved by Mr. James Murley that the March 19th, 2014, meeting of the Task Force be extended for one hour. This motion was seconded by Dr. David Enfield, and upon being put to a vote, passed by a unanimous vote of those members present.

VI. Discussion on Format and Content of the Report

Chairman Ruvin noted the Task Force's report to the Commission should probably follow the requirements of the resolution creating this body. He asked Ms. Hefty to send the resolution to the Task Force members.

Assistant County Attorney Angell directed the attention of the Task Force members to Section 7 of the resolution, displayed on the screen. He explained that Section 7 provided specifically what the report should

contain, as follows: "The report shall consist of a comprehensive assessment of the realistic impacts of sea level rise and storm surge on vital public services and facilities, water and other ecological resources, waterfront property, real-estate, and infrastructure. The report shall be used to develop recommendations ..."

Mr. Murley suggested that the first two or three pages of the report explain the sea level rise background, and that some of Mr. Englander's graphs be used as illustrations in the report.

Chairman Ruvlin suggested that the presentation to the Commission begin with the short Peter Harlem video, which shows sea level rise against LIDAR mapping.

Ms. Lauren Ordway, from the Nature Conservancy, noted she believed that while the report was important, the presentation to the Commission was equally, if not more important. She suggested that the Task Force consider hiring a firm to prepare the presentation.

Dr. Enfield noted he agreed that the presentation would be crucial to garner support, and its content would depend on the nature of the audience. He pointed out that if Mayor Carlos Gimenez and other commissioners were non-believers, it would be useful to know the reasons for their skepticism, as this information would help prepare the presentation.

Assistant County Attorney Angell noted the Mayor was not a commissioner, and may be absent when the Task Force makes its presentation.

Ms. Fain stressed that it was important to present sea level rise with the premise that it is happening. She said that it would be necessary to show the cost of inaction, as this might be the most compelling argument.

Chairman Ruvlin noted the only figure that he was aware of was from the Tuft University study which concluded that Miami-Dade County could incur losses amounting to \$3.5 trillion if nothing was done to address sea level rise.

Ms. Fain pointed out that it would cost billions to implement a plan, but it would cost more to do nothing.

Captain Kipnis noted the Compact Vulnerability study had itemized and inventoried the potential losses.

Mr. Murphy, a member of the public, said that it was important to inform the commissioners that by adopting this resolution they were sending a message to the insurance industry, and the financial markets that they were taking this issue seriously and were being responsible.

Chairman Ruvlin noted it would be important to build a case, and have direct quotes from the re-insurance industry. He pointed out that over the past few months, the Task Force had collected a great deal of material, and it was now possible to move forward and develop a report.

Assistant County Attorney Angell said that he discussed the report process with Ms. Hefty. He noted a sunshine meeting was held with the Task Force Chair and Vice Chair in which it was decided to have Ms. Hefty draft an initial report. He suggested that Ms. Hefty draft an initial report and disseminate it to the members who would then send their suggestions. At that point, advised Assistant County Attorney Angell, Ms. Hefty could compile the final report or present all of the suggestions to the members at the next meeting.

Pursuant to Chairman Ruvlin's question as to whether the members wanted an outline of the draft as a starting point, Mr. Murley and Ms. Fain said that it would be useful.

Assistant County Attorney Angell advised that while Ms. Hefty was drafting the report, she could contact individual members. However, he noted, she was not allowed to act as a conduit for different members to express their thoughts and ideas.

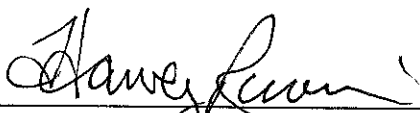
Ms. Fain suggested that Ms. Hefty prepare an outline that could be discussed at the next meeting, in the sunshine.

VII. Proposed Topics for Next Meeting

Chairman Ruvin said that at the next meeting on April 4th, there would be no presentation, unless the U.S. Army Corps of Engineers was available.

VIII. Adjournment

There being no other business to come before the Sea Level Rise Task Force, the meeting adjourned at 3:32 p.m.



Chairman Harvey Ruvin
Sea Level Rise Task Force



**Miami Dade County
Sea Level Rise Task Force
March 19, 2014**

Prepared by: Maryse Fontus

EXHIBITS LIST

NO.	DATE	ITEM #	DESCRIPTION
1	3/19/14		Agenda
2	3/19/14		Roll Call Sheet
3	3/19/14		Attendance Sheets
4	3/19/14		Presentation by Mr. John Englander
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Miami-Dade Sea Level Rise Task Force Meeting

March 19, 2014

1:00 PM – 3:00 PM

Overtown Transit Village North

701 NW 1st Court, Second Floor Training Room

Miami, FL 33136

- **Welcome and Introductions**
Honorable Clerk & Sea Level Rise Task Force Chair, Harvey Ruvin
- **Approval of March 7th, 2014, Meeting Minutes**
- **Presentation by John Englander, oceanographer, consultant and author**
- **Q/A and Discussion**
- **Discussion on format and content of Report**
- **Proposed Topics for Next Meeting, April 4th, 2014**
- **Questions and Comments from the Public**

MEETING DATE OF March 19, 2014

[illegible]

Four (4) members constitutes a quorum

Sea Level Rise Task Force Meeting
 March 19, /2014
 1:00 PM
 Overtown Transit Village North
 2nd Floor Training Room

Name	Organization	Phone Number	Email Address
1 Guthrie Gura	MCDERMOTT	305-372-6731	gura@mcdermott.com
2 Pedro Villa	Office of Sen. Bill Nelson	305-536-5999	Pedro-Villa@billnelson.senate.gov
3 MARKIPULIS			
4 Bertha Golderberg	COAST -	786-552-8120	bgolder@coastmiami.com
5 Ken Brown	REEL		
6 Mark Werner	REEL		
7 Julie Dick	Sterglades Law Center	312-399-4057	julie@stergladeslaw.org
8 LUREN OEDWAY	THE NATURE CONSERVANCY	305-445-0352	loedway@tnc.org
9 Lyndi Bernstein	City of Miami Beach - Public Works	305-673-7080	lyndi@miamicity.gov
10 Kimberly Brown	Miami-Dade County	305-375-4724	
11 MARK R. WERNER	Miami-Dade County	305-375-2835	
12 TERRY MURPHY	Public Affairs Concepts	305-322-6707	terrymurphy@pacconcepts.com

	Name	Organization	Phone Number	Email Address
13	Michelle Oyster	Sea Level Adaptation Institute	954-259-9960	mchoyster@MichelleOyster.com
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Miami–Dade & Sea Level Rise

- Facts v Myths
- ‘Big Picture’ clarity
- Certainties and uncertainties
- Challenges and Opportunities

Dade County Sea Level Rise Task Force 3–19–14

© John Englander

Not a Future Problem

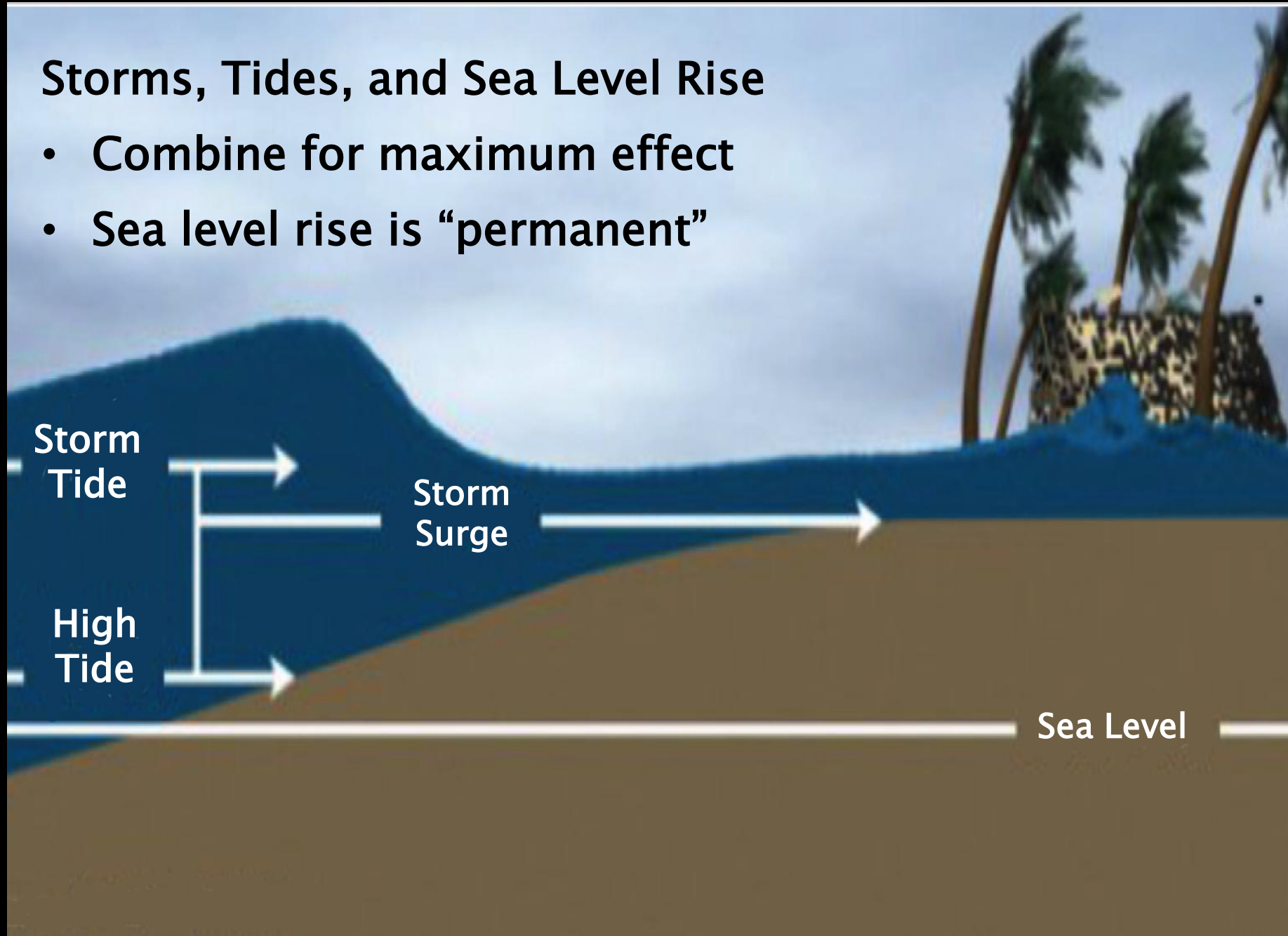
High Tide on Alton Road

saltwater on the streets
every month at peak tide



Storms, Tides, and Sea Level Rise

- Combine for maximum effect
- Sea level rise is “permanent”





New Jersey - October 29, 2012

- Storm Surge
- Moderate Extreme Tide
- Topographic Amplification
- Minor subsidence
- Global ocean redistribution
- Rising Sea Level – EARLY stage









Rising Seas & Shifting Shorelines

John Englander

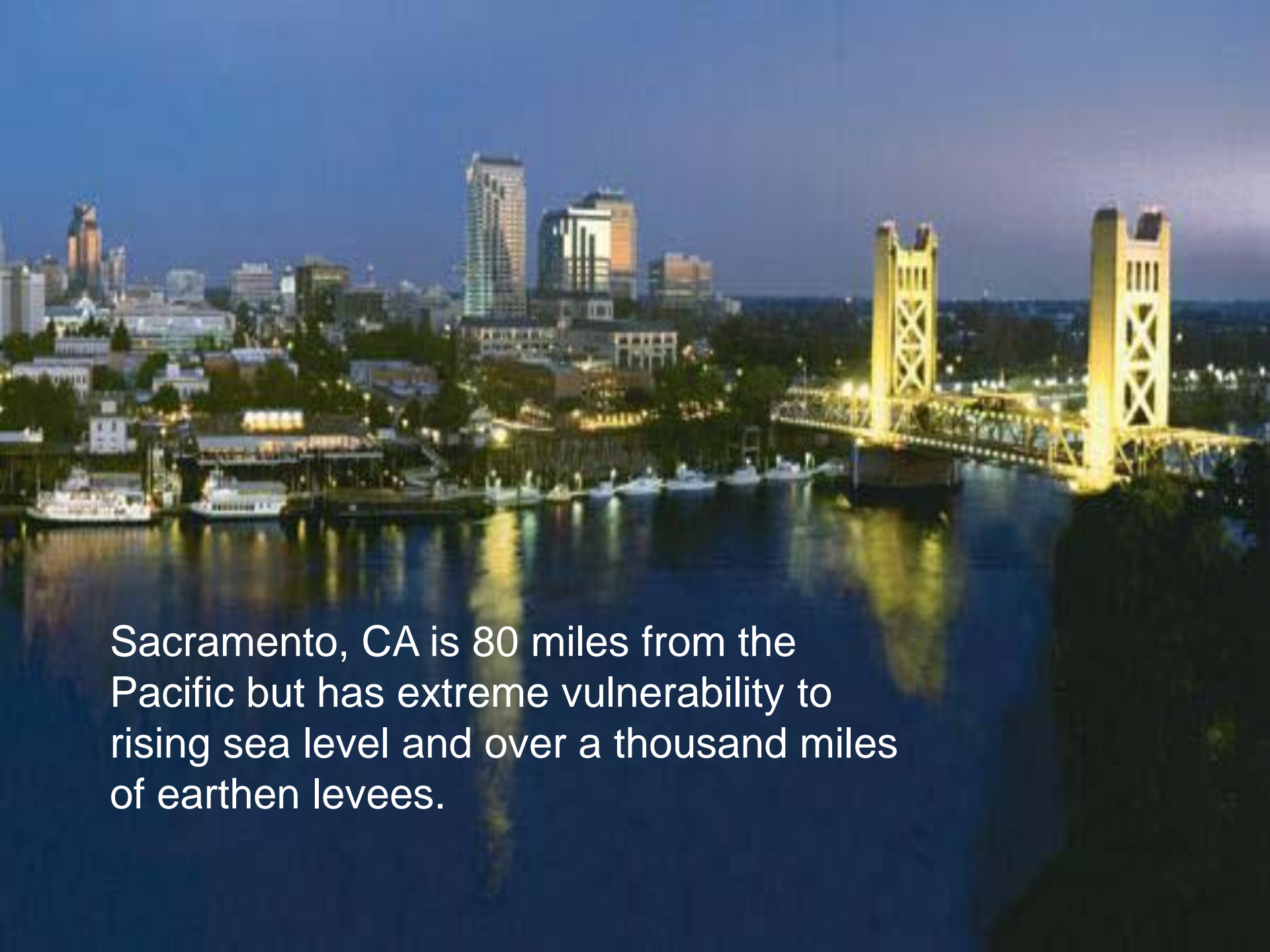
@ Google HQ

2-13-14









Sacramento, CA is 80 miles from the Pacific but has extreme vulnerability to rising sea level and over a thousand miles of earthen levees.



Myths about sea level rise (“SLR”)

1. Melting polar ice cap (North) big factor
2. “Being green” & sustainable can stop SLR
3. Technology could stop all sea level rise
4. Sea walls can protect south Florida
5. “Just a natural cycle”; humans no effect
6. Similar to storm surge and extreme tides





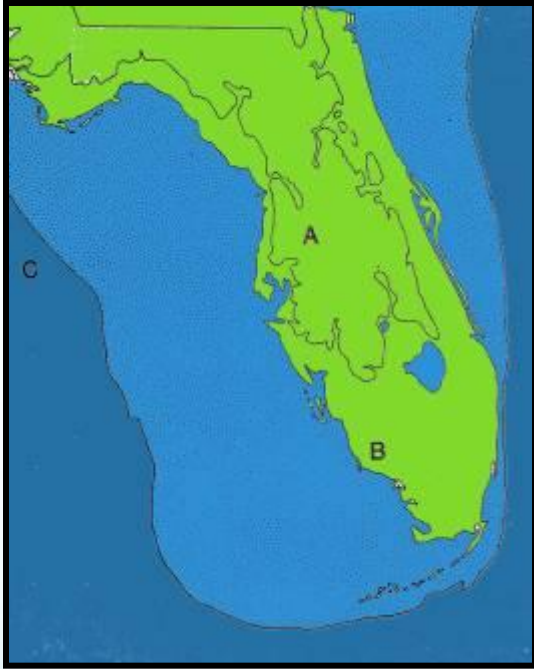


Sea level facts

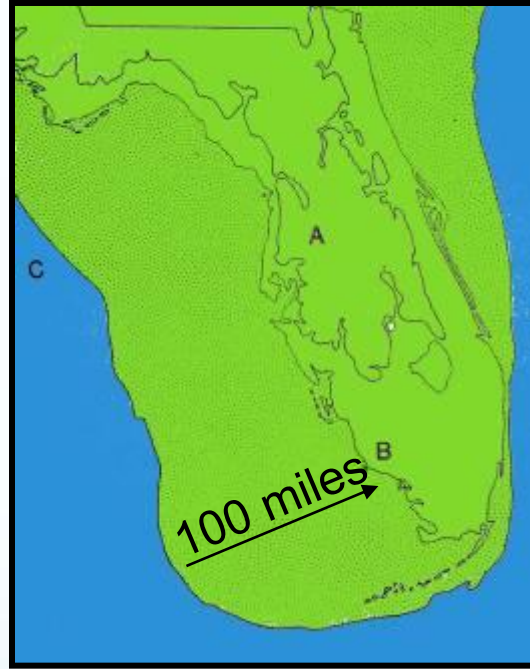
1. SL reflects long-term temperature and ice.
2. Changed little in 6,000 years.
3. 100,000 year natural cycle (the ice ages) moves SL approx. 350 feet up & down
4. Now moving slowly up; will continue for centuries, eventually rising ten feet and more.
5. We have not just accelerated, but have now changed the direction of the natural cycle.

FLORIDA THROUGH TIME

Today

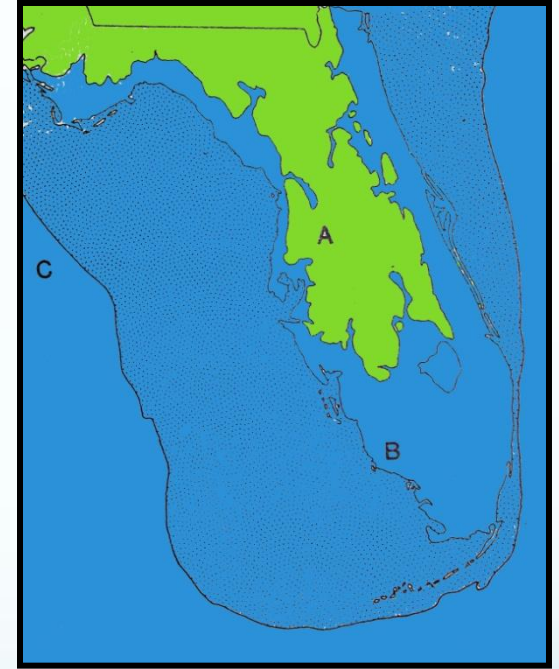


18,000 yrs ago



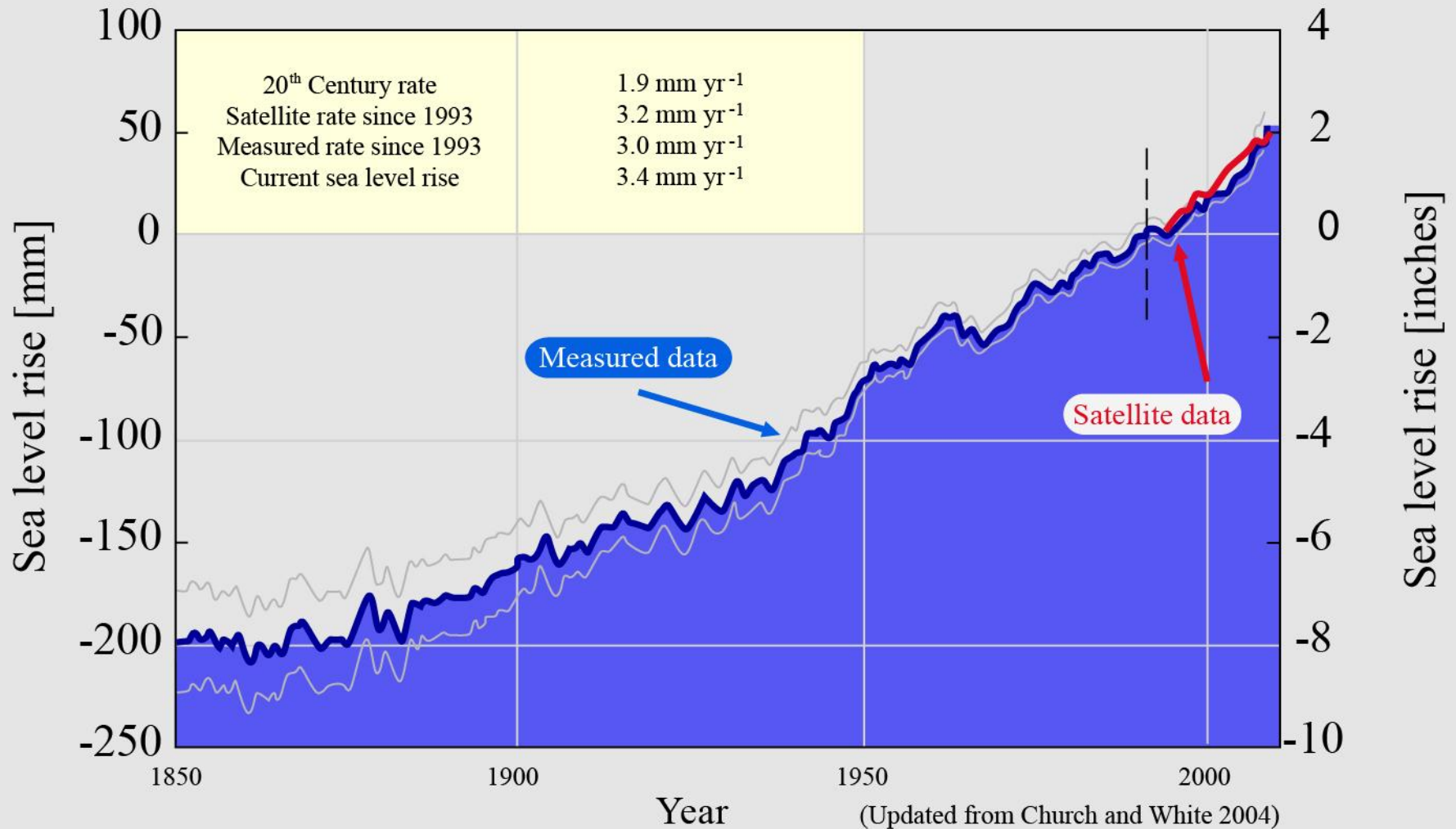
- 120 meters (- 390')

120,000 yrs ago

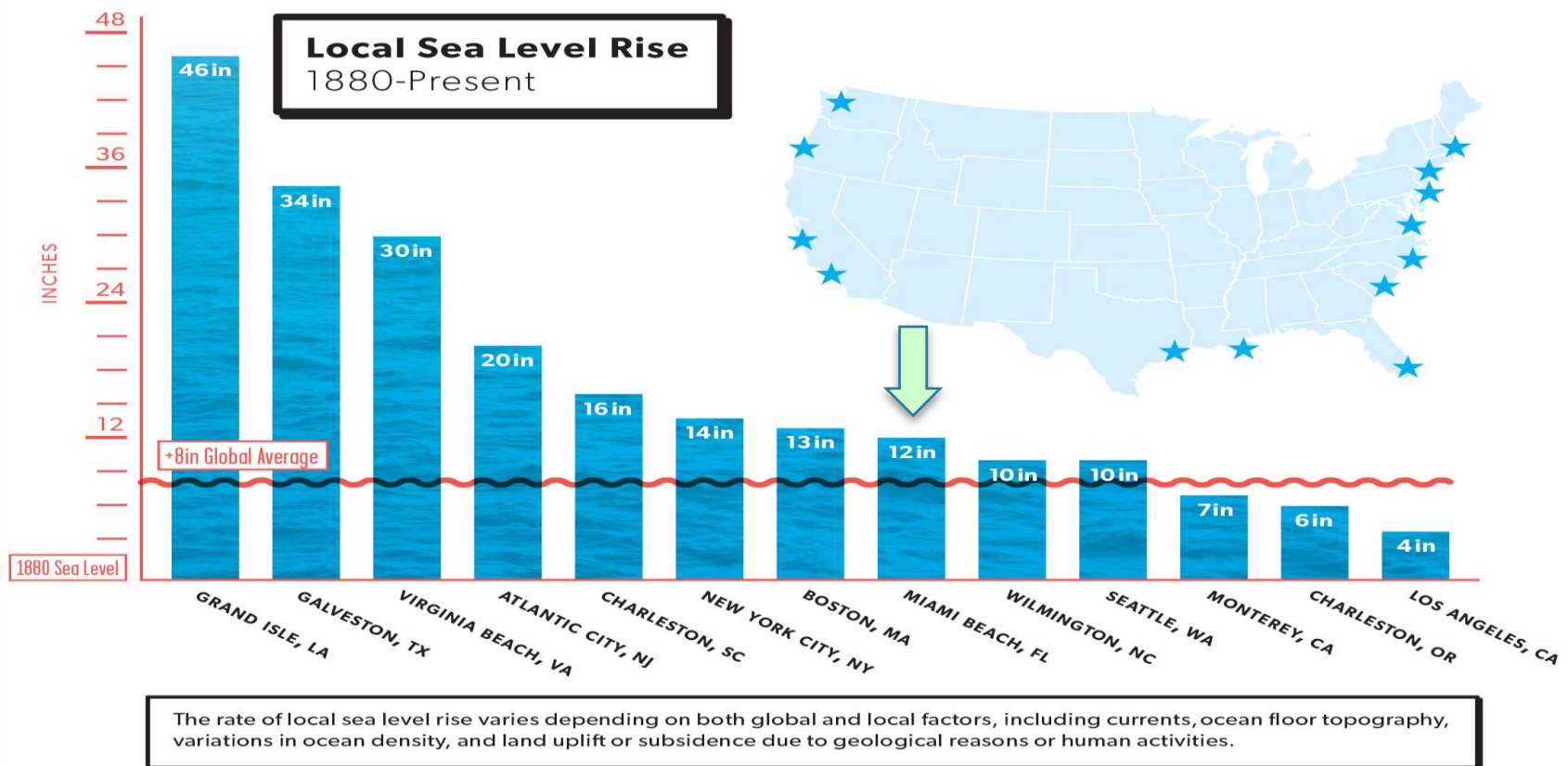


+ 8 meters (+ 25')

Sea Level Rise: 20th Century



Global average sea level has increased 8 inches since 1880. Sea levels along the U.S. East Coast and Gulf of Mexico are rising **much faster**.



Sea level – primary factors

- Amount of Ice frozen ***on land***
 - Natural Cycles, e.g. Ice Ages
 - Warming beyond cycles
- Thermal expansion of seawater
- Land uplift / subsidence
- Currents, e.g. Gulf Stream

- Soil retention, dams, groundwater

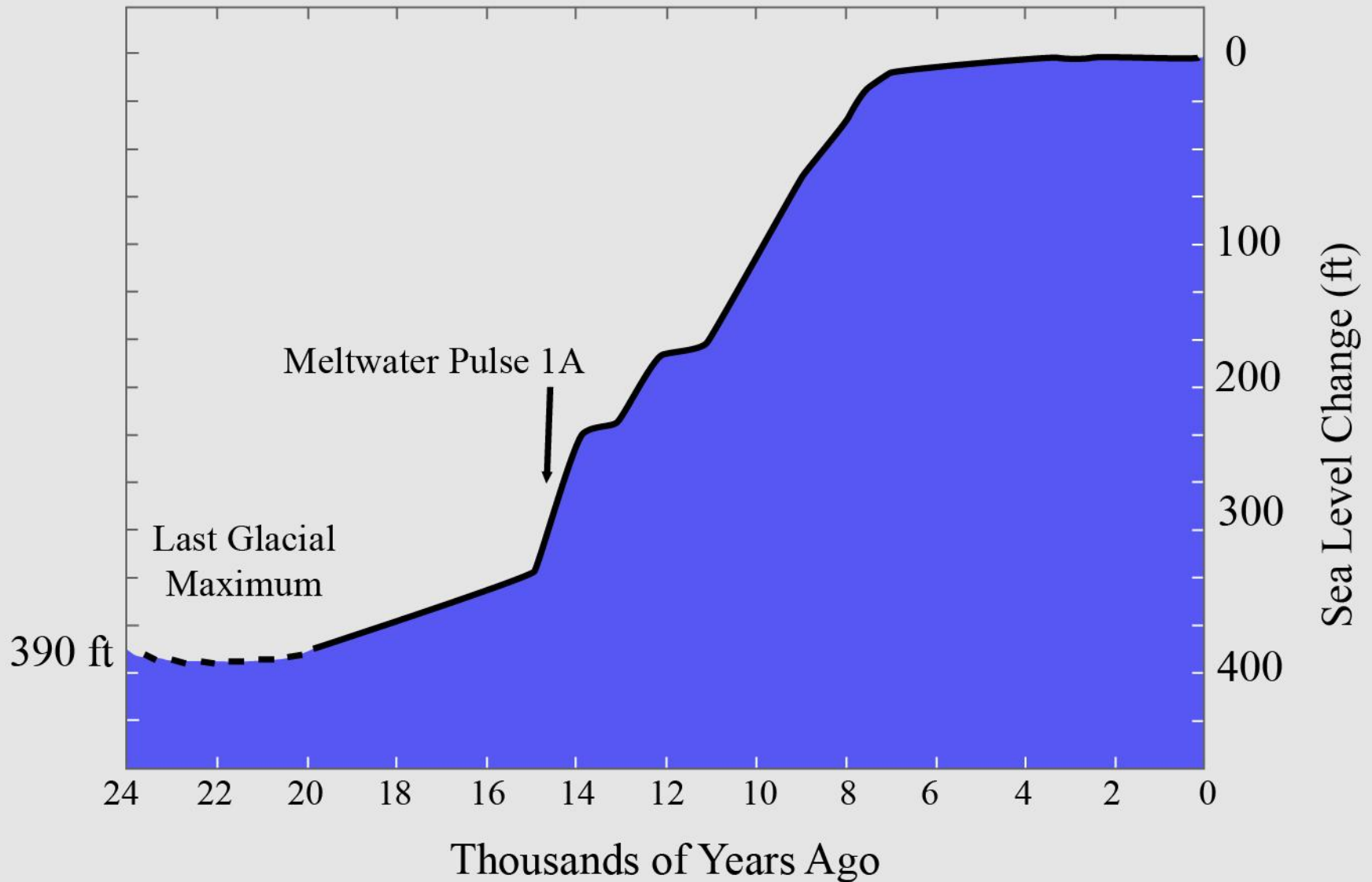


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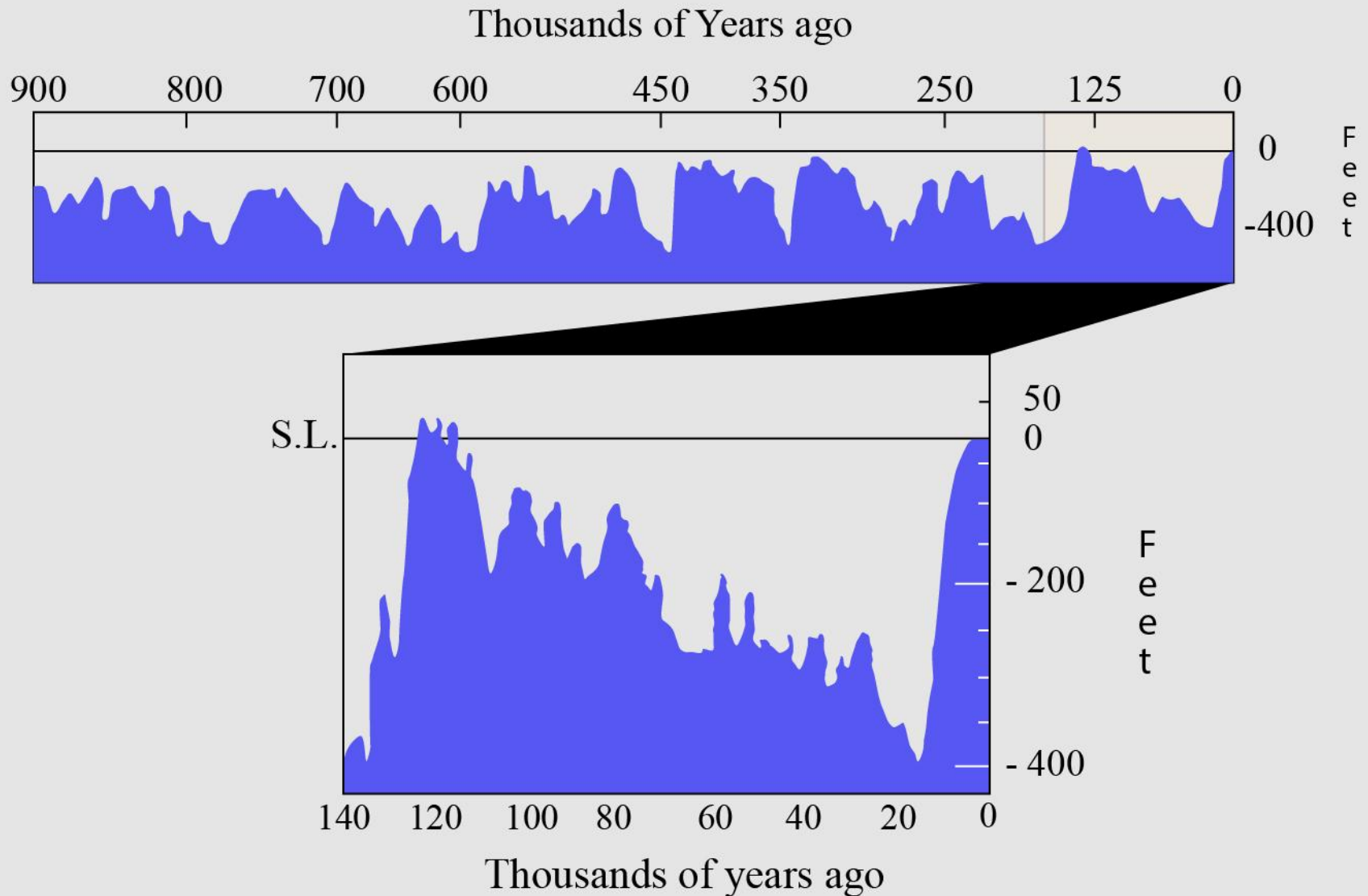
ICE AGE
THE MELTDOWN

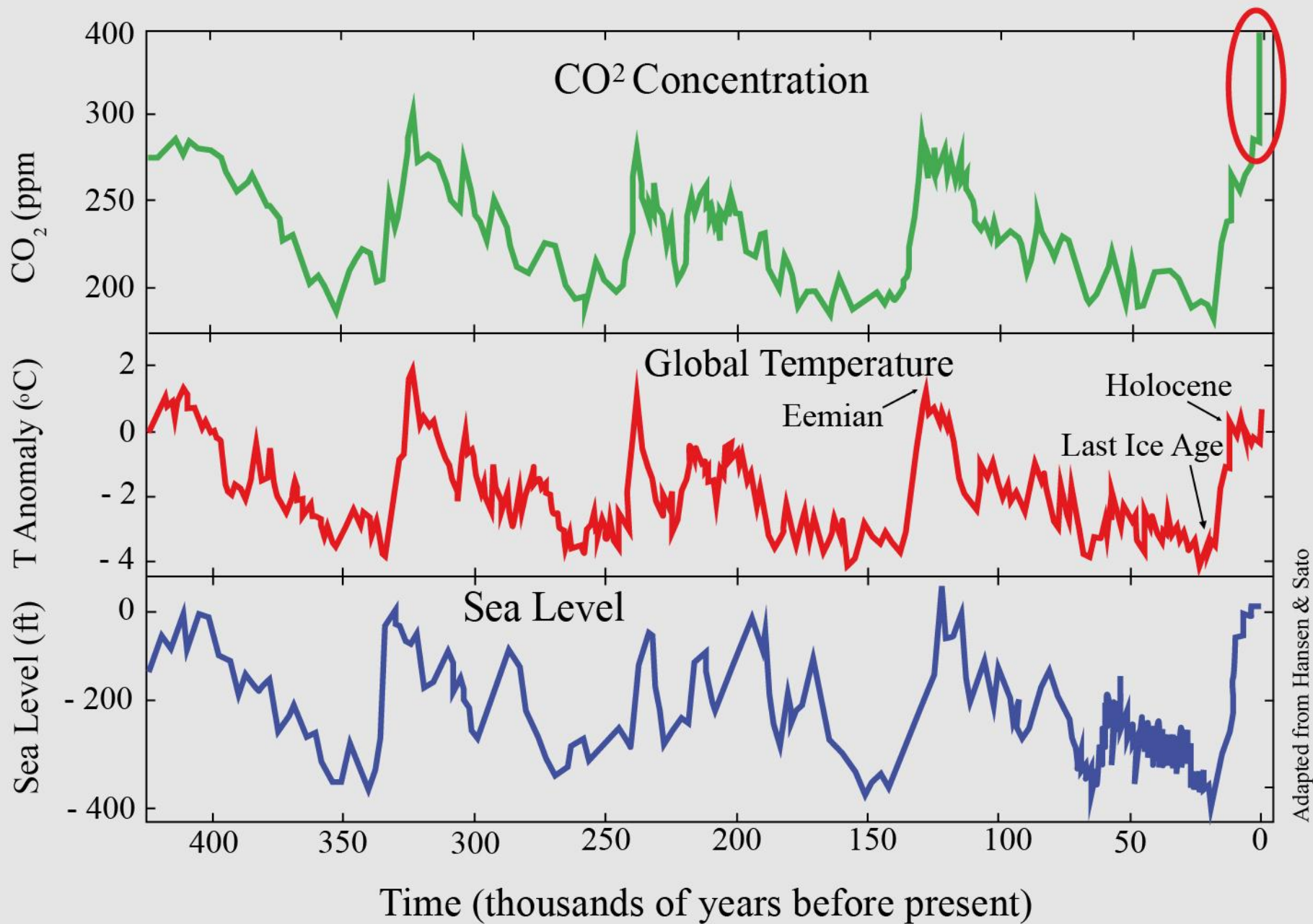
THE MELTDOWN

Post-Glacial Sea Level Rise

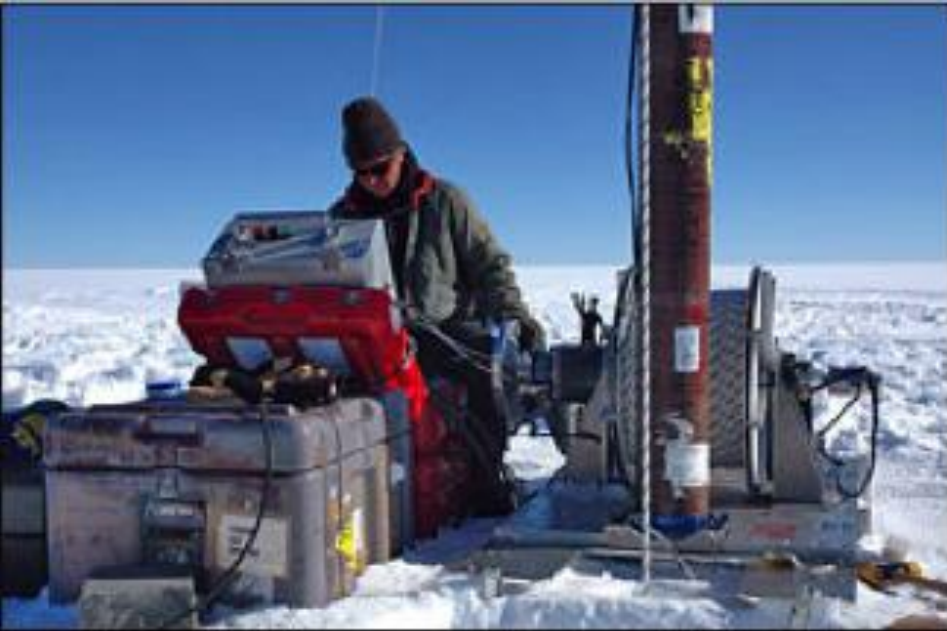


900,000 Year Sea Level Record

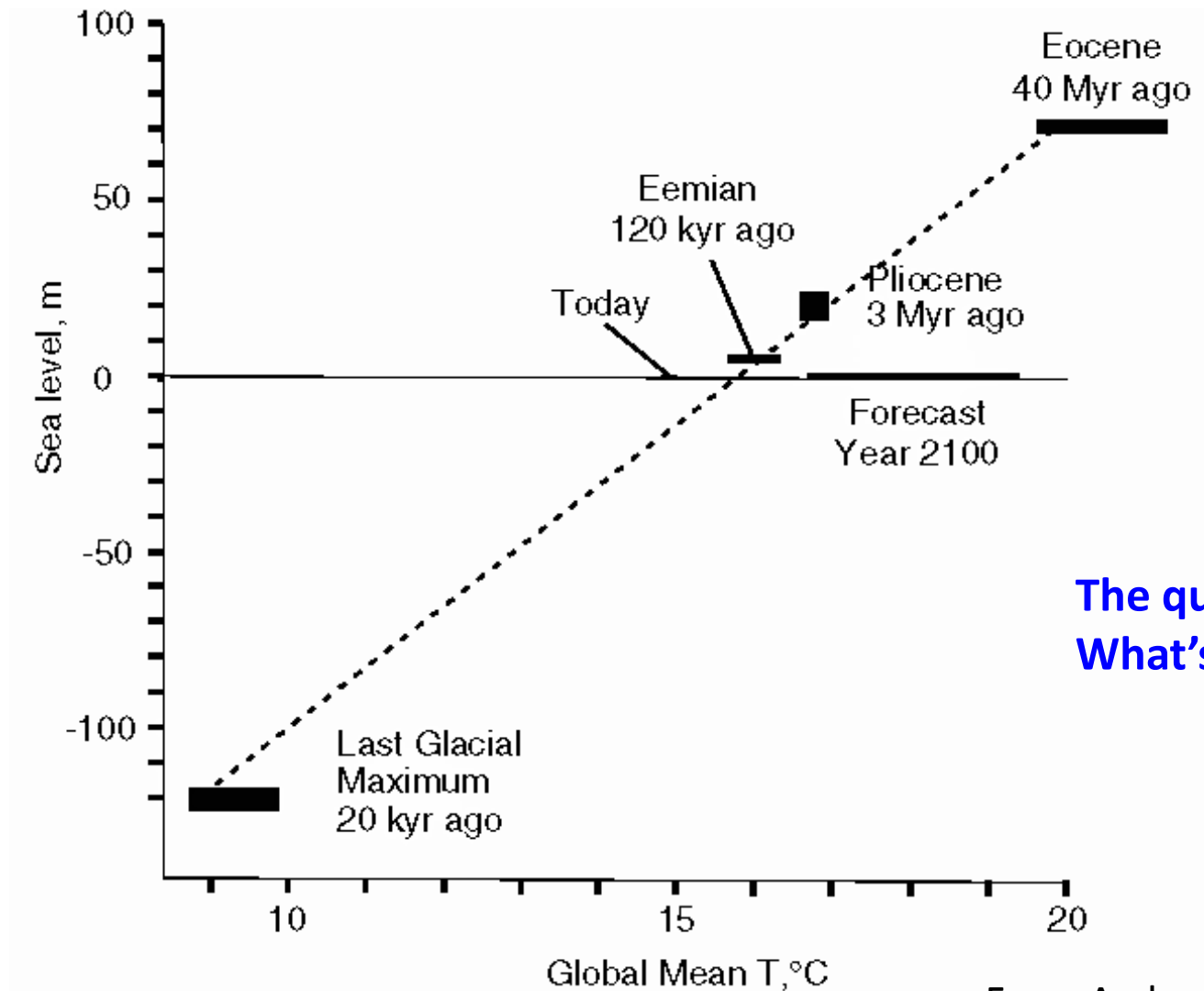




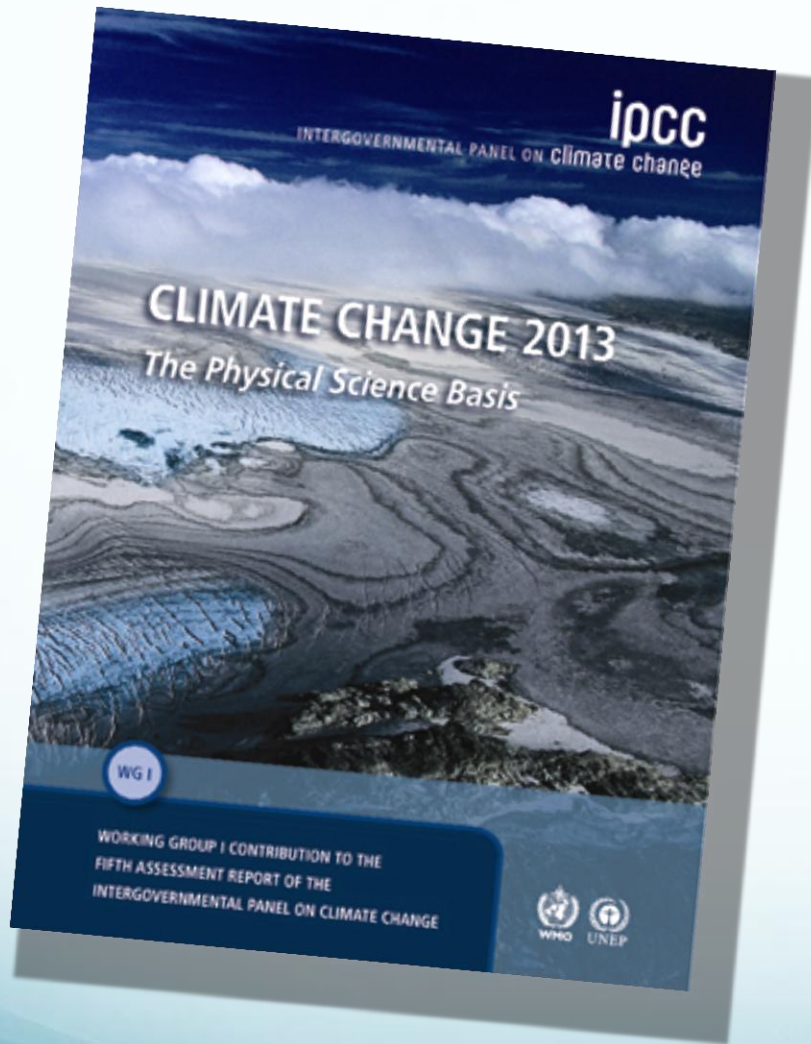
Adapted from Hansen & Sato



The very long term correlation of sea level and global average temperature



The question is:
What's the lag time?

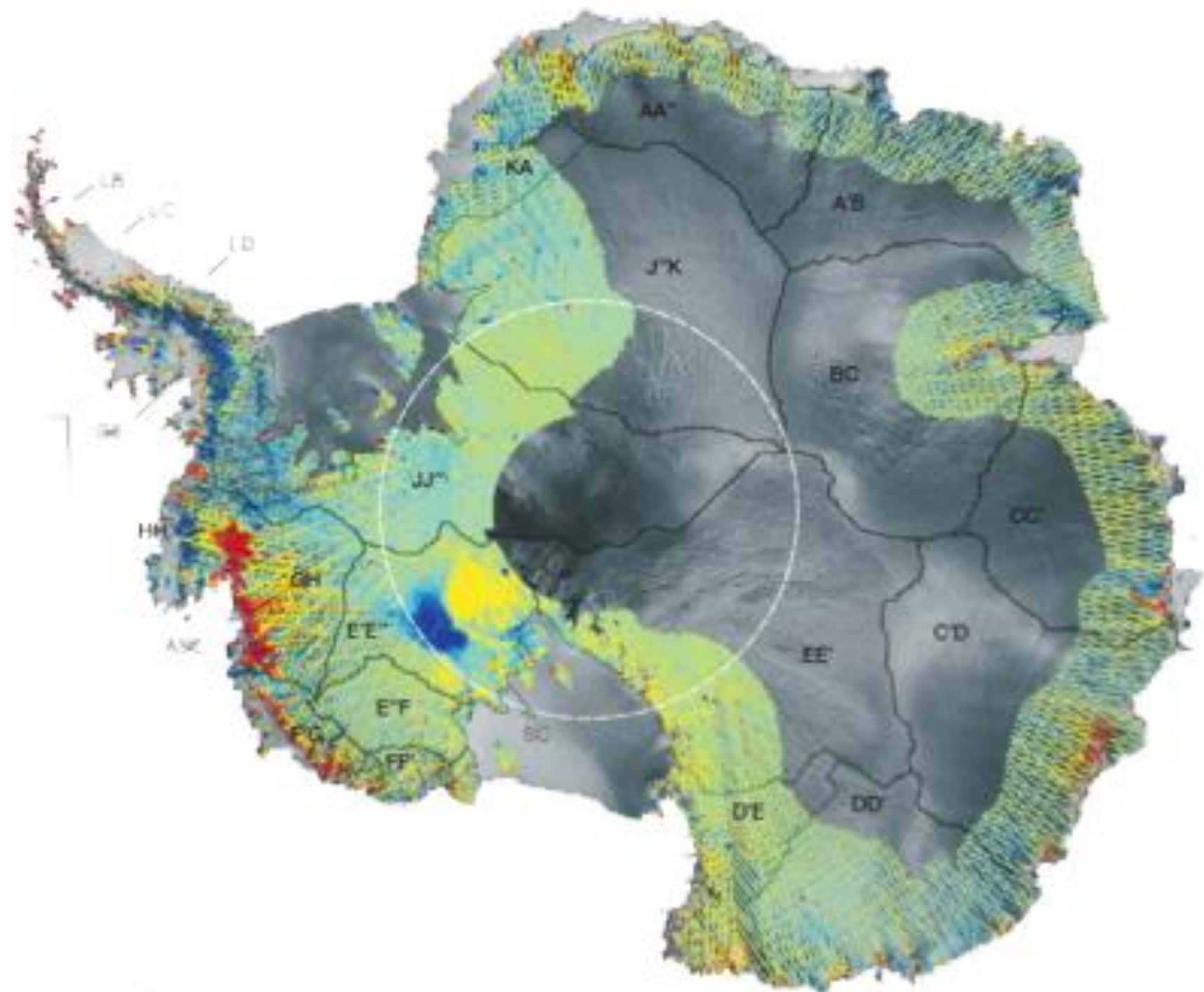


By 2100,
new IPCC Projections:

“10 – 32 Inches of SLR”

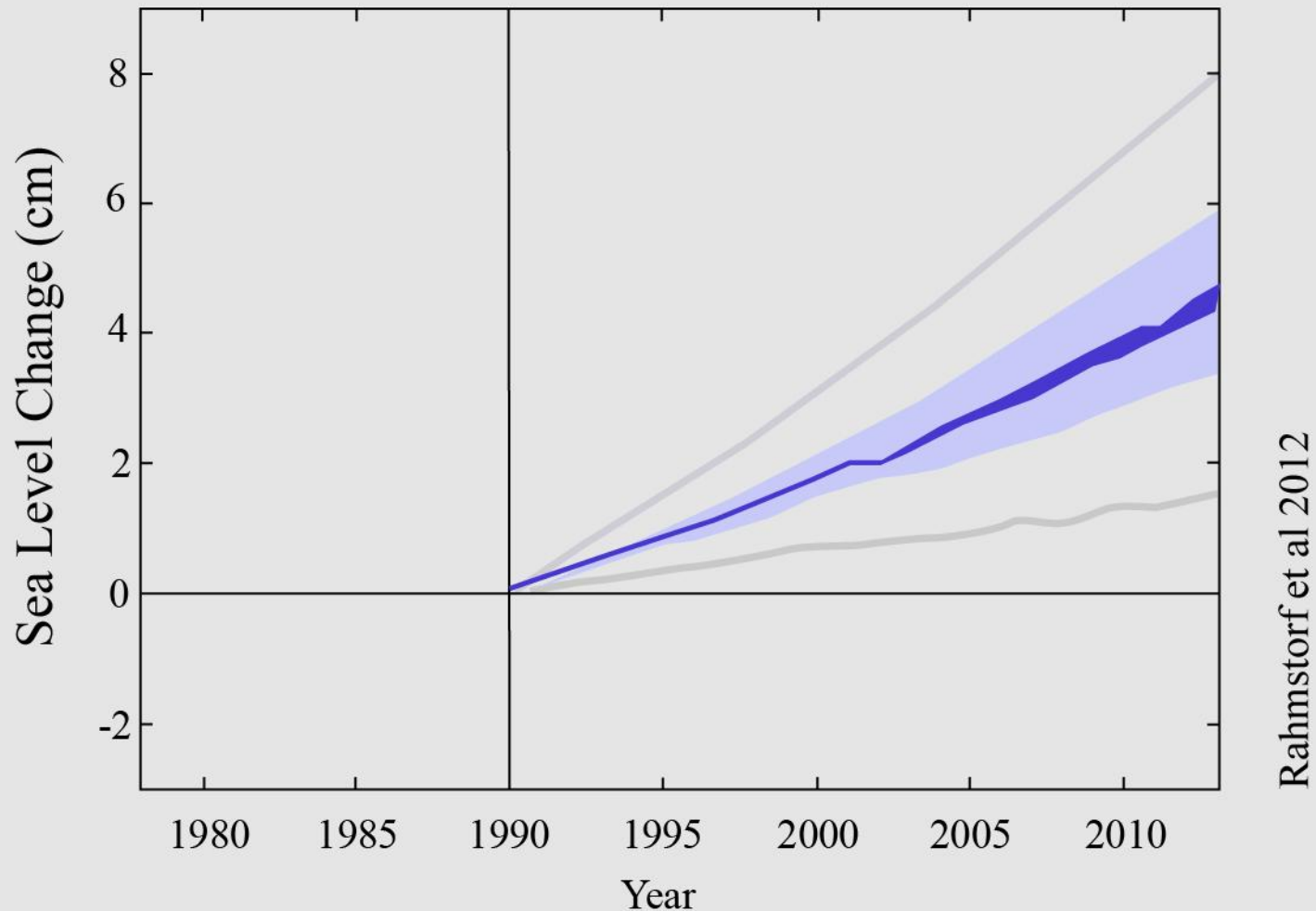
#’s do not include the
“wild card” amplifiers:

- Methane
- West Antarctic glaciers



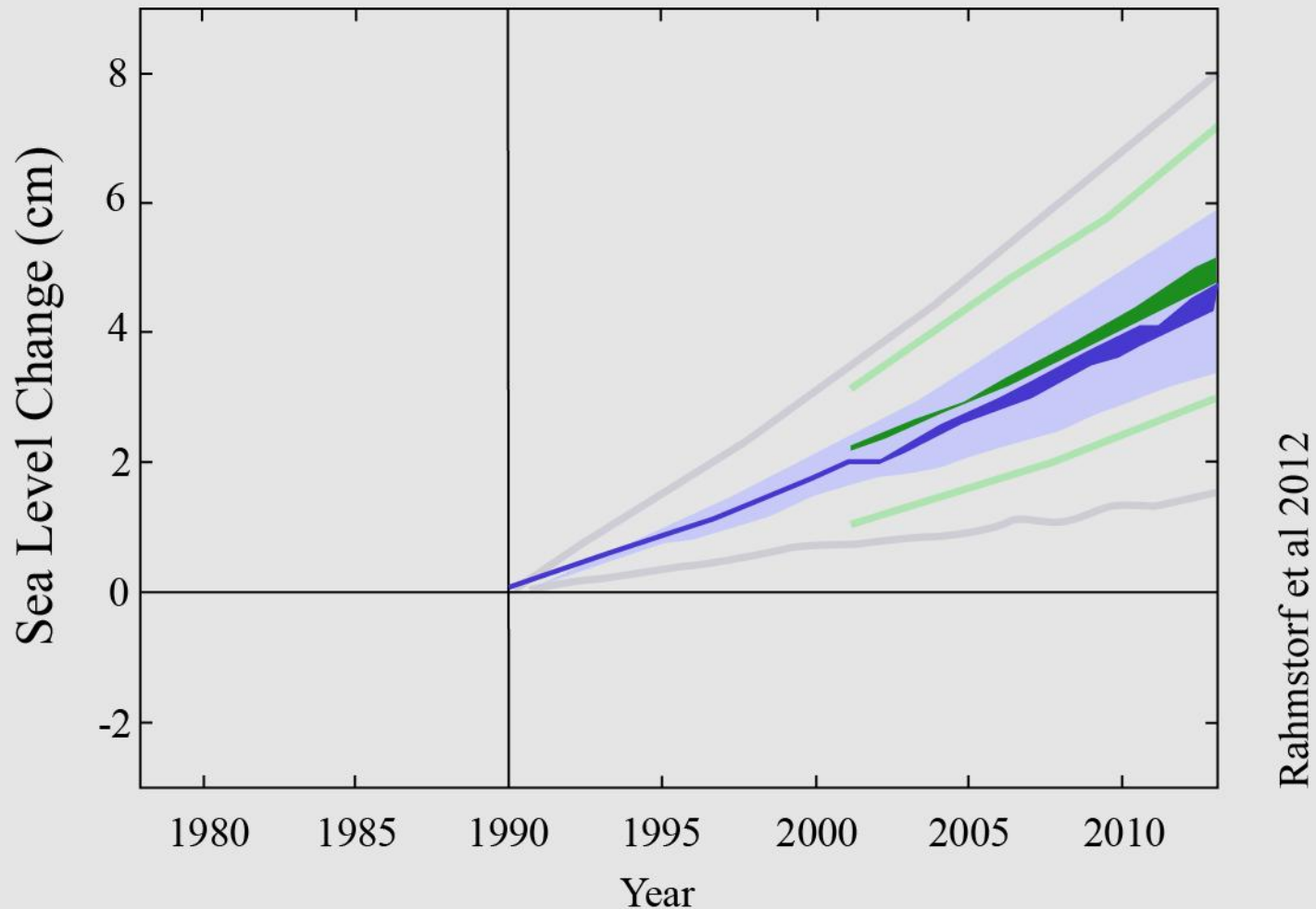


Actual SL Exceeding Projections



Blue – 1990 Projections

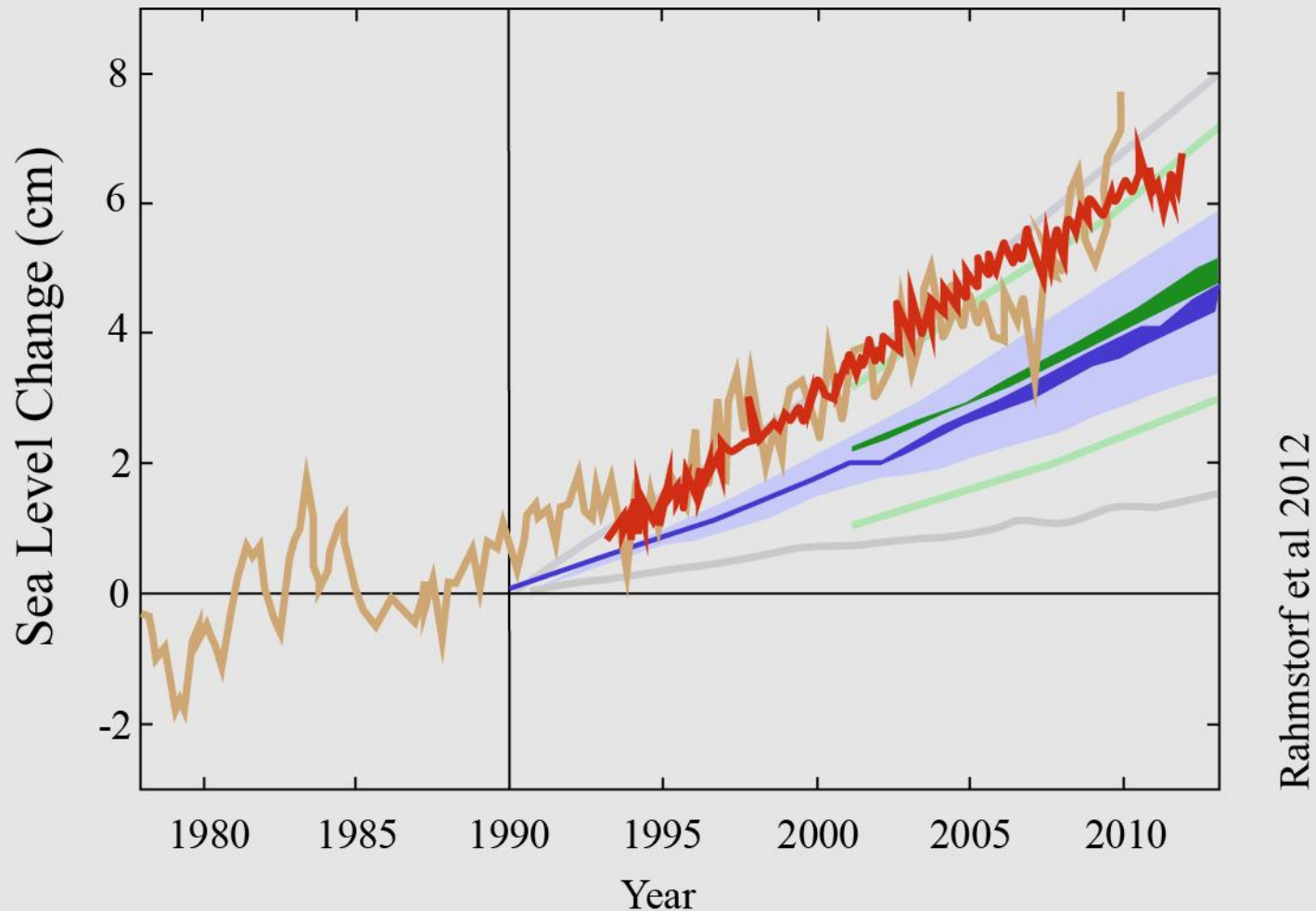
Actual SL Exceeding Projections



Blue – 1990 Projections

Green – 2002 Projections

Actual SL Exceeding Projections



Blue – 1990 Projections

Gold – Actual Sea level

Green – 2002 Projections

Red - SL with trend line smoothing

**How high will
sea level rise
in 30 years?**





Takeaways

- 1. Storms + tides + SLR = vulnerability now**
- 2. After years of stability, SL is rising and will continue for centuries**
- 3. We can slow SLR, but not stop it**
- 4. Inches matter**
- 5. Know your risk; plan and adapt**
- 6. Plan for 3 ft, - official estimates are low**

the silver lining

- 1. Provides decades of notice**
- 2. We do best when challenged**
- 3. Could transform our priorities**

Time to think of future generations.



My recommendations

1. Inform. Build Support: Businesses + voters for 30 year plan
2. Confront squarely. Don't hide from it. **Adapt to three feet.**
3. Have a “risk assessment” done to guide your priorities. Some assets can be protected with engineering or be elevated; some will eventually have to be abandoned.
4. Initiate a carefully tiered series of engineering studies & plans to lay out the realistic options and how to phase them in. Critical is to know what questions to ask and of whom.
5. Establish an Institute to be a global center of excellence, working WITH local universities. This would attract ideas, tourism, and business. Creates confidence and leadership.

Intentionally blank

For more information:
www.johnenglander.net

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