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Why is sea level rising in Hampton Roads?

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Why is sea level rising in Hampton Roads?

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12/9/2014
National Exercise – Hampton Roads
Sea level is trending upward at all NOAA tide gauge stations in the region. About 1.5 feet per century.
It’s not just here – all NOAA Tide Gauges on east coast and Gulf show rising.
Residents notice streets flooded more often

Hours per year that streets start to flood in the Hague, Norfolk, VA

- Hurricane of 1933
- Ash Wednesday storm (1962)
- Twin nor’easters (1996)
- Hurricane Isabel (2003)
- Thanksgiving nor’easter (2006)
- Storm Sandy (2012)
- Veterans Day nor’easter (2008)
Why is sea level rising?
Land is sinking - subsidence

- Subsidence = half the relative sea-level rise
  - Ground water pumping = one-half the subsidence.
  - Glacial isostatic adjustment and other processes make up the rest of subsidence.
Why is sea level rising?
Land Ice Sheets Melting

![Graph showing change in sea level from 2002 to 2012, with arrows indicating melting in Greenland and Antarctica. Image credit: NASA GISS.]
Why is sea level rising?
Ocean is warming and expanding
Why is sea level rising?
Ocean Circulation is Changing

The ocean surface is not flat – the ‘ocean is in motion’

Gulf Stream    Sea Level

Speeds up ↑    Goes Down ↓
Slows down ↓    Comes up ↑

We are seeing a lot of slowing down and accelerating rise rates
CLIMATE: The Slowing Gulf Stream

Coastal events like Superstorm Sandy will become more problematic due to higher sea levels from a slowing Gulf Stream.

By Gregory Morris

Scenario: For most of the U.S. the iconic image from Superstorm Sandy was the beloved roller coaster at Seaside Heights, NJ, half submerged in the Atlantic Ocean after the pier upon which it stood collapsed. For New Yorkers, however, the images seared in mind from the super storm were from Breezy Point, at the very tip of the Rockaway Peninsula, which became practically an island. Hurricane, tidal surge, and raging fires literally levelled the community. When federal and state aid began flowing to repair the Sandy damage, local and city entities at all levels mobilized. Coney Island, at the south end of Brooklyn, had already had its renaissance, and now it was the turn of the Rockaways.
So how do we project into the future?

Provide useful information

Determine subsidence rates around the region

and

Model SLR using different scenarios
Projections for Hampton Roads showing the sea levels the discussion today will focus on.

Stars indicate exercise dates/SLR of 2044 (1.5 ft) and 2084 (4.5 ft)
How do we narrow the range of SLR projections?

Measure Subsidence – integrate city, Commonwealth and Fed data – easy and cheap and

Observe the Ocean - Integrated Ocean Observing System – hard and expensive.
And the end result

Better predictions

So we can adapt