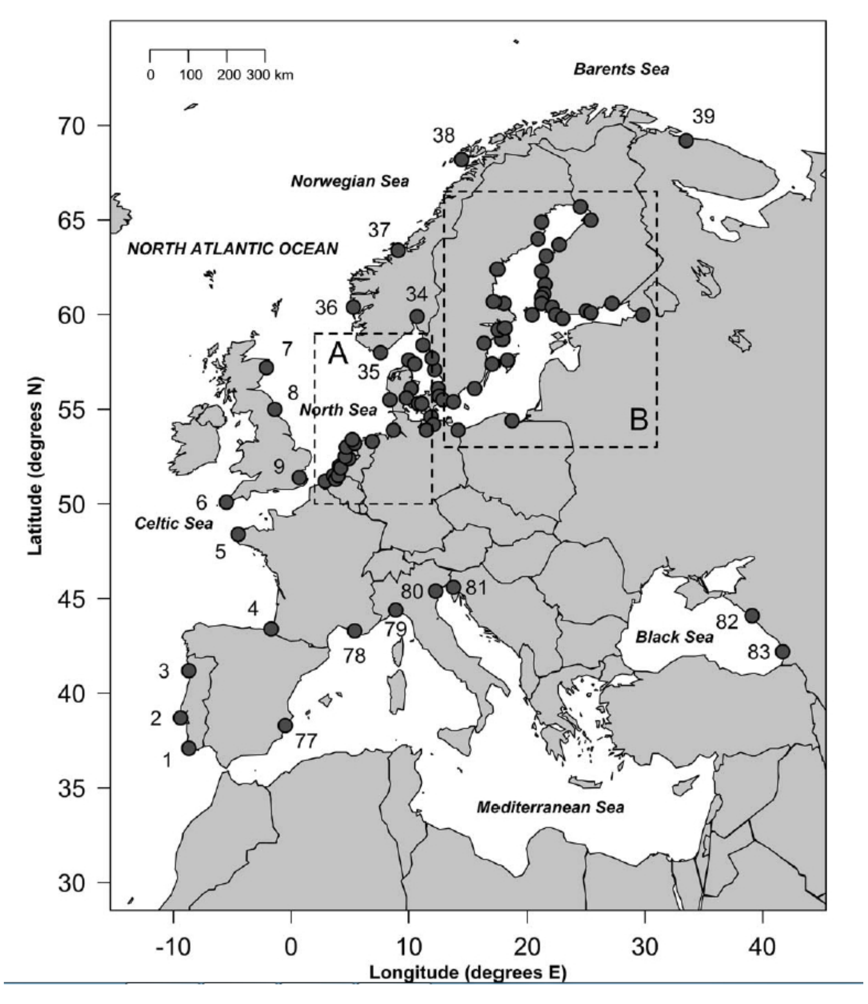
Do sea levels rise faster at EU coasts?

One of the great scares of climate alarmists is the "we are all going to drown" meme; rising global sea-levels (caused by our CO2 emissions) are predicted to displace millions and millions of people, and the media joyfully bring more and more graphic pictures of this impending catastrophe. As always, one should look at the data, at that's what Phil J. Watson does in his latest paper "Acceleration in European Mean Sea Level? A New Insight Using Improved Tools" (Journal of Coastal Research, 33/1, Jan.2017, link to full version).

1. **Relative and geocentric sea-level**

The best and longest data series we have on changing sea levels come from coastal tide gauges (and not from satellites). The Permanent Service for Mean Sea Level has many long-time records (most are European), some going back to the beginning of the 19th century and even further. These tide gauges have usually be well maintained, as they were important for the safety of ships entering or leaving a harbor. One of the best known series comes from the town of Brest (France), starting in 1807. A tide gauge measures a **relative sea level**, i.e. the sea level relative to the position of the instrument. When we speak of global sea levels, then these levels are **geocentric**, i.e. relative to the center of the geode (the center of the earth with its not spherical form). A global sea-level has as much practical value as a mean global temperature, that is mostly none. It is an intellectual construct which may be interesting from a scientific point of view, but useless as a tool for concrete political action, such as deciding to build dams or coastal protections. So what Watson does, is to detect if there is any acceleration in the relative sea level measured at 81 locations on the European costs. The following picture shows his selection of tide gauges:

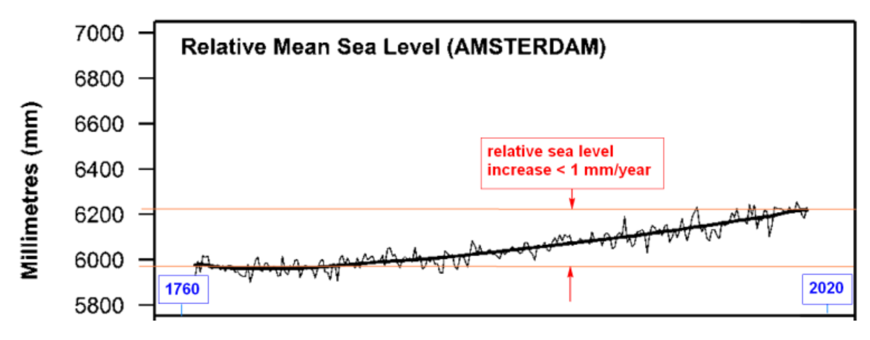


Clearly most stations are on the Atlantic and Baltic coasts. The Netherlands are accustomed since long times to protect their low-lying land against rising sea and storms, so I will insist on the situation at Amsterdam, and of Brest as representative for much of the more southern Atlantic coast. When talking about relative sea-level, one should remember that (at least) 3 factors have an influence:
1. **land movement** at the site of the gauge: this can be an uplift caused by glacial rebound (the ground moves up as the pressure of the heavy ice masses that covered it during the last ice age have vanished: this is the case around the Baltic, the stations in the rectangle B). The ground also may move down due to ground water extraction or simply the weight of the neighboring buildings. These land movements can be quite different are close locations: at Vlissingen (NL) there is a mean rise of +0.28 mm/y, and at Ostende (BE) 59km away the ground sinks at -35 mm/y.
2. **atmospheric influences** (short time such as atmospheric pressure and wind, long time such as those caused by NAO (North Atlantic Oscillation). Usually the gauge readings are corrected for atmospheric pressure variations and are low pass filtered to remove for instance the influence of the wind.
3. **climate change influence**, essential melting (land based) glaciers adding water to the oceans and thermal expansion of warmer waters.

Extracting unambiguously these single factors from the gauge data is difficult, if not yet impossible. But it is not a practical necessity, as decisions to begin work on new dams or other protective measures rely on the relative sea level (including all these factors), and not on a single parameter. Watson has used a new tool, actually a new module called **msltrend** of the well-known open source R2 statistical package to obtain data series of exceptional quality.

2. The situation at Amsterdam

The following picture shows the relative sea level at Amsterdam, from 1766 to 2010:

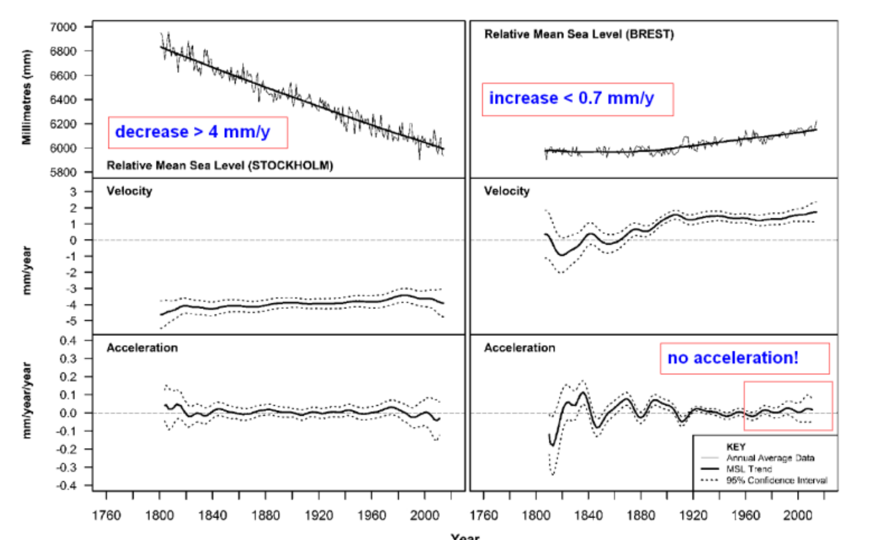


Two conclusions are obvious:
1. the relative sea level begins to rise around 1820, close to the end of the Little Ice Age which is usually taken as 1850.
2. since that date the increase is uniform, without any visible acceleration since the start of the industrial age (~1850); over the whole period the average increase is less than 1 mm/y or about 1.3 mm/y since 1820.

Clearly the period of highest CO2 emissions between 1970 and 2010 does not leave any visible impression in this sea level change.

3. Velocity of change and acceleration at Brest and Stockholm

The next picture shows the time series of relative sea level, the velocity of change (= the time gradient) and the acceleration at Brest and Stockholm:

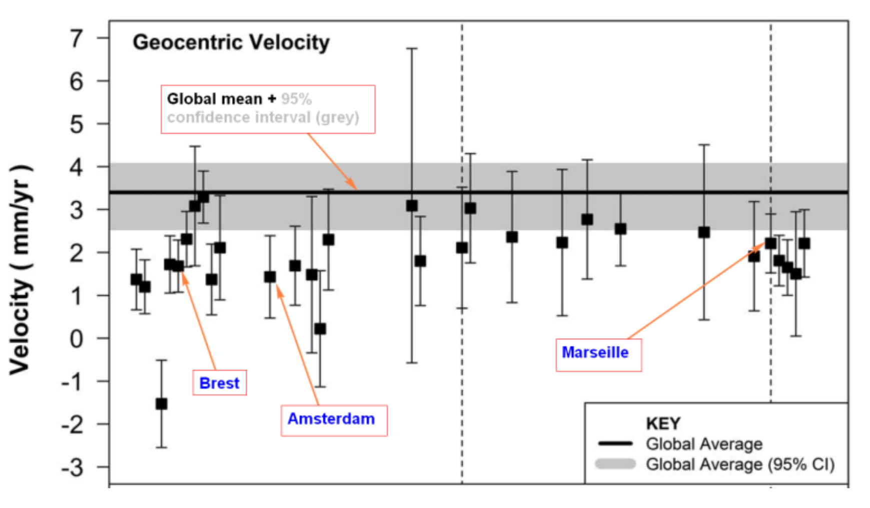


Stockholm's relative sea-level is continuously falling, at a near constant velocity and a practically zero acceleration (which is obvious, as acceleration is the derivative of velocity). The relative fall of the sea-level is important: more than 4 mm per year, and is practically the fingerprint of glacial rebound around the Baltic sea (at the island of Visby, ~150 km from Stockholm, the ground rises at 3.31 mm/y, and at Furuogrund, close to the northern coast of the Baltic, the rise is a spectacular 10.43 mm/y).

At Brest the picture is quite different: there is a small increase less than 0.7mm/y over the whole period, with a near constant velocity since 1990 (and no statistically significant acceleration). As at Amsterdam, a "global warming" causing accelerated sea-level rise is not visible in these series. Watson writes in his paper that such a warming might show up with a delay of 15 to 20 years: well, the two periods of 1910-1945 and 1976-1990 usually accepted as being the two global warming events, are long past that delay, and leave no impression in the relative sea-level series.

4. The geocentric sea-level rise and the IPCC scenarios

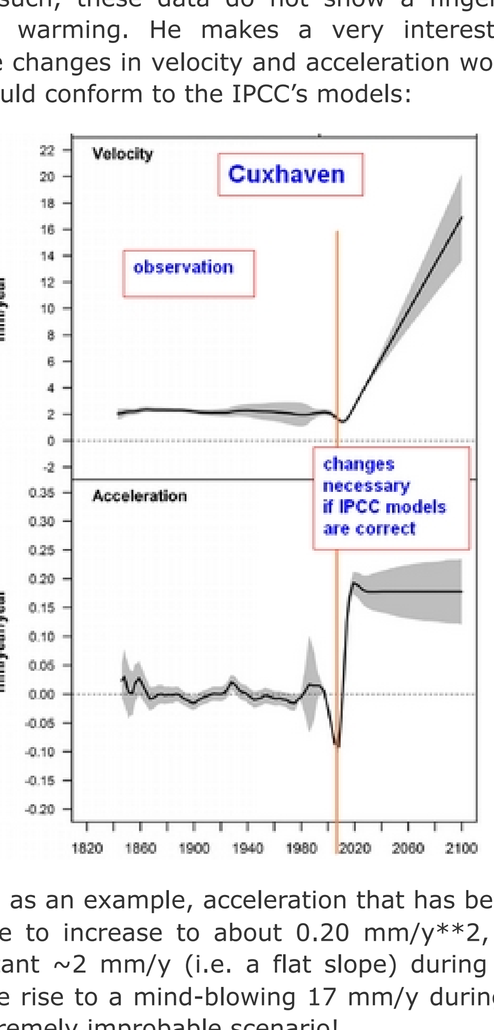
Geocentric sea-levels can be calculated from the relative levels (with some caveats), using tectonic models or GPS measurements for the newest data. It is interesting to compare the European situation to the "global" geocentric sea-level rise (in mm/y) as used by the IPCC and in many models:



The global geocentric sea-level average change corresponds to the black line at about 3.4 mm/y (the grey band represents the 95% confidence interval i.e. the region outside which there is a low probability to find data). All EU geocentric sea-levels are below the global average, and most even clearly below the lower confidence boundary!

5. Conclusions

Watson's paper concludes that relative sea-levels at European coasts do not show a statistically significant acceleration (that is their change per year remains constant); remember that these sea levels are given by very long time series and reliable instruments, usually carefully maintained. As such, these data do not show a finger print of an ongoing climate warming. He makes a very interesting point in plotting what the changes in velocity and acceleration would be if past observations should conform to the IPCC's models:



Taking Cuxhaven as an example, acceleration that has been zero since 1840 would have to increase to about 0.20 mm/y**2, and velocity which was constant ~2 mm/y (i.e. a flat slope) during the last 180 years would have rise to a mind-blowing 17 mm/y during the coming 90 years: an extremely improbable scenario!

The conclusion for our political rulers is first to read this paper, than try to understand the numbers and finally avoid to jump to hysteric "mitigation" measures that may well be extremely costly, but essentially superfluous for changing the coastal sea-levels whose century long changes do not point to any potential catastrophe.

Related

Sea-level budget along US Atlantic North-West coast
February 4, 2018

Climate refugees
December 8, 2009
In "1"

The Copenhagen Synthesis Report: No, it ain't so!
June 30, 2009
In "1"

This entry was posted on June 2, 2017 at 14:21 and is filed under Uncategorized. You can follow any responses to this entry through the RSS 2.0 feed. You can leave a response, or trackback from your own site.

Leave a comment