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Memorandum by Professor Nils-Axel Mörner, Head of Paleogeophysics & Geodynamics, Stockholm University, Sweden President, (1999-2003) of the INQUA Commission on Sea Level Changes and Coastal Evolution, Leader of the Maldives Sea Level Project

FACTS AND FICTION ABOUT SEA LEVEL CHANGE MAY LOW-LYING ISLANDS AND COASTAL AREAS BE FREED FROM THE CONDEMNATION TO BECOME FLOODED IN THE NEAR-FUTURE

Climate is becoming increasingly warmer we hear almost every day. This is what has become known as Global Warming. The driving idea is that there is a linear relationship between CO₂ increase in the atmosphere and global temperature. The fact, however, is that temperature has constantly gone up and down. From 1850 to 1970, we see an almost linear relationship with Solar variability; not CO₂. For the last 30 years, our data sets are so contaminated by personal interpretations and personal choices that it is almost impossible to sort up the mess in reliable and unreliable data.

Most remarkable in the record of climatic changes during the last 600 years are the cold periods around 1450, 1690 and 1815 and their correlation with periods of Solar Minima (the Spörer, Maunder and Dalton Solar Minima). The driving cyclic solar forces can easily be extrapolated into the future. This would call for a new cold period or "Little Ice Age" to occur at around 2040-50. Still, we hear nothing about this. It is as if IPCC and the Kyoto Protocol enthusiasts want to "switch off the Sun itself". Let us take this, at least, as a piece of information to rise our awareness and curiosity.

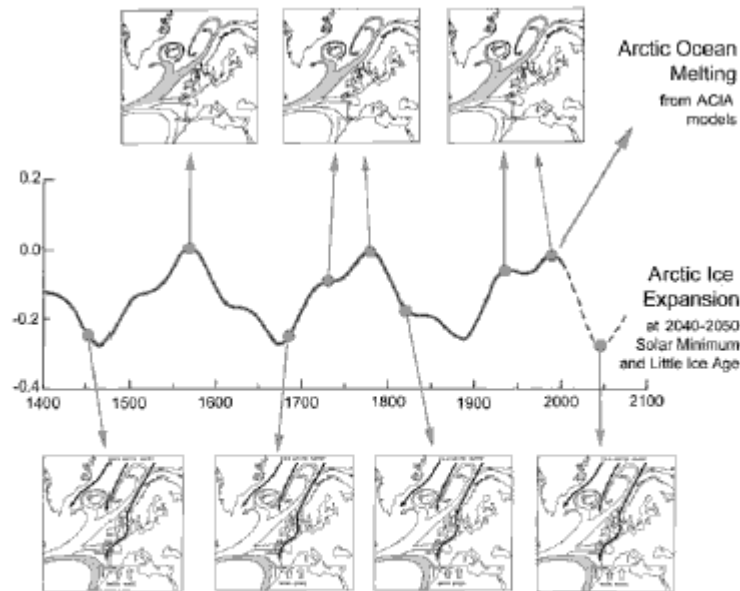


Fig. 1. The main Solar cycle in the last 600 years and its expected extension into the future. At Solar minima NW Europe, the North Atlantic and the Arctic have experienced cold phases known as "Little Ice Ages". By year 20040-2050, a new Solar Minimum is to be expected, and hence a new cold phase.

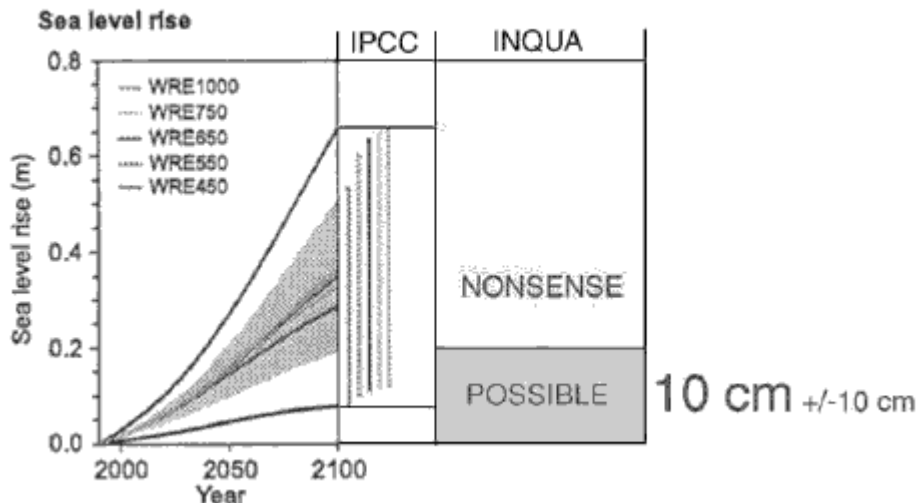
In the global warming concept, it has been constantly claimed that there will be a causal rise in sea level; a rise that already is in the accelerating mode, in the near future to cause extensive and disastrous flooding of low-lying coastal areas and islands. *"It will be the death of our nation"*, says the President of the Maldives, and the people of Tuvalu in the Pacific claim that the flooding has already commenced.

Is this facts or fiction? It is true that we are flooded by this information. But what lies behind this idea? And, especially, what do the true international specialists think?

The recording and understanding of past changes in sea level, and its relation to other changes (climate, glacial volume, gravity potential variations, rotational changes, ocean current variability, evaporation/precipitation changes, etc) is the key to sound estimates of future changes in sea level.

The international organisations hosting the true specialists on sea level changes are to be found with the INQUA commission on sea level changes and the IGCP special projects on sea level changes. When I was president of the INQUA Commission on *Sea Level Changes and Coastal Evolution*, 1999-2003, we paid special attention just to this question; ie proposed rise in sea level and its relation to observational reality. We discussed the issue at five international meetings and by Webb-networking. Our opinion is illustrated in Fig 2. In view of the Fig 1 prediction, I have later revised the estimate for year 2100 to: **+5 cm ± 15 cm**.

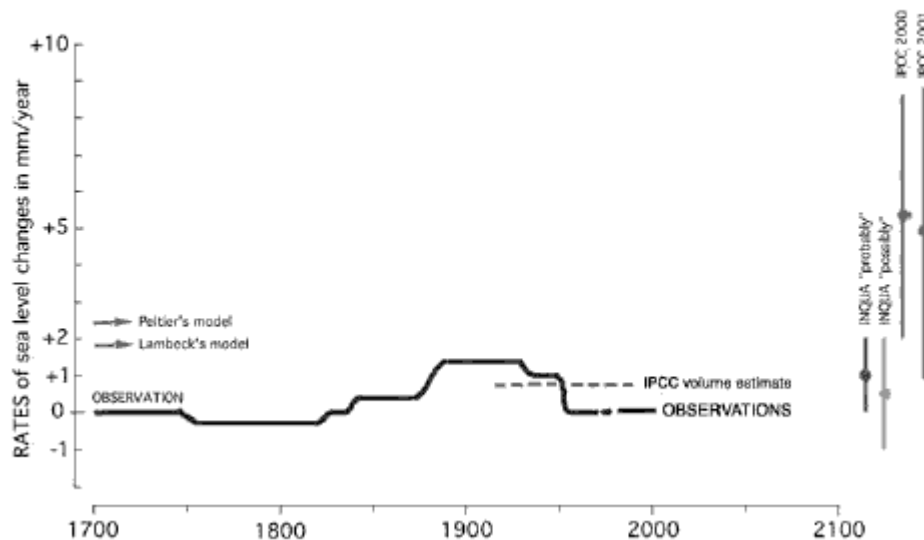
Fig 2: The sea level rise by year 2100 according to IPCC and its evaluation by INQUA



Prior to 5000-6000 BP, all sea level curves are dominated by a general rise in sea level in true glacial eustatic response to the melting of continental ice caps. In the last 5,000 years, global mean sea level has been dominated by the redistribution of water masses over the globe. In the last 300 years, sea level has been oscillating close to the present level, with peak rates in the period 1890-1930 (Fig 3).

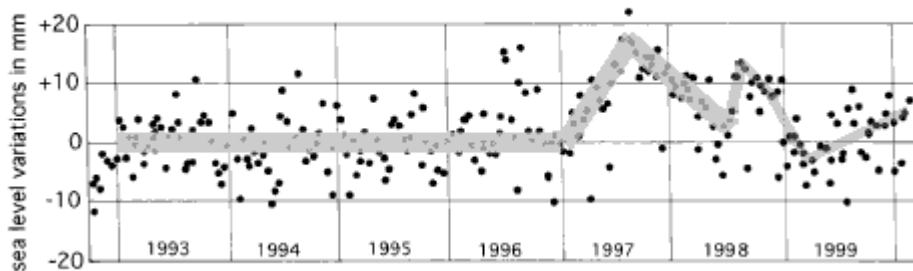
It is true that sea level rose in the order of **10-11 cm** from 1850 to 1940 as a function of Solar variability and related changes in global temperature and glacial volume. From 1940 to 1970, it **stopped** rising, maybe even fell a little. In the last 10-15 years, we see no true signs of any rise or, especially, accelerating rise (as claimed by IPCC), only a variability around **zero**. This is illustrated in Fig 3.

Fig. 3. Observed sea level changes in the past 300 years and estimated changes by year 2100 (from Mömer 2004a).



With the TOPEX/POSEIDON satellite mission in 1992, we now have new means of recording actual sea level changes. The record from 1992 to early 2000 (Fig 4) lacks any sign of a sea level rise; it records variability around zero plus a major ENSO even in year 1997.

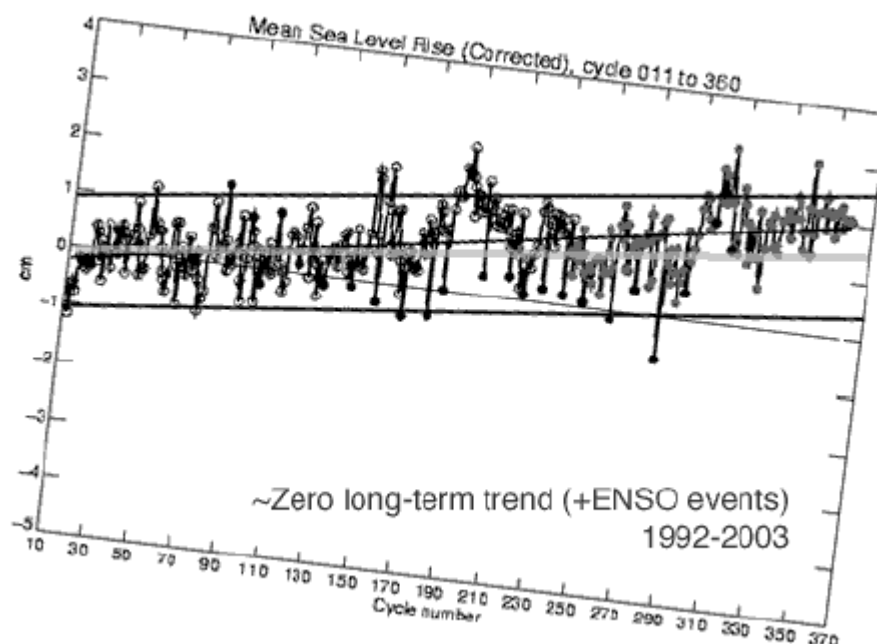
Fig. 4. Satellite altimetry of TOPEX/POSEIDON (from Mömer, 2004a).



When we three years later have the same record extended into year 2003 on the Webb, a tilt has been introduced. This tilt does not originate from the satellite altimetry readings, however, but represents an inferred factor from tide-gauge interpretations. In order to get back to true satellite data, we have to tilt the whole record back to its original data of Fig 4. When this is done, there is no sea level rise to be seen—only a variability around zero plus a number of high-amplitude ENSO oscillations (Fig 5). This is why I in Fig 3 conclude that the sea level remained stationary at around zero for the last 10-15 years (as further discussed in Mömer, 2004a and 2005).

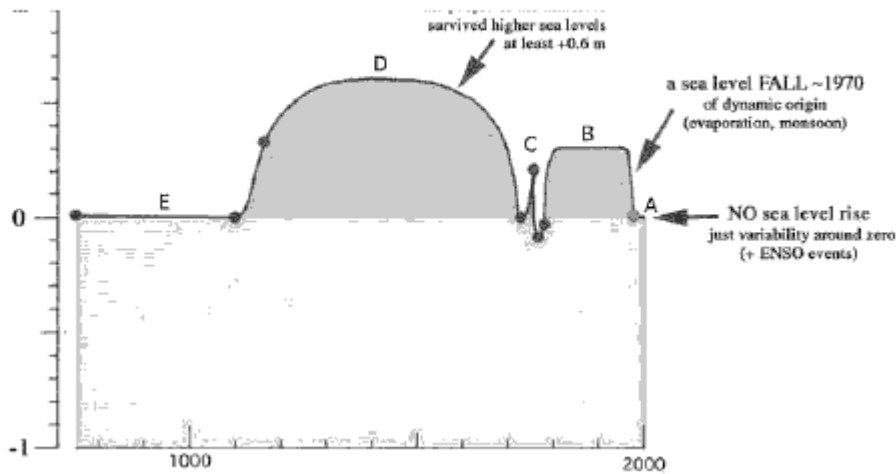
The tide-gauge introduced into the satellite data on the Webb seems to violate observational facts at sites spread all over the globe; not least our NW European data covering both uplifted areas (Fennoscandia, Scotland) as subsiding areas (the North Sea).

Fig. 5. Satellite altimetry data of TOPEX/POSEIDON tilted back to original level (excluding the tide-gauge factor) providing a variability around zero plus ENSO events (from Mömer, 2005).



From 2000 to the present, we have run a special international sea level project in the Maldives including six field sessions and numerous radiocarbon dates. Our record for the last 1,200 years is given in Fig 6. There are no signs of any on-going sea level rise. It seems all to be a myth.

Fig. 6. Our sea level record from the Maldives (see Mömer et al., 2004).



Tuvalu in the Pacific is often said already to be in the flooding mode. The tide-gauge record (Fig 7) for the last 25 years does not show any rise, however. The truth seems to be that a Japanese pineapple industry had subtracted too much freshwater by that forcing saltwater to invade the subsurface.

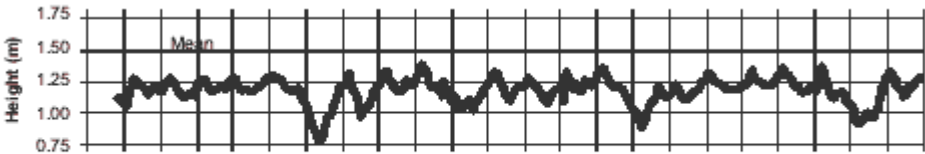


Fig 7. The Tuvalu tide-gauge record 1978–2003 showing stability around a zero level plus three negative ENSO events (from Mömer, 2004c).

Fig 7. The Tuvalu tide-gauge record 1978–2003 showing stability around a zero level plus three negative ENSO events (from Mömer, 2004c).

Venice is notorious for its flooding problems. It lies on a delta area subjected to subsidence. Therefore, the sea level variations are superposed on a long-term subsidence trend (Fig 8). Any rise in sea level would immediately worsen the situation. The last 30 years lack signs of any rise or accelerated rise, on the contrary sea level fell (partly as a function of engineering work).

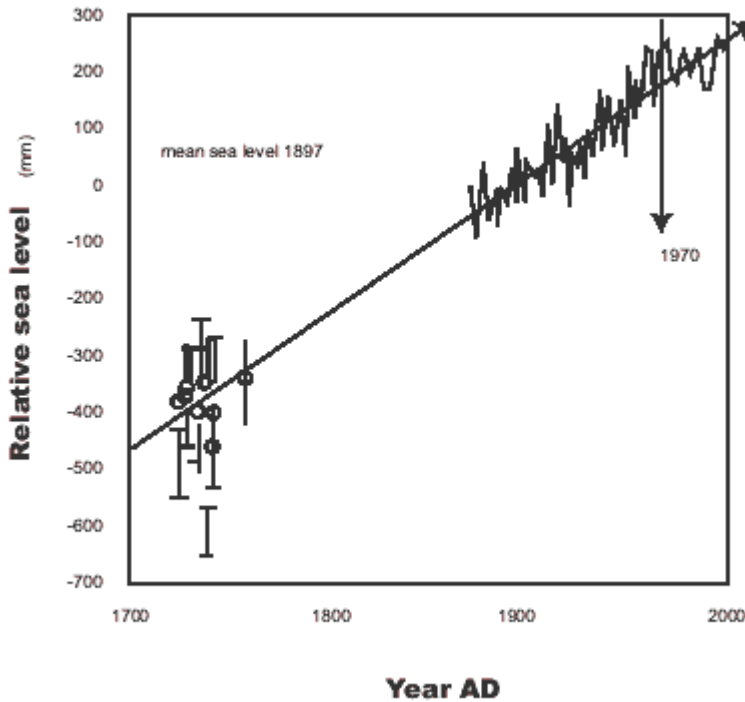


Fig 8. Observes sea level changes (purple) superposed on a long-term subsidence trend (blue). At 1970 (green arrow), there is a marked change in tendency, partly due to engineering work, but certainly seriously contradicting a sea level rise and especially an accelerated sea level rise.

In conclusion; observational data do not support the sea level rise scenario. On the contrary, they seriously contradict it. Therefore, we should free the world from the condemnation of becoming extensively flooded in the near future.

There are more urgent natural problems to consider on Planet Earth like tsunamis, earthquakes, volcanic eruptions, etc.

30 March 2005

Some recent scientific papers by the author

The INQUA Commission—www.pog.su.se/sea

Authors homepage—www.pog.su.se.

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Plus numerous sea level papers in the period 1969-95.

See also:

Lars Mortensen, 2004; *Doomsday Called Off*, TV-documentary, Danish TV, Copenhagen.

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