Global and Planetary Change 62 (2008) 219–220

Contents lists available at ScienceDirect

Global and Planetary Change

journal homepage: www.elsevier.com/locate/gloplacha

Discussion

Comment on comment by Nerem et al. (2007) on "Estimating future sea level changes from past records" by Nils-Axel Mörner (2004)

Nils-Axel Mörner

Paleogeophysics & Geodynamics, Rösundavägen 17, 13336 Saltsjöbaden, Sweden

ARTICLE INFO

Article history:
Received 8 March 2008
Accepted 18 March 2008
Available online 28 March 2008

Normal scientific publication ethics include the possibility to make comments on a publication. Such comments should normally follow reasonably close to the time of the publication of the paper under discussion. Finally, such comments should always be presented to the original author with an offer of responding to the comment. In the present case, there has been some unusual parts. In 2004, I published a paper on "estimating future sea level changes from past records" (Mörner, 2004). Three years later, there appeared a comment by Nerem et al. (2007). This comment was never presented to me for responding comments. I never saw the comment until in print. The reason for this was a change in address. I hereby take my right to respond on the comments by Nerem et al. (2007).

First let us clear up the origin of my Fig. 2 (in Mörner, 2004). It is a product of the CLS Company printed in MEDIAS (2000, Fig. 1.2; also available on the net at Aviso, 2000). My curve was a redrawing of this graph. This curve, spanning the time from October 1992 to April 2000, does not record any sea level rise; only a variability plus one (or more) ENSO signals. That was the point of my picture. It should be noted that this graph includes the technical adjustments (including the drift factor of Mitchum, 2000, Fig. 10) illustrated by the lower arrow in Fig. 1.

Later the same graph re-appears with a strong tilt (Aviso, 2003; cf. Leuliette et al., 2004; Mörner, 2005). Why is that?

It is because of the introduction of additional calibrations (Mitchum, 2000; Leuliette et al., 2004; Cazenave & Nerem, 2004) — and those "calibrations" are subjective interpretations (Fig. 1; upper arrow); not objective readings. Consequently, they are opinion-dependent.

"We adopt the rate given by Douglas (1991, 1995) of 1.8±0.1 mm/yr", Mitchum (2000) states. This rate, however, is widely debated and far from generally accepted. Especially not in the geological sea level community (cf. Mörner, 2004, Fig. 4), where we realize that the tide gauges quite frequently are installed in unstable local position, and I quote (from Mörner et al., 2004): "Tide gauge records, however, do not provide simple and straight-forward measures of regional eustatic sea level. They are often (not to say usually) dominated by the effects of local compaction and local loading subsidence. With this perspective, our multiple morphological and sedimentological records appear more reliable and conclusive" (cf. Mörner, 2007). This makes the requited "correction" for land motion at the tide gauge very delicate and subjective.

The nice and interesting thing with the graph under discussion (Mörner, 2004, Fig. 2) is that it represents the readings before all these interpretational "corrections". The situation is illustrated in Fig. 1. The satellite readings need technical adjustments (for the individual instruments, T/P-A, T/P-B and Jason, as well as for the integrated reading). This record (my Fig. 2 of Mörner, 2004) gave a sea level change of ±0 mm/yr (MEDIAS, 2000; Aviso, 2000; Mörner, 2004).

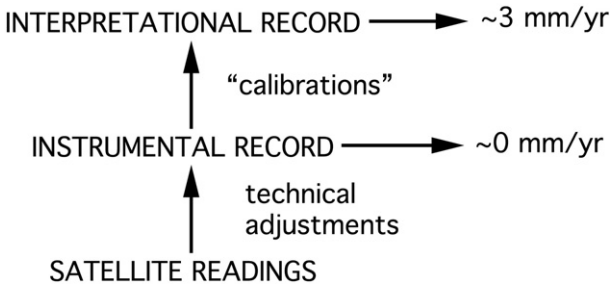

Fig. 1. Satellite altimetry instrumental readings (P/T-A, P/T-B, Jason) are in need of technical adjustments in order to provide an "instrumental record". This record gives no rise in sea level (Mörner, 2004, Fig. 2; MEDIAS, 2000; Aviso, 2000), or at the most a very slight rise of <0.5 mm/yr (Mörner, 2007, Fig. 5; cf. Aviso, 2003, 2008). The group commenting (Nerem et al., 2007) on my paper (Mörner, 2004), argue for additional "calibrations". All those "calibrations" are of quite subjective nature and very strongly debated. What they are driving for is therefore, in fact, an "interpretational record" — not a measured record. That is exactly the difference in our graphs. And I argue that my graph fits the geological data base much better that their "interpretative record" does.

E-mail address: morner@pog.nu.

0921-8181/$ – see front matter
doi:10.1016/j.gloplacha.2008.03.002

Later, a number of "calibrations" were added, giving an "interpretational record" of 2.3 mm/yr (Aviso, 2003), today given as 3.0 mm/yr (Aviso, 2008). I question all those quite personal "corrections" and prefer the uncalibrated "instrumental record"; in 2000 giving no rise (±0 mm/yr) and in 2003 and 2008 giving zero to a slight rise (<0.5 mm/yr; cf. Mörner, 2005).

In conclusion, what I call "instrumental record" (Fig. 1) is what we obtain from satellite altimetry reading. What is widely referred to as satellite altimetry of global sea level rise is, in fact, obtained after a number of quite personal "calibrations", and hence only provides "an interpretational record" (Fig. 1).

So far, the vertical changes in sea level. What is perfectly unique with satellite altimetry, however, is the documentation of the horizontal redistribution of water masses in the last 15 years. Weather absolute or relative on a vertical scale, it records significant variations on the horizontal scale. It should be remembered, however, that such lateral variations were recorded long ago, on the decadal to centennial bases, by our geological observational data (e.g. Mörner, 1996).

Finally, this is the background why INQUA (2000) proposed that the sea level change by year 2100 would be in the order of +10 cm ±10 cm, a value later updated to +5 cm ±15 cm (Mörner, 2004).

References

Aviso, 2000. Observing the oceans by altimetry. www.aviso.cis.cnes.fr.
Aviso, 2003. Observing the oceans by altimetry. www.aviso.cis.cnes.fr.
Aviso, 2008. Mean Sea Level as seen by altimeters. www.avsio.oceanobs.com.
Cazenave, A., Nerem, R.S., 2004. Present-day sea level change: observations and causes. Rev. Geophys. 42, 1–20 RG3001.
Douglas, B.C., 1991. Global sea level rise. J. Geophys. Res. 96, 6981–6992.
Douglas, B.C., 1995. Global sea level changes: determination and interpretation. Rev. Geophys. 33, 1425–1432.
INQUA, 2000. Homepage of the INQUA Commission on Sea Level Changes and Coastal Evolution. www.pog.su.se/sea (from 2005: www.pog.nu).
Leuliette, E.W., Nerem, R.S., Mitchum, G.T., 2004. Calibration of TOPEX/Poseidon and Jason altimeter data to construct a continuous record of mean sea level change. Mar. Geod. 27, 79–94.
MEDIAS, 2000. Satellite-based altimetry reveals physical ocean. Medias Newsletter 12, 9–17.
Mitchum, G.T., 2000. An improved calibration of satellite altimetric heights using tide gauge sea levels with adjustment for land motion. Mar. Geod. 23, 145–166.
Mörneer, N.-A., 1996. Sea level variability. Z. Geomorph. 102, 223–232 N.F., Suppl-Bd.
Mörner, N.-A., 2004. Estimating future sea level changes from past records. Global Planet. Change 40, 49–54.
Mörner, N.-A., 2005. Sea level changes and crustal movements with special aspects on the eastern Mediterranean. Z. Geomorphol. 137, 91–102 N.F., Suppl.
Mörner, N.-A., 2007. Sea level changes and tsunamis, environmental stress and migration overseas. The case of the Maldives and Sri Lanka. Int. Asien-forum 38, 353–374.
Mörner, N.-A., Tooley, M., Possnert, G., 2004. New perspectives for the future of the Maldives. Global Planet. Changes 40, 177–182.
Nerem, R.S., Cazenave, A., Chambers, D.P., Fu, L.L., Leuliette, E.W., Mitchum, G.T., 2007. Comment in "Estimating future sea level changes from past records" by Nils-Axel Mörner. Global Planet. Change 55, 358–360.