**Accuracy requirements for detecting changes in sea level**

Graham Quartly

Some climate models have suggested that global warming will accelerate sea level rise, which is clearly a strong motivation for maintaining a high-quality altimetric observing system. This raises the question:

- How long is needed to detect a change?
- What is the effect of loss of continuity?

This paper explores methodology to answer these issues and to complement the assessment and the numbers placed on the literature.

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**Monte Carlo Simulations**

- Illustrate the credibility of the trend estimated from a sequence of altimetric missions.
- Consider results of an ensemble of experiments on the same or similar altimetric observing system and of different observing systems.
- Compare results from different observing systems.

**Combining Error Sources**

- Black and red curves show that a complete solution to the problem of estimating confidence intervals for the trend requires the assessment of both these error sources.
- Light blue curves show that a simple model, when used in a deterministic way, is not adequate to estimate the variability of the observed trend.

**Conclusions**

- Emphatically, errors are much more severe when step changes occur in the data rather than when trends are linear.
- Independent altimetric observing systems (e.g. ENVISAT) have been shown to reduce the uncertainty and hence the error in trend estimation.

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**What do we know of the future?**

- We do not have a true altimetric observing system only a system drift “within 1 mm/yr”. Here this is interpreted as the uncertainty should be less than 0.5 mm/yr.

**Present**

- What are our present capabilities?

**Future**

- What do we know of the future?

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**Acknowledgements**

We are very thankful to the editors for making this contribution a high-impact paper. We are also grateful to the referees for making their comments on the clarity of the paper. We would like to thank the National Aeronautical Cosmonautics for their support.

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**References**


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**Image**

Illustration of Monte Carlo technique. The grey line indicates the real MSL time series; the coloured segments are individual 5-year missions based on “truth”, but with small random drift and inter-satellite biases (i.e. a year after the third mission began).

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