Evaluating and Interpreting the Global and Regional Sea Level Climate Record

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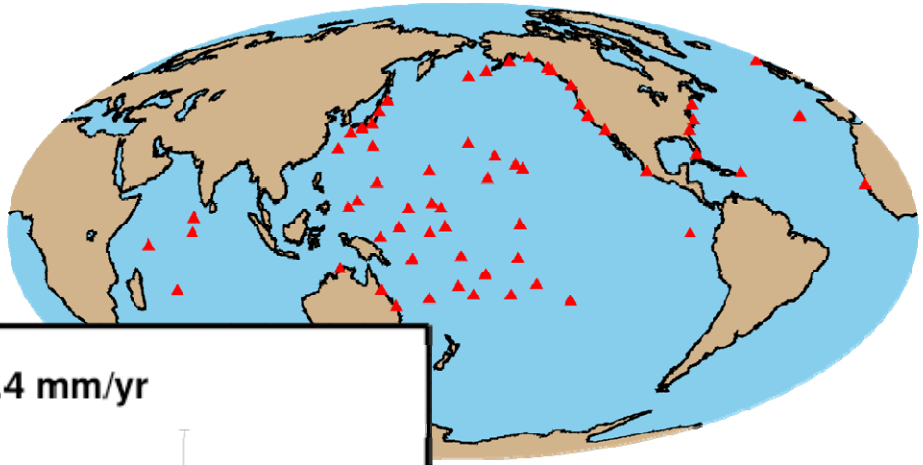
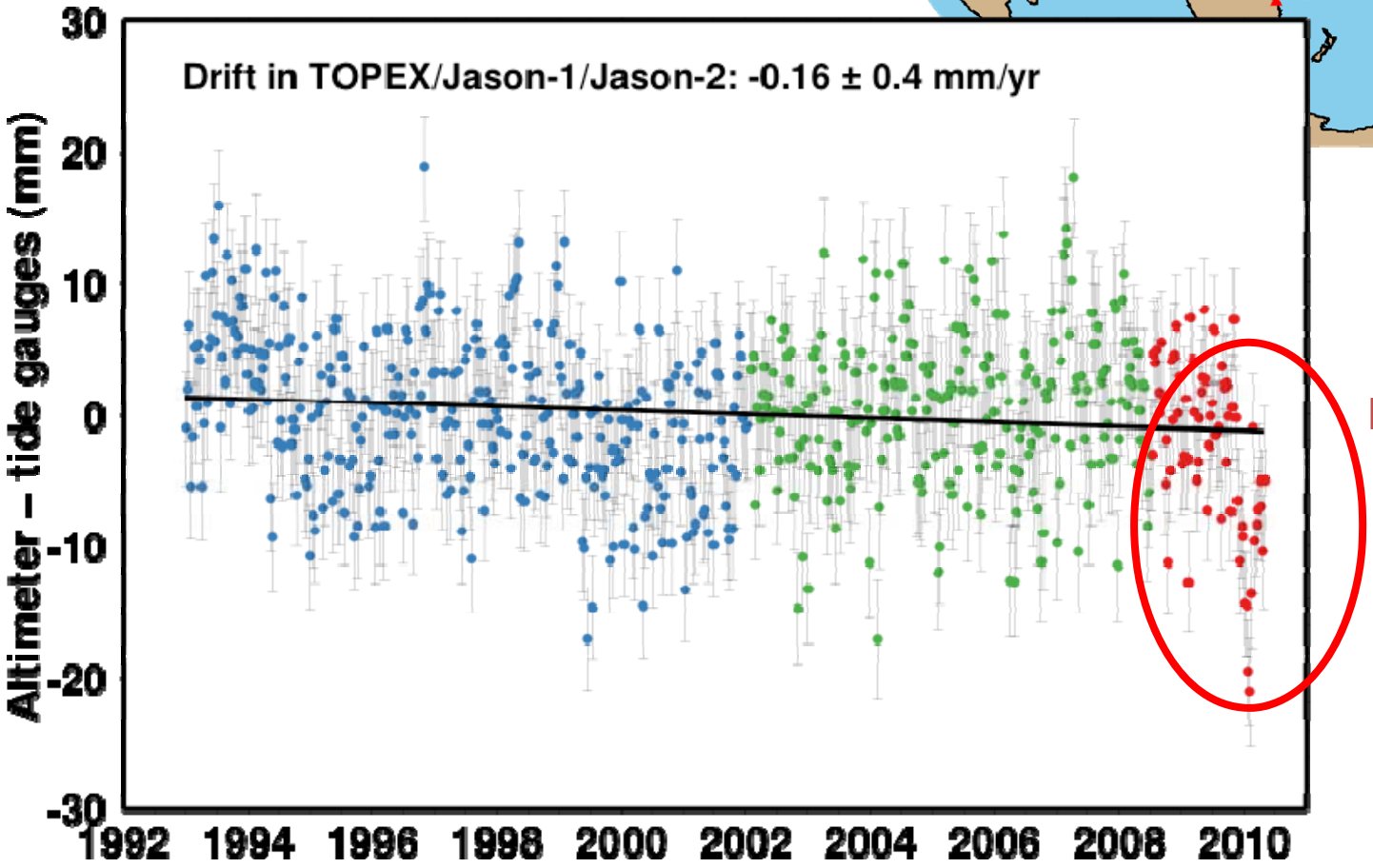
Tide gauge calibration

Mitchum tide gauge calibration

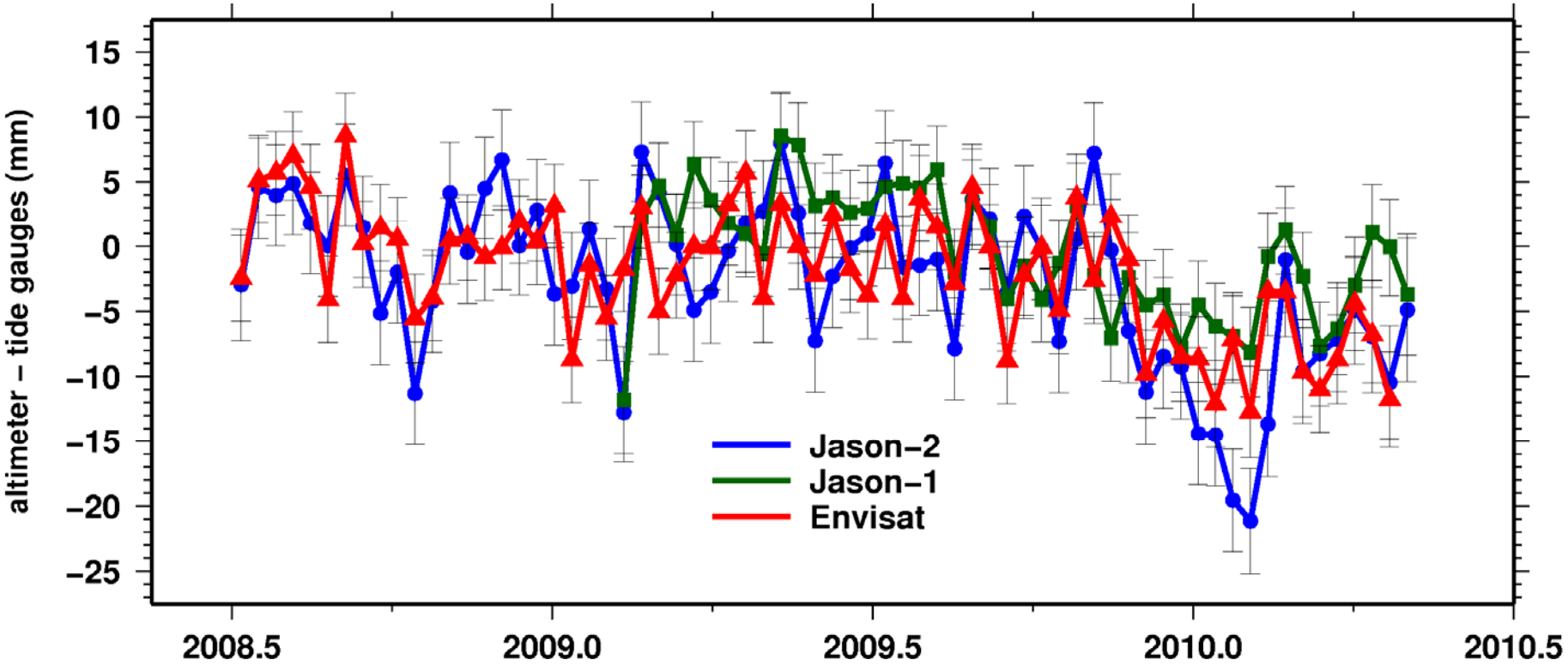
"Single mission" TX/J1/J2 combination calibration





Jason-2 ~1 cm offset in November 2009?

Recent drift/offset in all altimeters



Apparent drifts/offsets in the altimeter — tide gauge residuals for Jason-1, Jason-2, and Envisat in late (November) 2009.

Possible causes of offset/drift

Common to all altimeter calibrations

Tide gauges

- Instrument and datum shifts
- Vertical land motion

Meteorological fields

- Inverted barometer correction is not applied for calibration
- Dry troppsphere

Reference frame

Independent causes

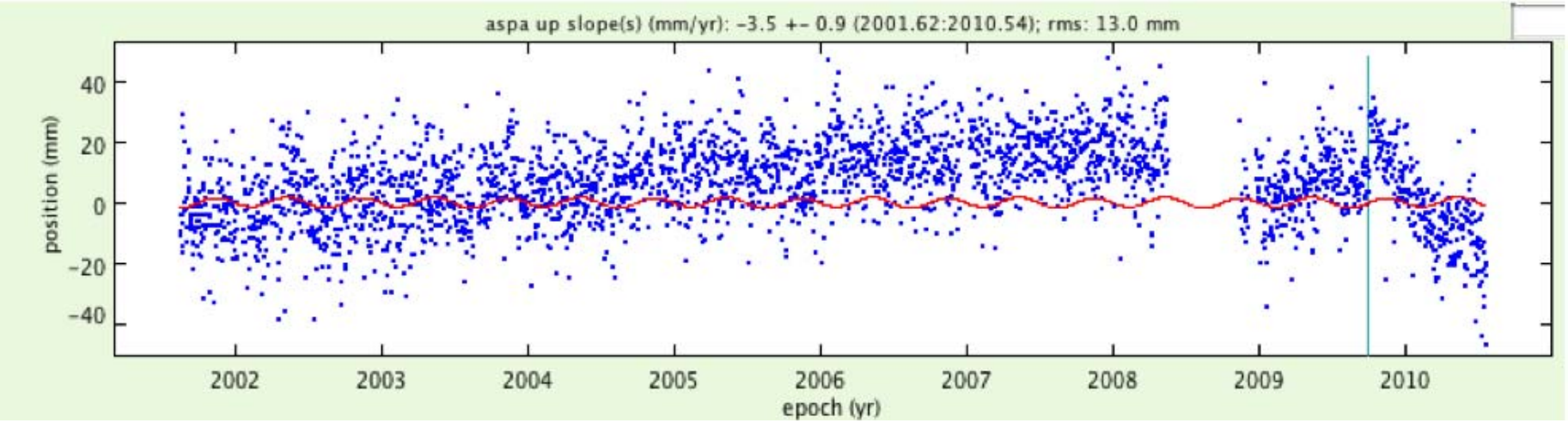
- Wet troposphere

Earthquakes near gauges

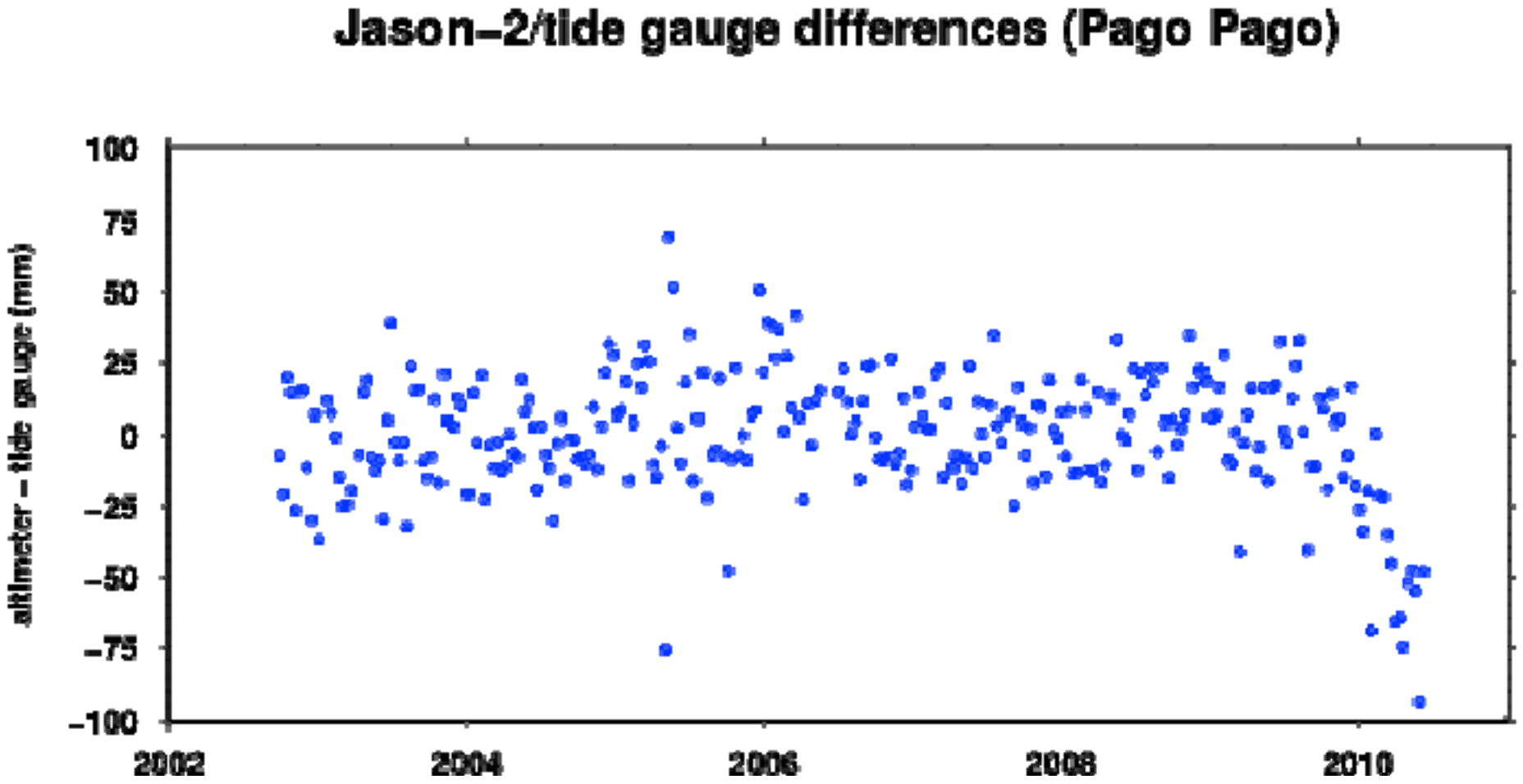
Two relatively large earthquakes struck near gauges at roughly the time of the offset

- M 7.3, 100 km, Suva, Fiji, 9 November 2009
- M 6.8, 135 km, Nuku'Alofa, Tonga, 24 November 2009.

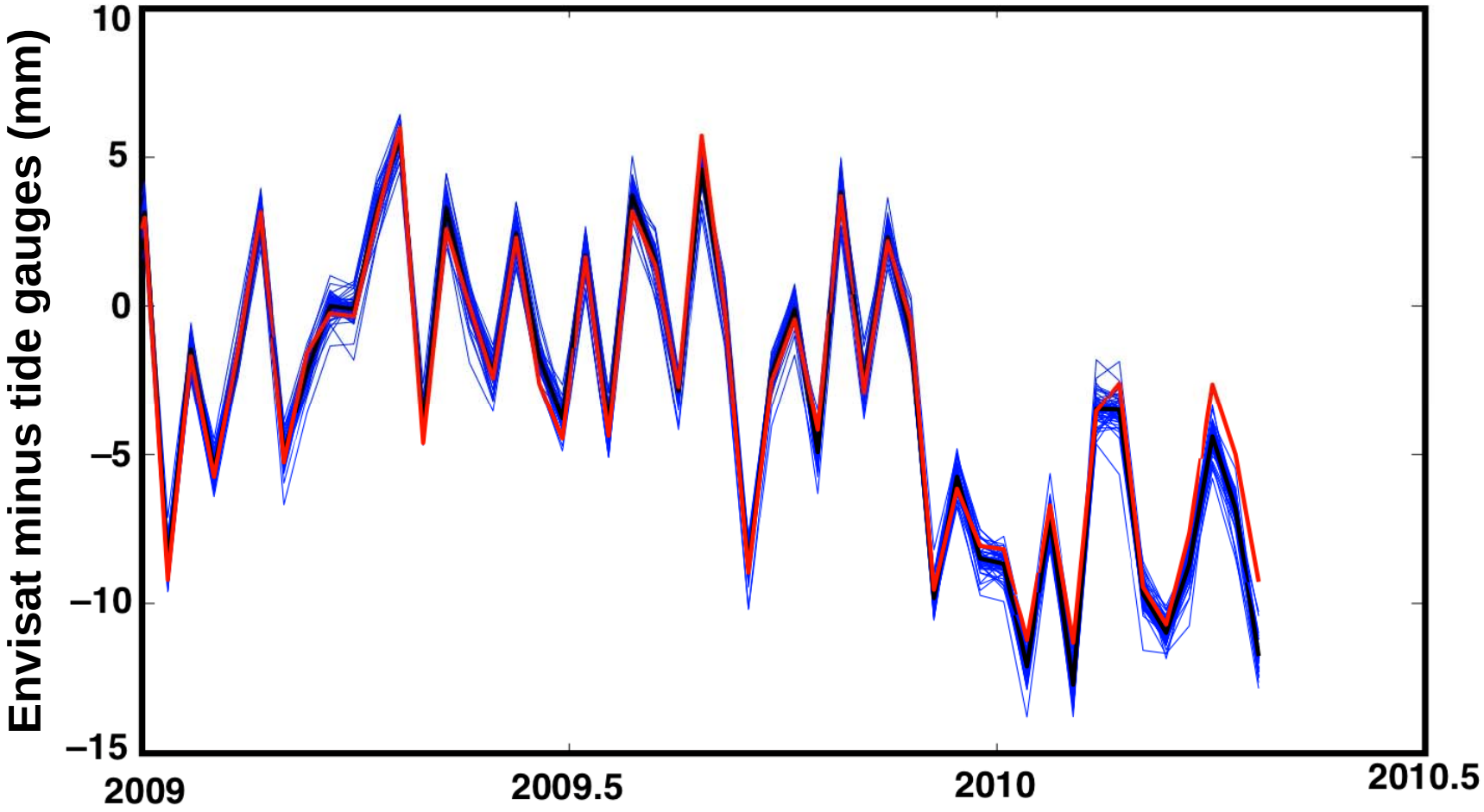
GPS vertical motion at Suva



Problem with a single tide gauge?



Eliminate single gauges

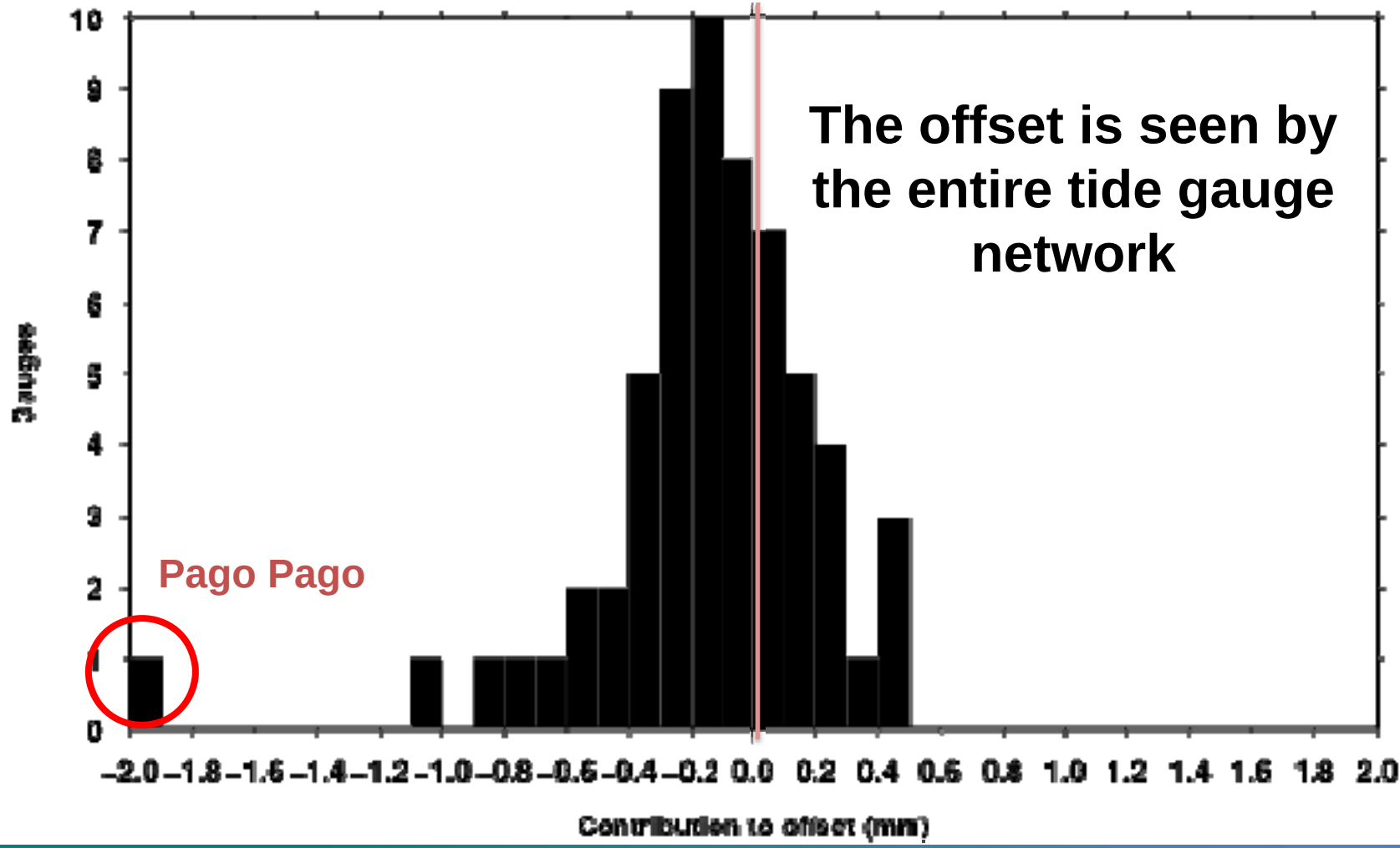


Drift series results when one station at a time is excluded from the analysis. The red line excludes Pago Pago.

Contributions to offset from gauges

Contribution to Jason-2 offset from individual tide gauges

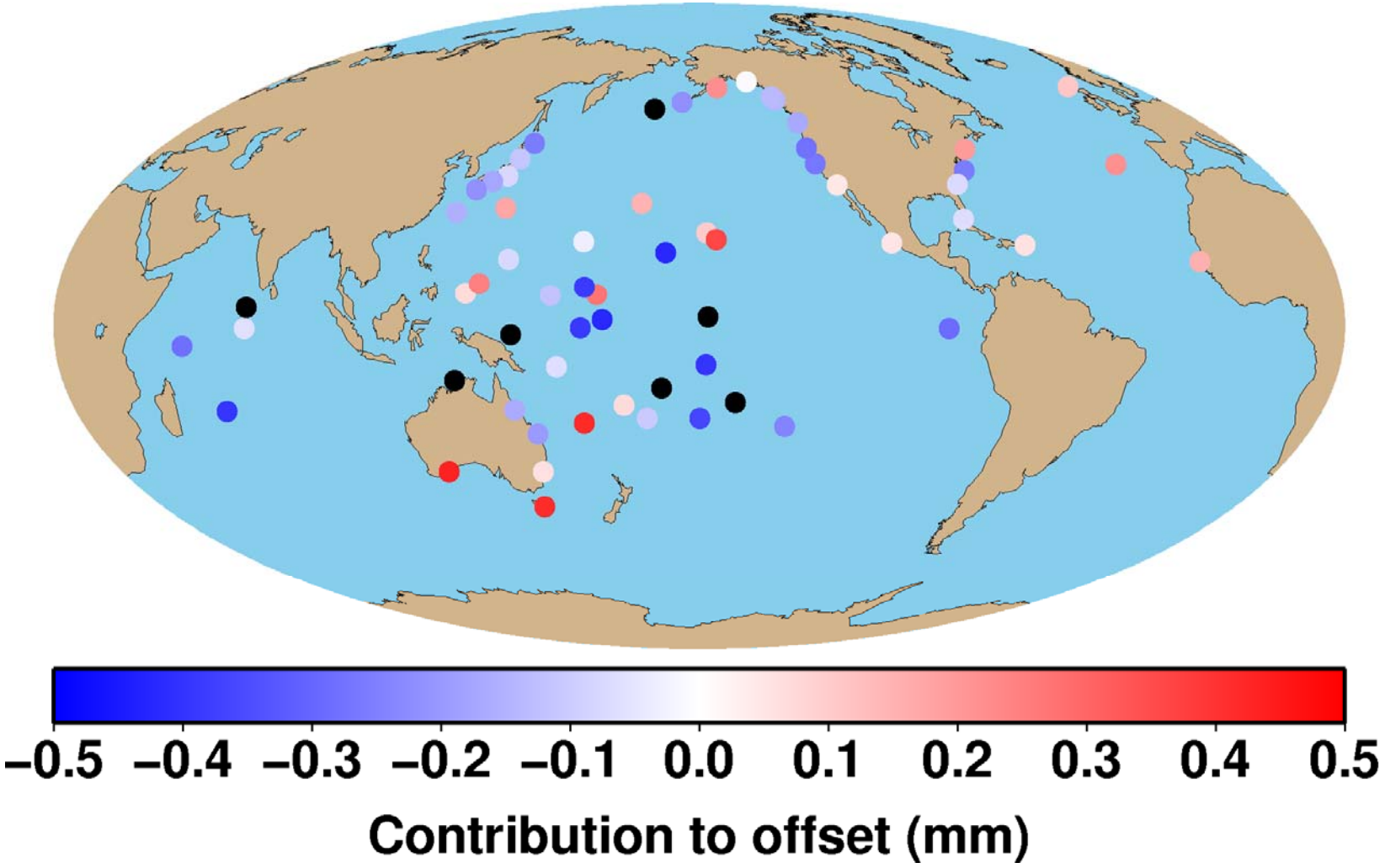
- weighted differences in mean bias for Nov. 2009 ± 5 months



Geographical correlation?

Contribution to Jason-2 offset from individual tide gauges

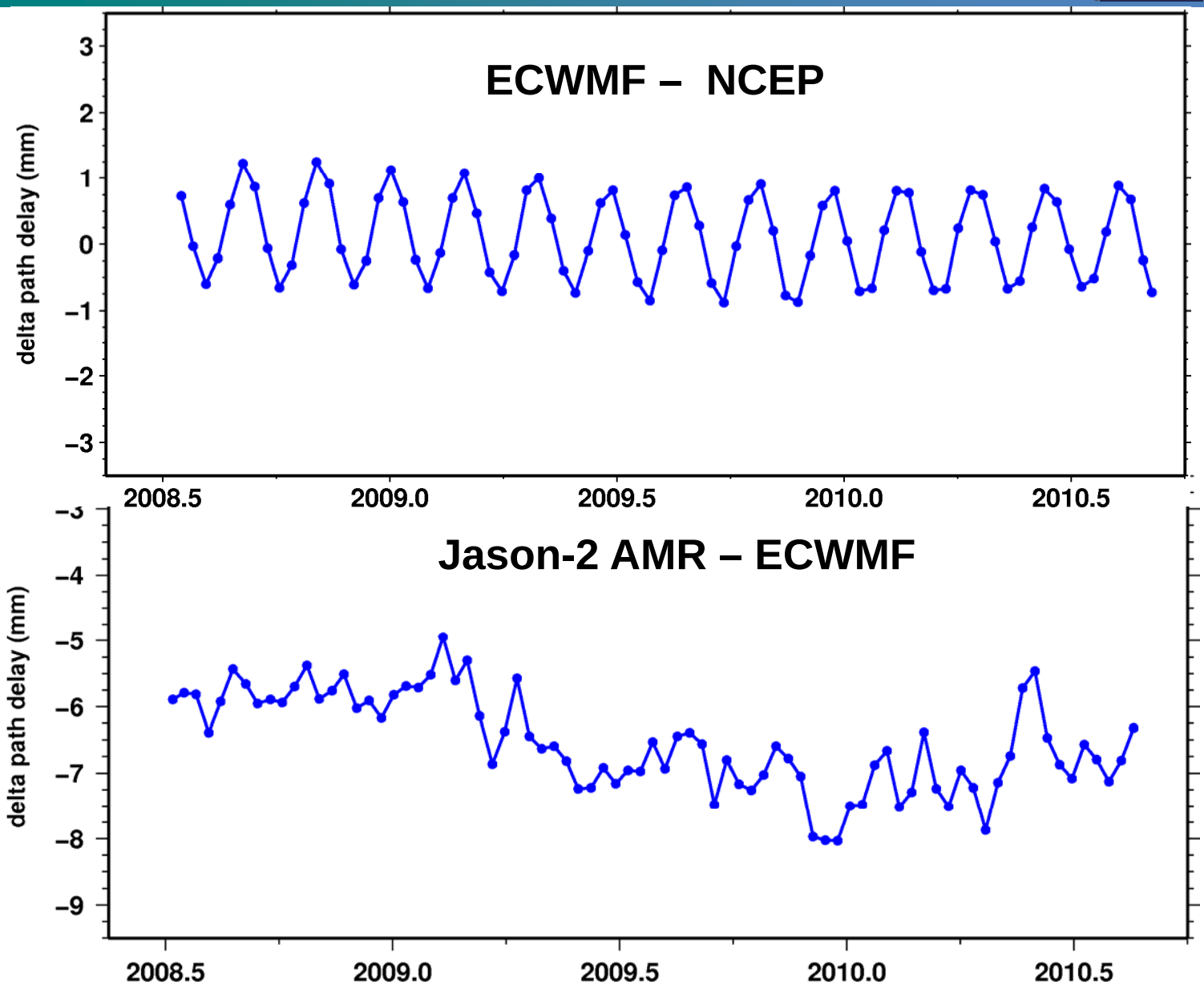
- weighted differences in mean bias for Nov. 2009 ± 5 months



Global offsets in meteorological fields?

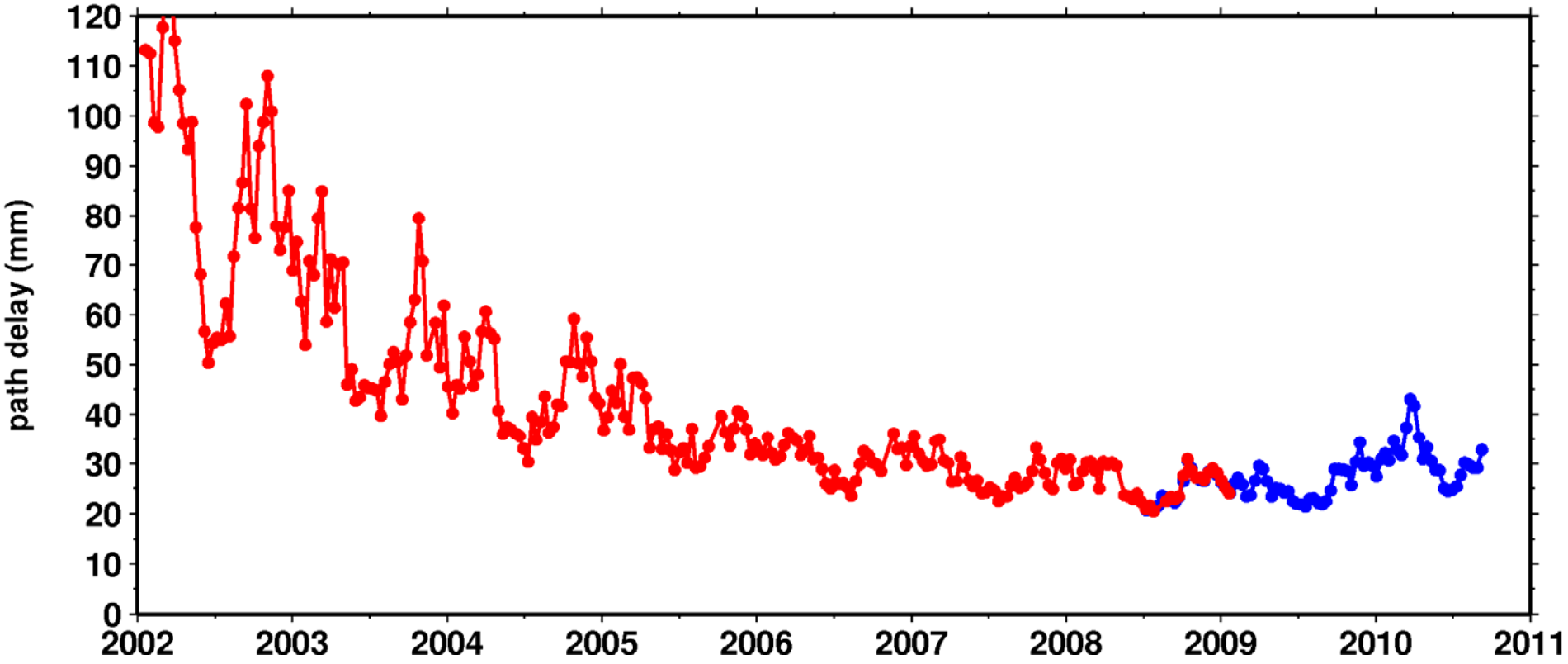
Dry

Wet



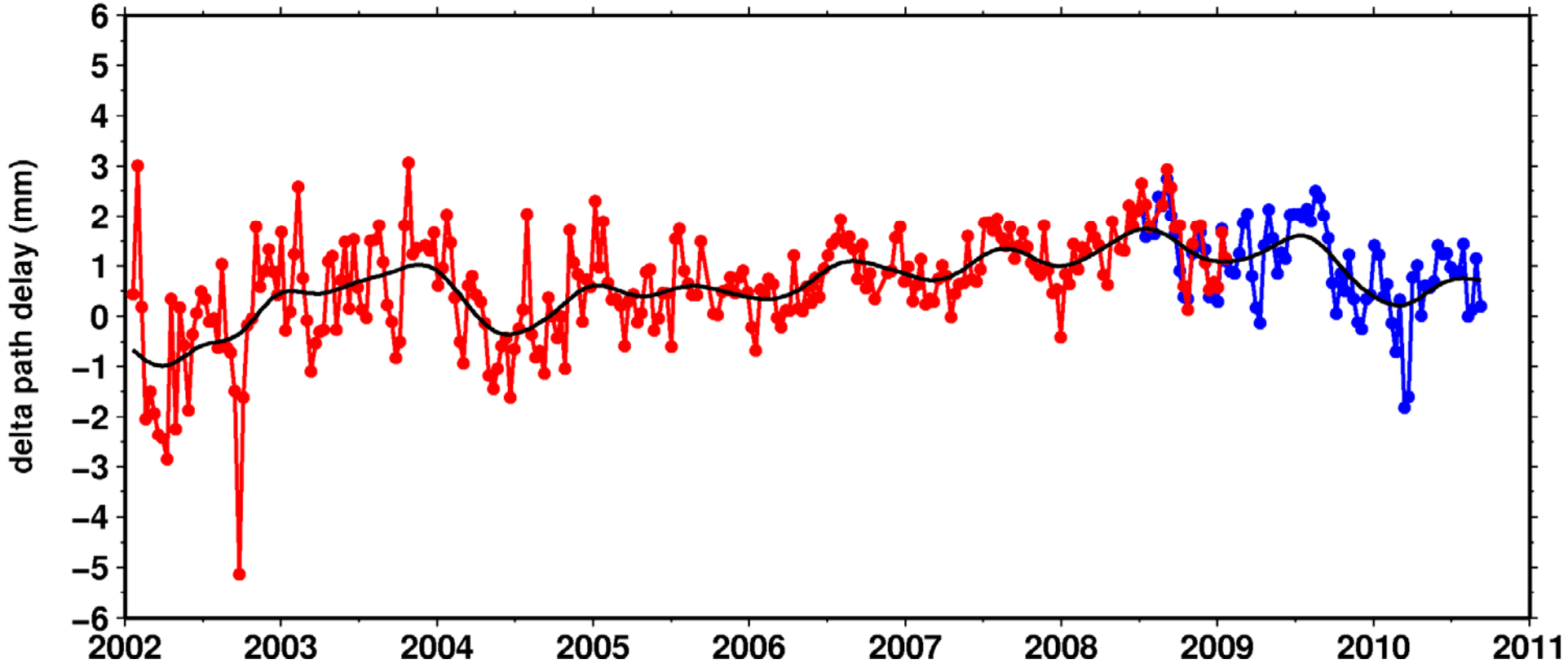
Ionosphere

Jason-1 and Jason-2 dual frequency



Ionosphere

Jason-1 and Jason-2 dual frequency — NIC09



Conclusions

For the complete TX/J1/J2 time series, the drift estimate (–0.16 ± 0.4 mm/yr) is consistent with no drift within the uncertainty in the calibration.

Earthquakes explain 2 – 4 mm of the offset.

An offset/drift around Nov. 2009 appears to be common to three altimeters and the majority of the tide gauge network.

Sources we can exclude:

- Single tide gauge vertical offsets
- Global shifts in meteorological corrections

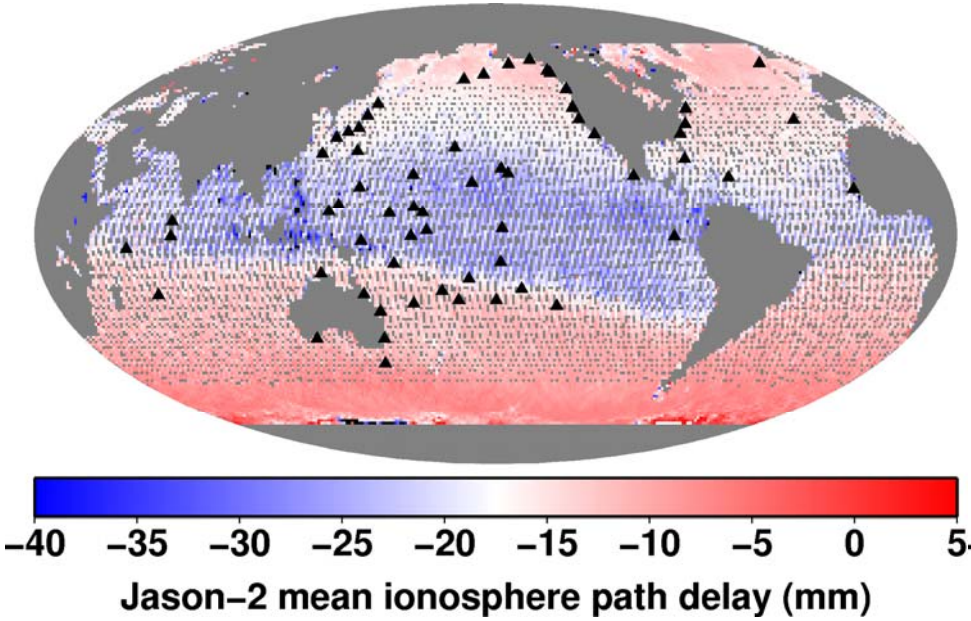
Other possibilities:

- Tide gauge sampling bias from local effects in one of the corrections?

Tide gauge sampling bias?

Mean of dual-frequency ionosphere correction

Cycles 33–51



Cycles 52–70