Using ExtR Method to Retrack Satellite Radar Altimetry Waveforms, Case Studies: Caspian Sea and Persian Gulf

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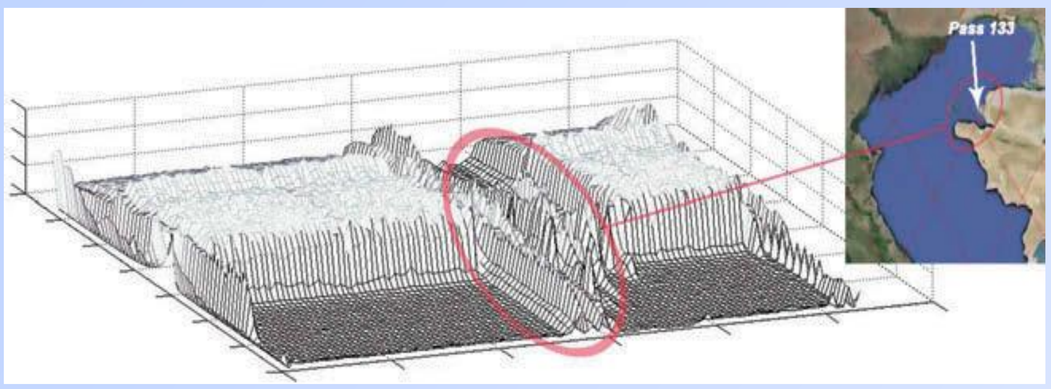
Abstract

Satellite radar altimetry according to their high precision, vast coverage and dense spatial resolution has a wide application in study of oceans, inland body of waters. Unfortunately the altimetry data products become erroneous in some regions such as shallow water, coast lines, Ice-sheet and rivers due to the variety of reasons such as effect of land topography and atmospheric conditions. Here in this study we investigate influence of inland body of water especially coast lines on two satellite radar altimetry include TOPEX/POSEIDON and JASON-1 in Caspian Sea and Persian Gulf. Our effort is consist of two main parts: first, we used three present retracking methods consist of OCOG (Off Center Of Gravity), NASA β parameter and threshold retracking. Afterward, in second part, waveforms are retracked with our new approach called 'ExtR retracking method'. At the end, results of both parts are comparing with in-situ measurements. Although the results in both parts show significant improvement in SSH time series as well as SSH profiles, ExtR retracking method has minimum error and bias. The new retracking method represents much more correlation to the tide gauges as well.

Waveforms

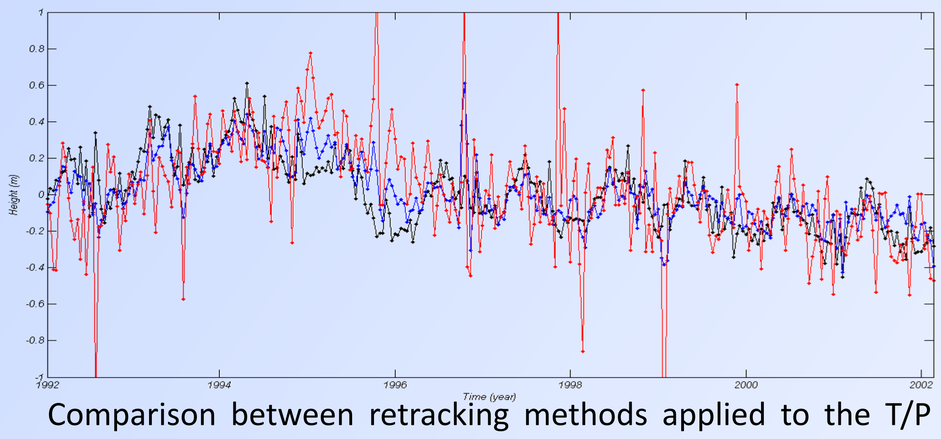


The left graph represents a schematic view of all the waveforms in pass 133 of cycle number 151 from the TOPEX/Poseidon mission over Caspian Sea (pass 133)

Results

Result of retracking

Satellite / Tide guage	TOPEX/Poseidon				Jason-1			
	Before retracking		After retracking		Before retracking		After retracking	
	Mean value	RMS	Mean value	RMS	Mean value	RMS	Mean value	RMS
Anzali	1.2151	0.9614	0.9947	0.9118	0.8754	1.9332	0.7981	1.1085
Noshahr	0.9691	2.1088	0.7641	0.8235	0.9378	2.3507	0.8622	0.9678
Neka	2.0436	4.5321	1.8794	2.1786	1.9612	3.9043	0.9542	1.9518



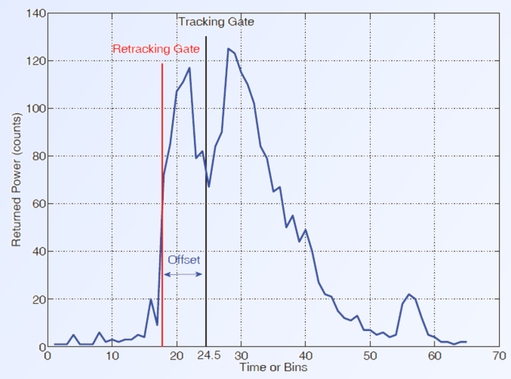
Comparison between retracking methods applied to the T/P observations close to the Anzali Port. Figure 9(a) includes the SSH time series derived from in situ observation (black), the GDR data (red), and retracked time series using the ExtR method (blue).

Procedures

1) Noise elimination
   1-1) Outlier detection
   1-2) Noisy waveforms
   totally 7.9% of waveforms are excluded
2) Waveform classification
   the waveforms are located in 4 different groups
3) Retracking
4) Compare with in-situ data

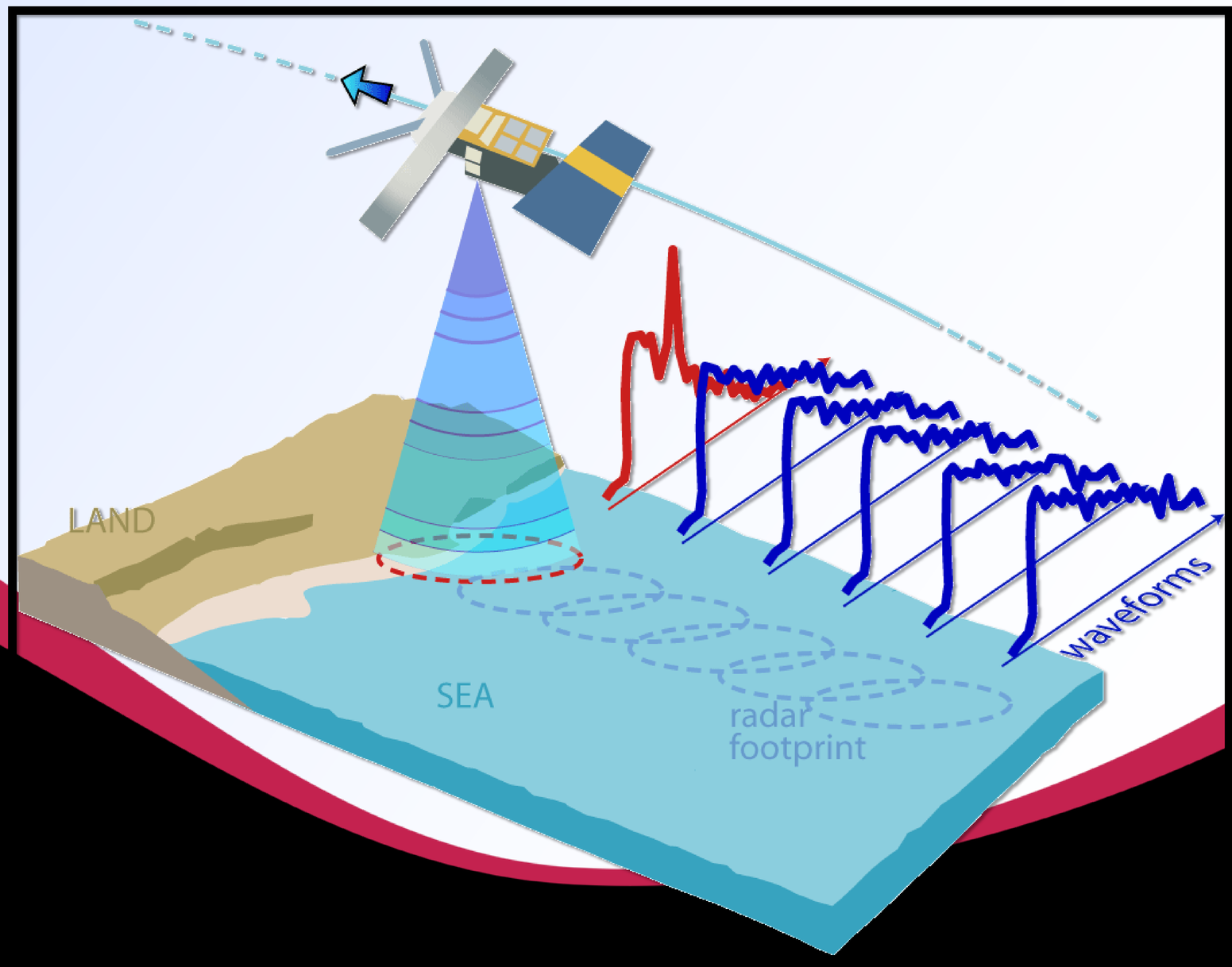
Methods

1) β parameter retracking
2) OCOG (off center of gravity) retracking
3) Threshold retracking
4) * Extrema retracking method



Conclusion

In this study we develop an algorithms to deal with erroneous data achieved T/P and Jason-1, we worked on three main subjects, first eliminate of noisy waveforms; second unsupervised classification and third retracking. Addition to previous methods a new algorithm for retracking represent. We believe that the presented post-processing approach has improved the accuracy of altimetry-derived SSH estimations over the Caspian Sea and Persian Gulf, particularly over the coastal area. This was evident from the validation of the retracking results with three available in situ observations.



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