Tidal Solution along Topex/Poseidon Track near Prigi Tidal Station

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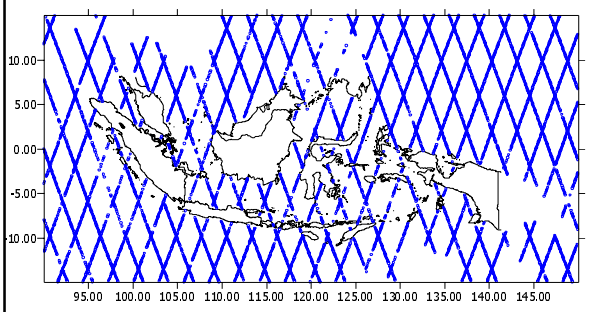
Introduction

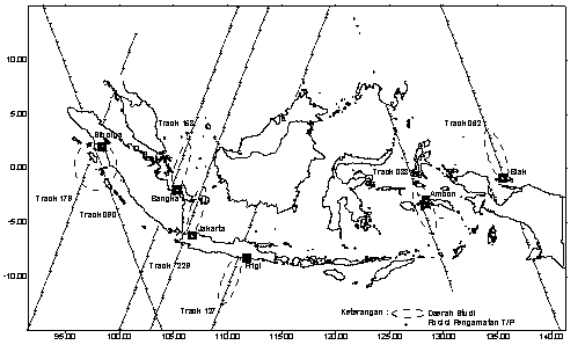
- Availability of TOPEX/Poseidon (T/P) data since 1992 to 2003
- Indonesia, a maritime country, is crossed by about 50 TOPEX/Poseidon tracks. Seven of which are almost coincide with six tidal station *(see Figure 1, 2)*
- About 53 tidal stations over 80.000 km shorelines
- Tidal information from along coast tidal stations are not representative of open ocean and internal water within Indonesia

Objective

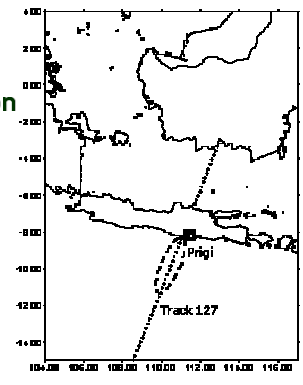
T/P Tracks Over Indonesia



T/P Tracks Across Over Tidal Stations



Track 127 Near Prigi Tidal Station



Back to Backgrounds

Objective

- To find an empirical tidal solution of 7 major tides (M2, S2, O1, K1, N2, P1, Q1) along track T/P sea level data near Prigi tidal station

Data

- T/P data is provided by NASA JPL PO.DAAC
- Five years T/P data spanning from Nov. 1994 to Dec. 1999 (about 189 cycles)
- Prigi tide gauge data of the same spanned time

Topex/Poseidon Data Processing

T/P Data

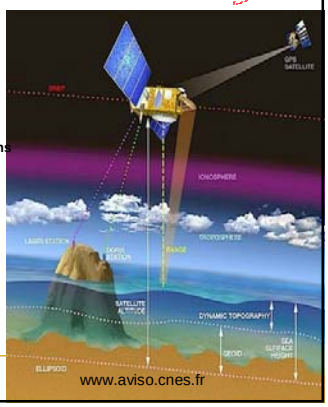
Sea Surface Heights (SSH) at normal points

Apply. corrections

Residual Sea Surface (RSS)

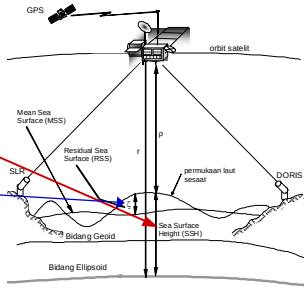
Time series of T/P data

(T/P Sea level data)



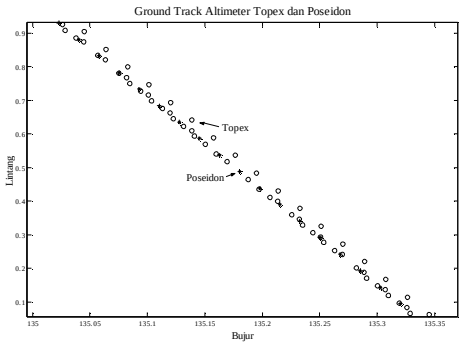
Topex/Poseidon Data Processing

- SSH = h – corrected ρ
- RSS = ζ = SSH – MSS – Tides – Inv.Bar

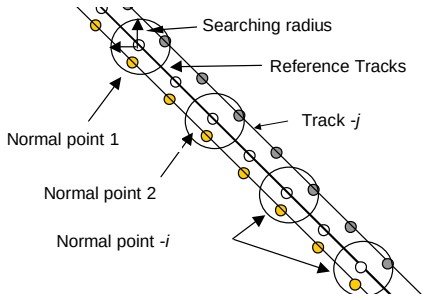


Pole tide, solid earth tide, Loading tide

Topex and Poseidon Ground Tracks



Normal Points Concept



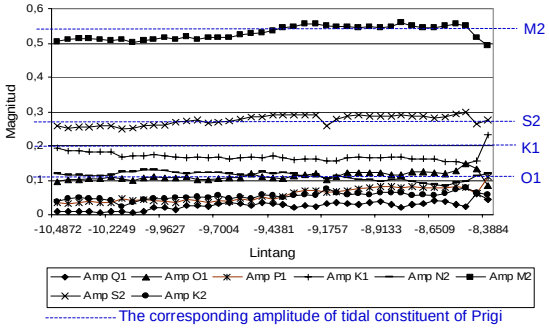
Tidal Analysis Method

- Using Least Square based on Thompson (1997) algorithm fit to major tides (M2, S2, O1, K1, N2, P1, Q1)
- Applying aliased frequencies of major tides
- Applying nodal correction relative to center of time of T/P data

Aliasing Periods

Tidal constituents	Period (hour)	Phase Advance	Aliased Periods (days)
Q1	26.8684	-51.4669	69.3575
O1	25.8193	78.0909	45.7111
P1	24.0659	-40.1588	88.8876
K1	23.9345	-20.6153	173.1538
N2	12.6583	-72.0467	49.5459
M2	12.4206	57.4754	62.1068
S2	12.0000	-60.7681	58.7417
K2	11.9836	-41.2007	86.6398

The Results:
Along tracks amplitudes of major tides from Topex/Poseidon



The Results

	Amplitude errors (%)			Mean Phase errors (^{0})
	Min.	Max.	Mean	
Q1	0,61	93,55	39,57	-59,97
O1	0,12	36,72	9,98	-121,41
P1	2,21	123,25	36,29	54,34
K1	4,71	25,29	17,54	-109,33
N2	0,61	50,44	27,59	89,76
M2	0,04	9,83	3,70	-200,96
S2	0,01	12,68	4,72	45,27

Conclusion

- Amplitude of 4 major ocean tides (M2, S2, O1 and K1) from T/P is almost the same as one resulted from Prigi tidal data
- However, the accuracy of resulted phases are still poor with different in sign and magnitude

Suggestion

- the amplitude of 4 major tides resulted from T/P altimetry tides may be used to map the type of tide over the open and internal waters of Indonesia

THANK YOU

Thanks to PO.DAAC NASA, Bakosurtanal & colleges at ITB