

2nd MEETING OF THE IHO TIDAL AND WATER LEVEL GROUP

27 - 29 APRIL 2010, STAVANGER, NORWAY



CHILEAN SEA LEVEL NETWORK

TSUNAMI FEBRUARY 27TH-2010

TSUNAMI SIGNALS IN A SEA LEVEL REGISTER

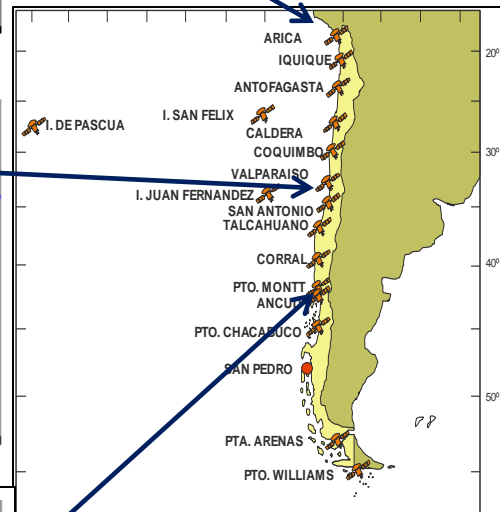
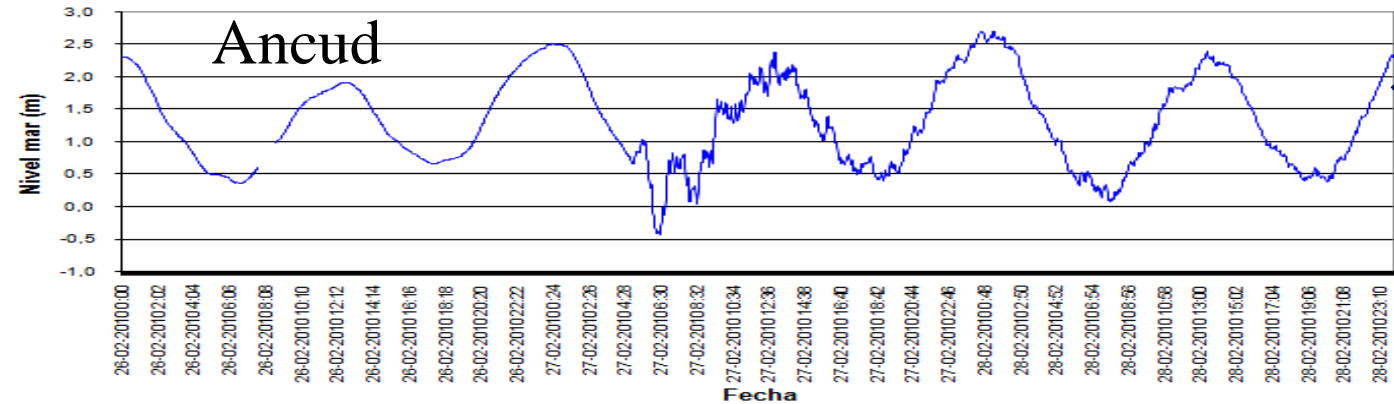
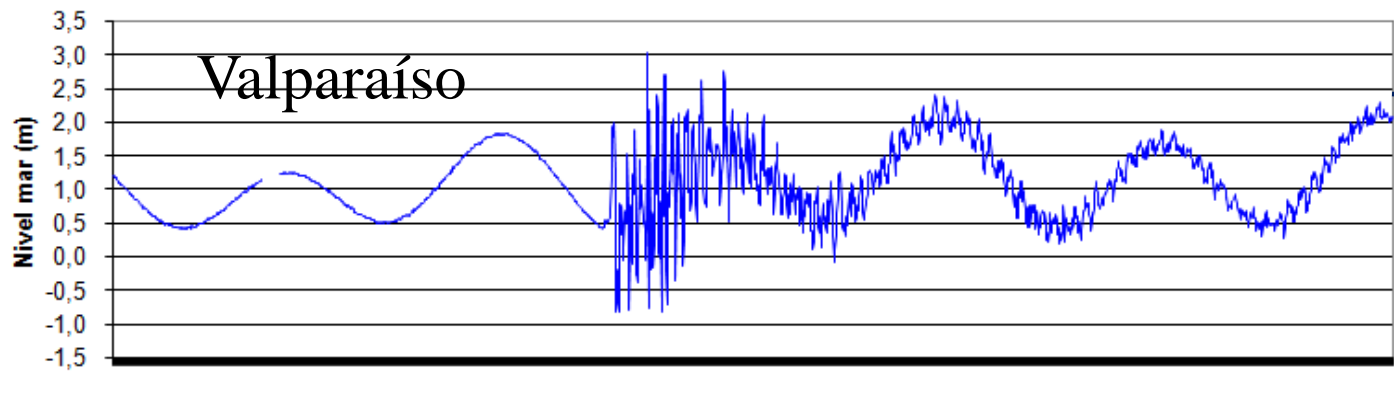
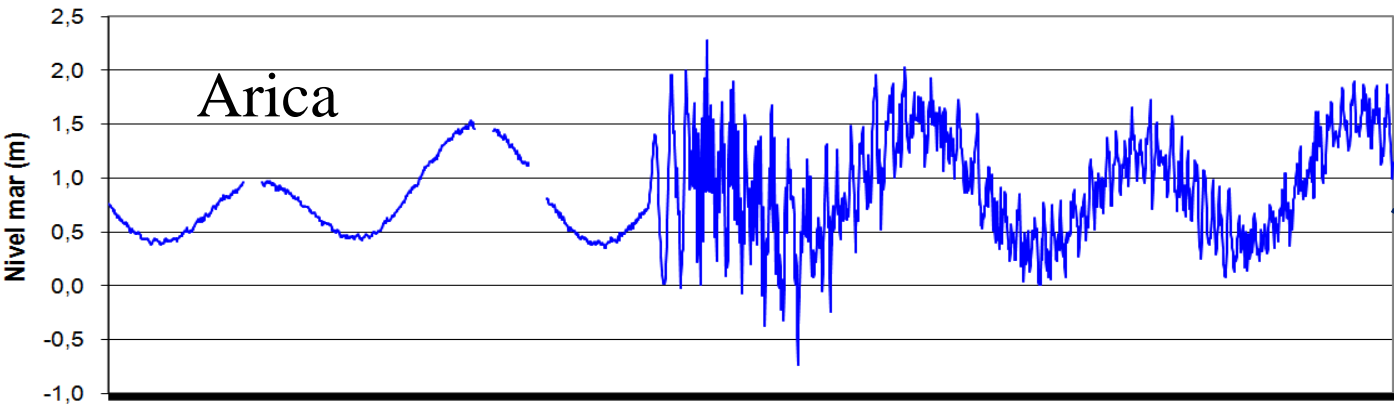
Juan Fierro C.

Lecture Overview

- Graphs of Tsunami Waves
- Sea Level Registers
- Rate of Changes of Sea Level
- General Notes for discussion



Sea Level Register 26-28 Feb 2010



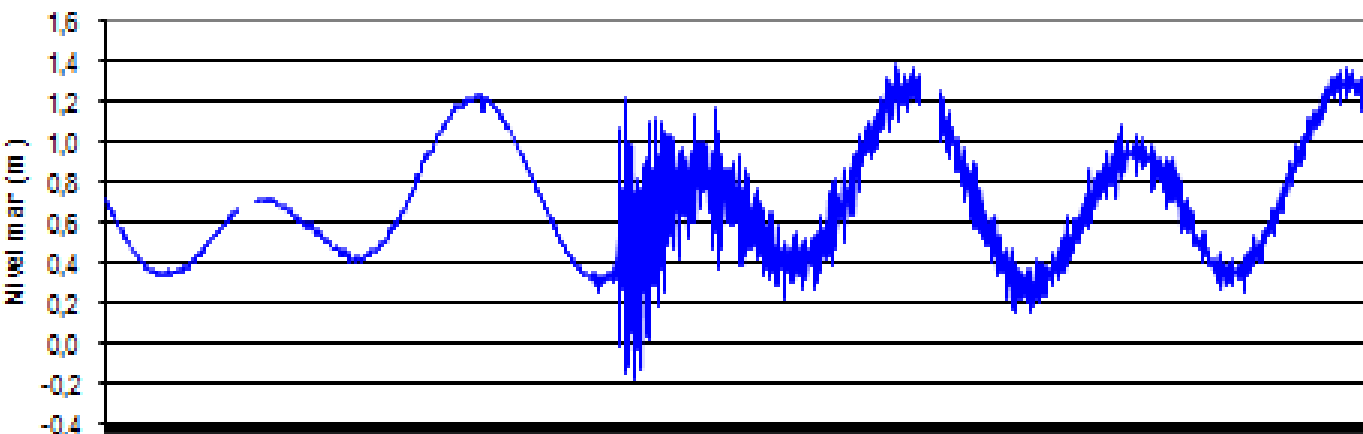
Sea level Heights referred to CD

Local Time

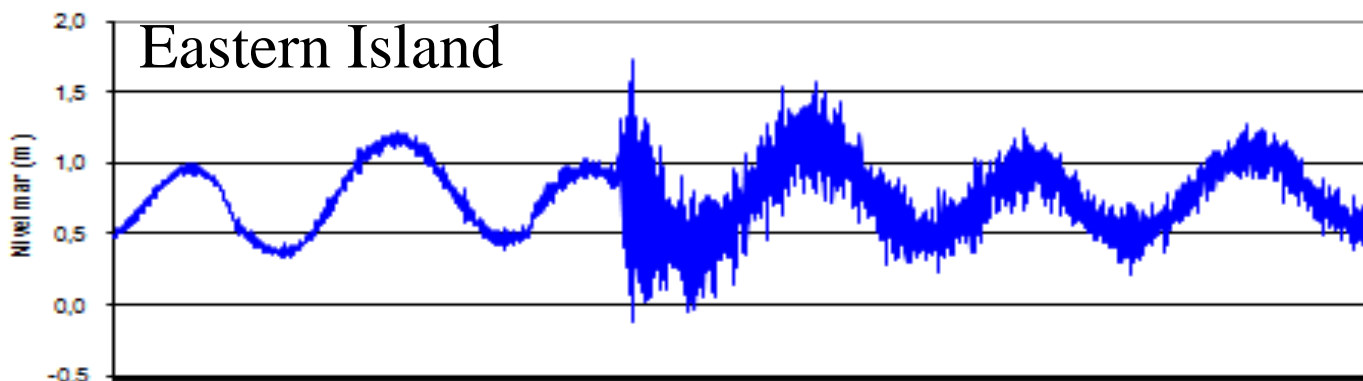


Sea Level Register 26-28 Feb 2010

San Félix Island



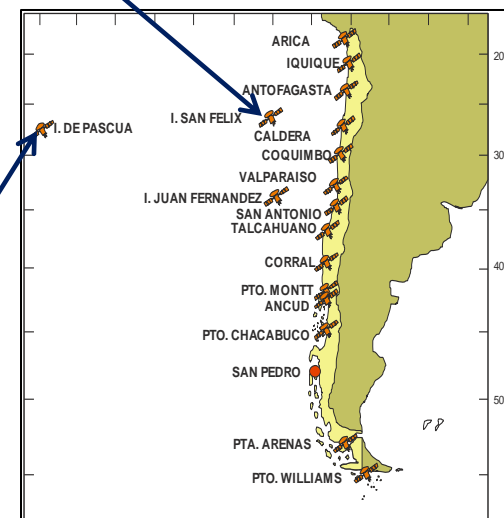
Eastern Island



26-02-2010 0:00
 26-02-2010 2:45
 26-02-2010 5:30
 26-02-2010 8:15
 26-02-2010 11:00
 26-02-2010 13:45
 26-02-2010 16:30
 26-02-2010 19:15
 26-02-2010 22:00
 27-02-2010 0:45
 27-02-2010 3:30
 27-02-2010 6:15
 27-02-2010 9:00
 27-02-2010 11:45
 27-02-2010 14:30
 27-02-2010 17:15
 27-02-2010 20:00
 27-02-2010 22:45
 28-02-2010 1:30
 28-02-2010 4:15
 28-02-2010 7:00
 28-02-2010 9:45
 28-02-2010 12:30
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 28-02-2010 20:45
 28-02-2010 23:30

Fecha

Chilean Islands



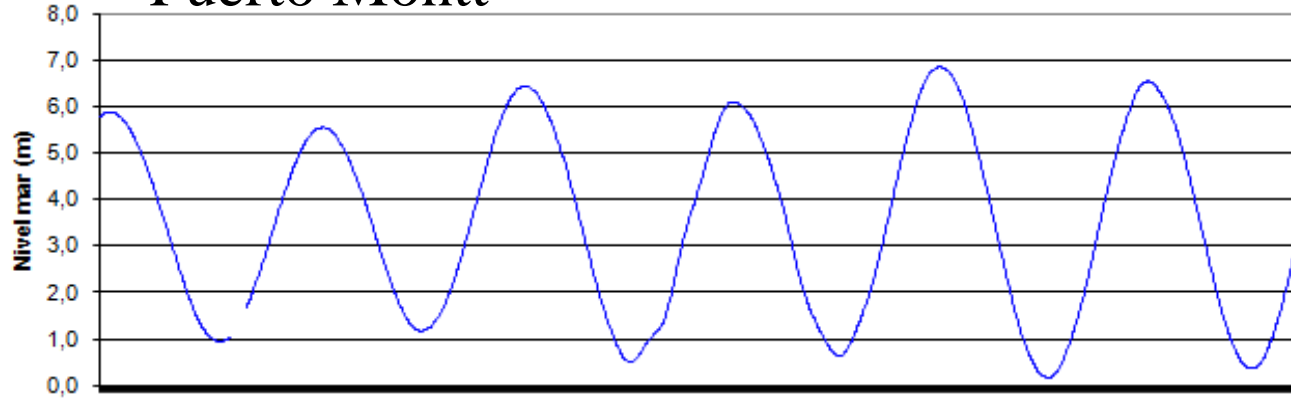
Sea level Heights referred to CD

Local Time

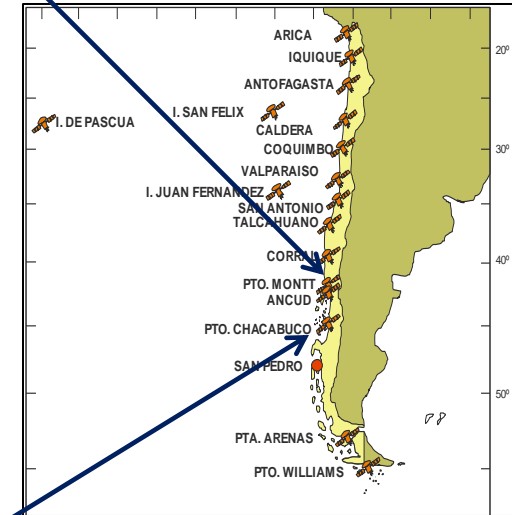


Sea Level Register 26-28 Feb 2010

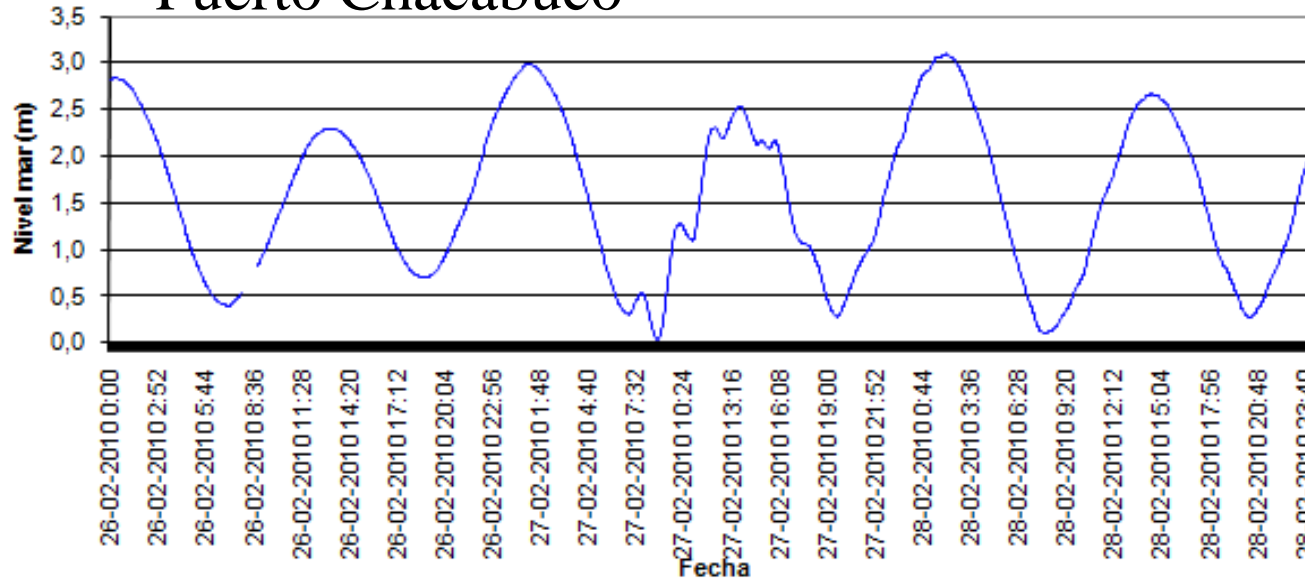
Puerto Montt



Inland Waters



Puerto Chacabuco

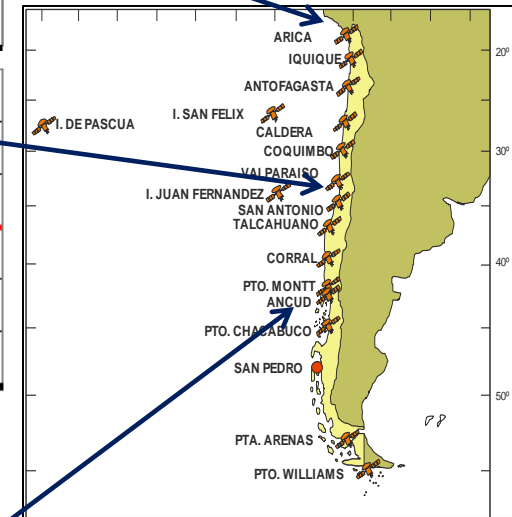
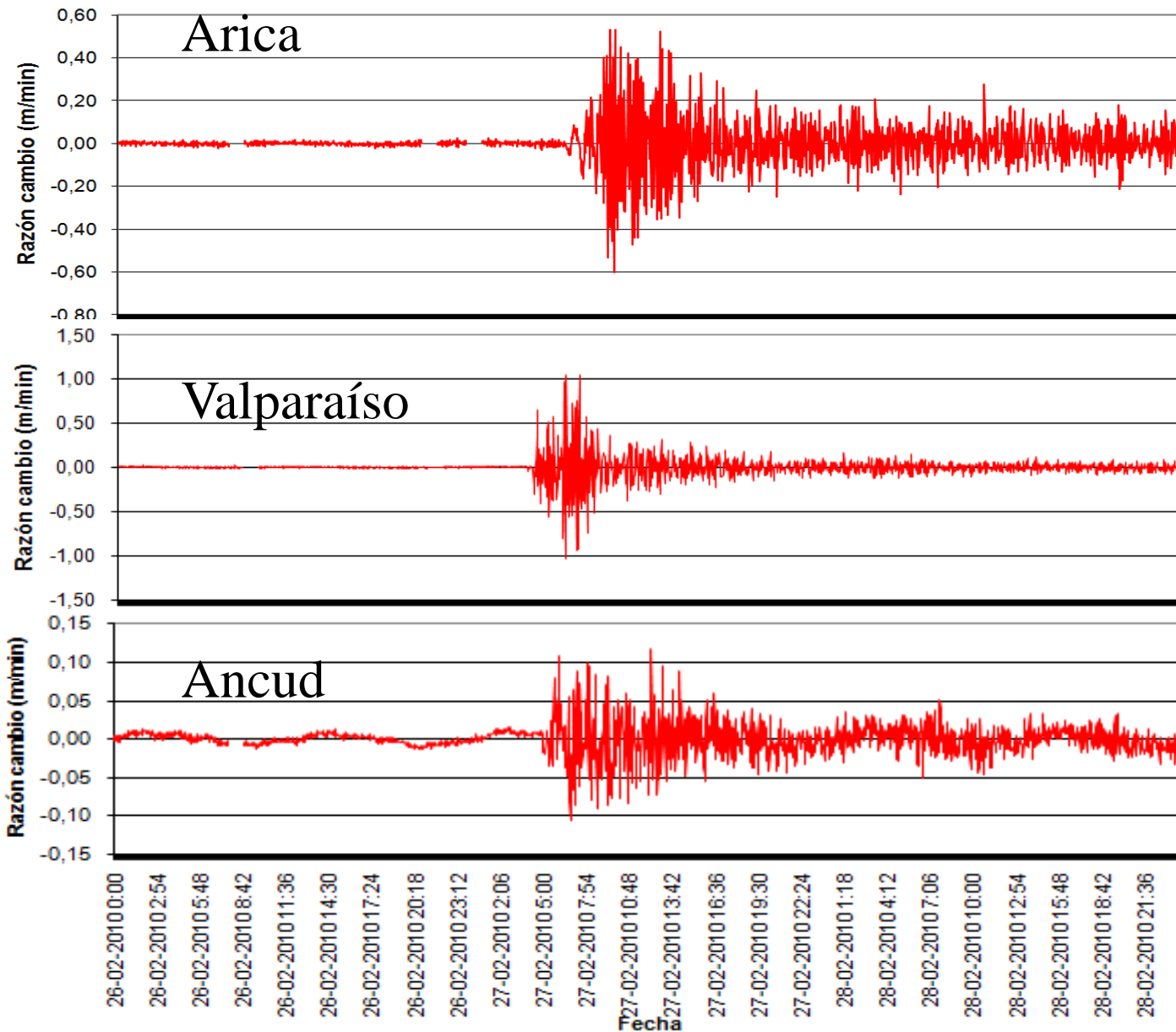


Sea level Heights referred to CD

Local Time

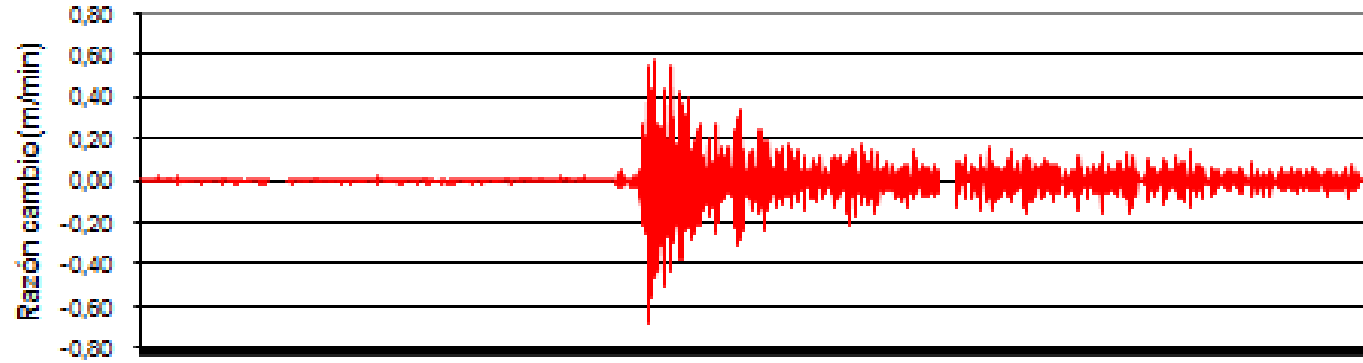


Rate of Changes of Sea Level

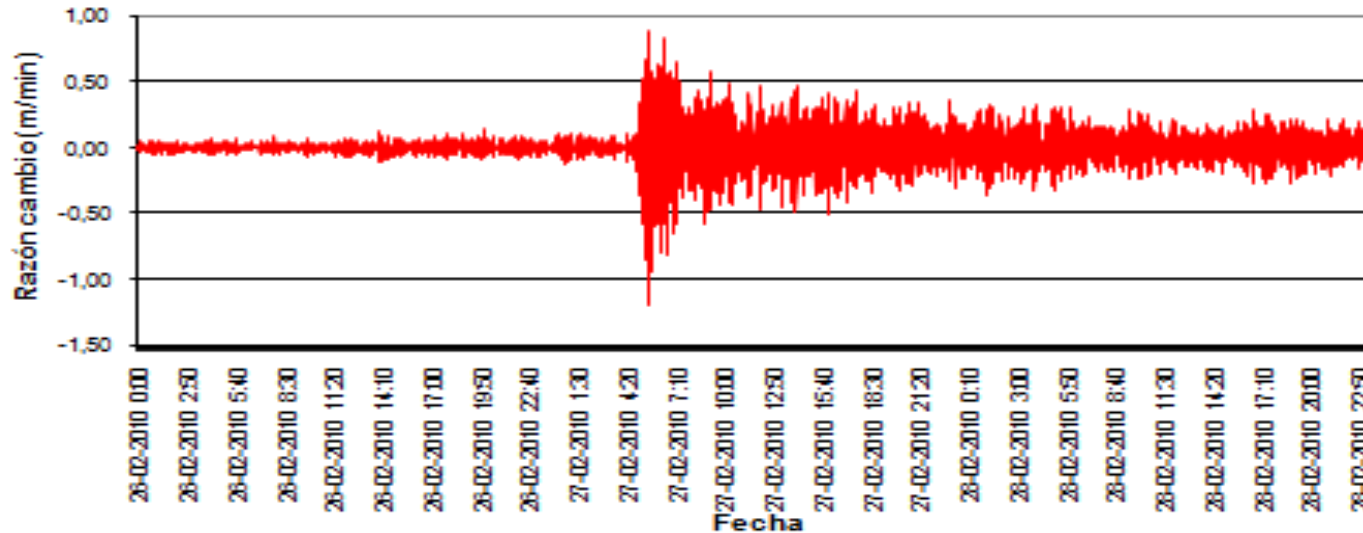


Rate of Changes of Sea Level

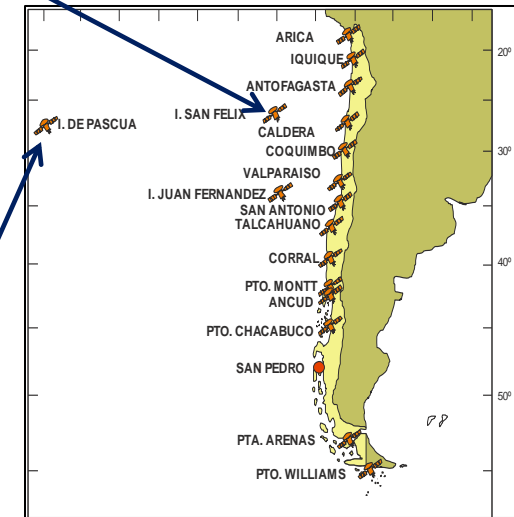
San Félix Island



Eastern Island

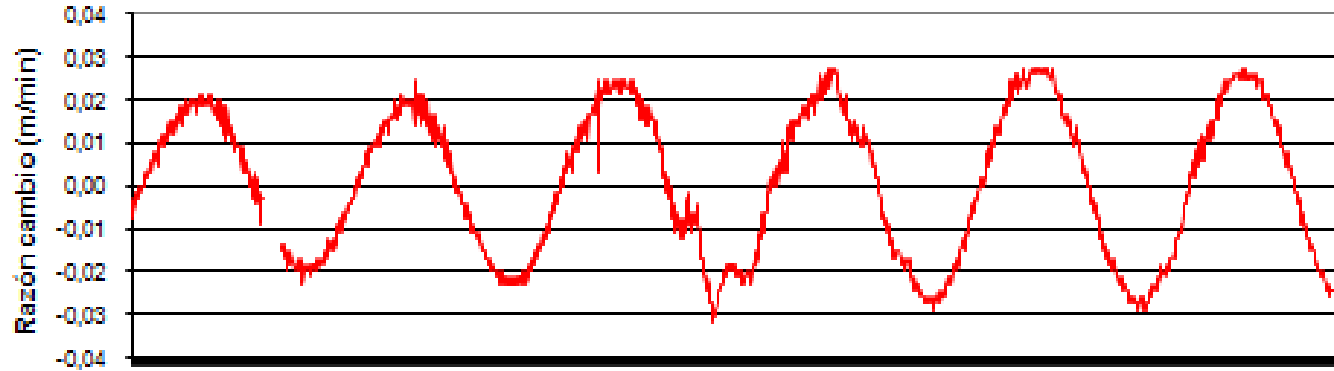


Chilean Islands

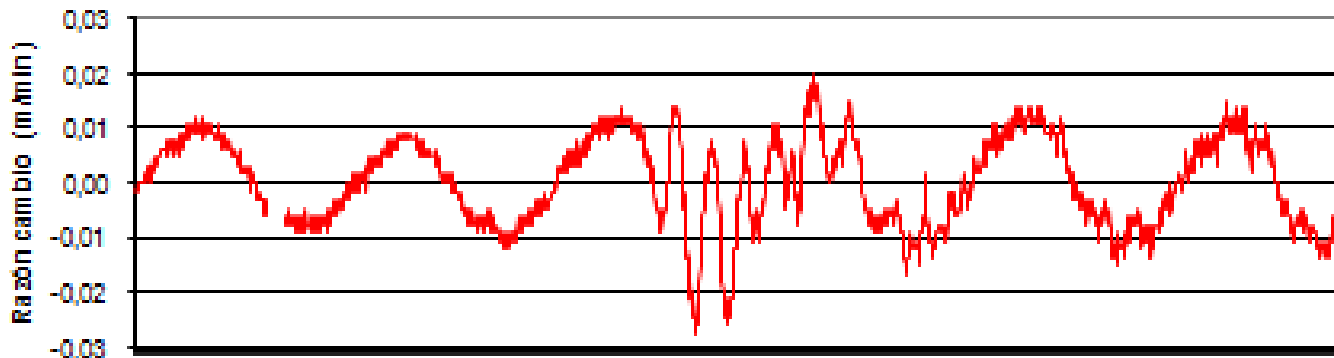


Rate of Changes of Sea Level

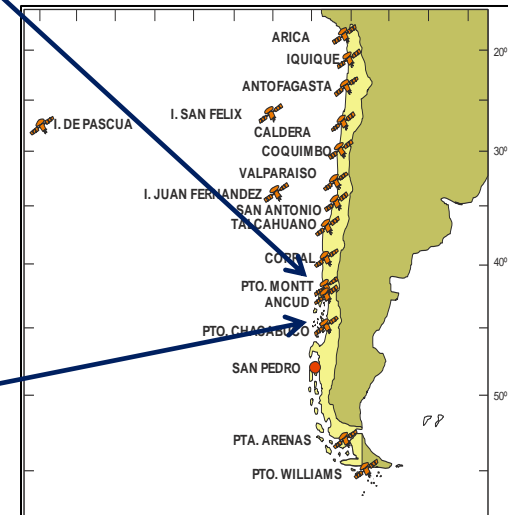
Puerto Montt



Puerto Chacabuco

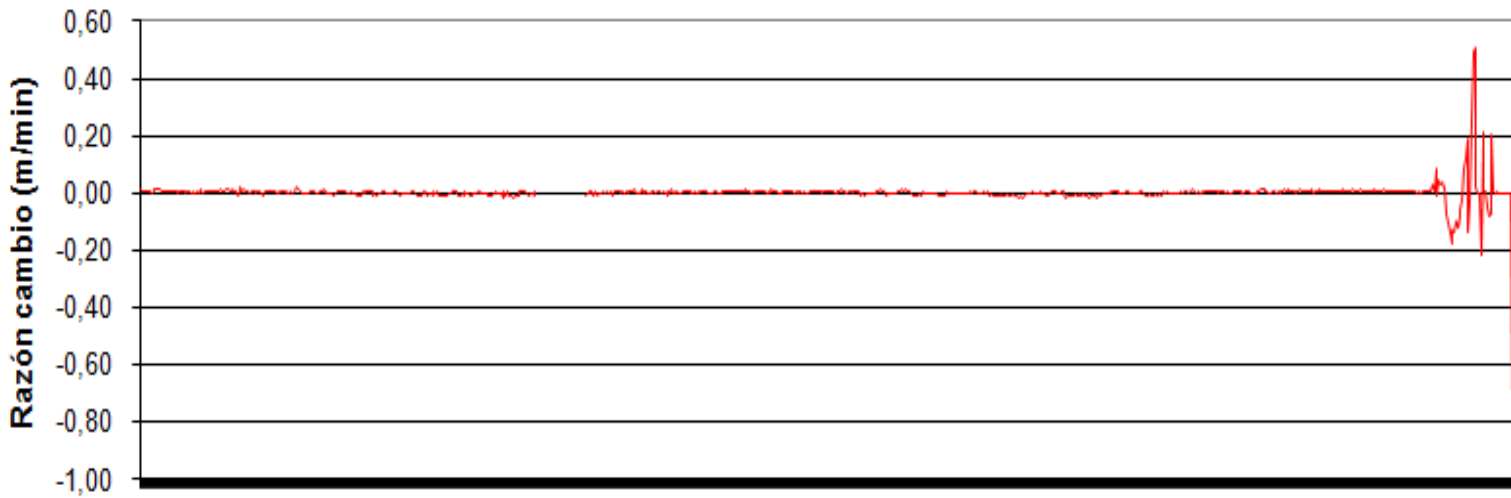
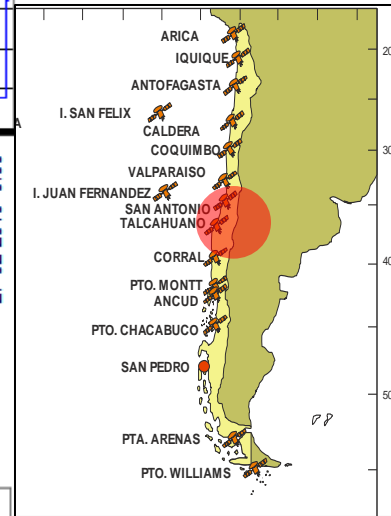
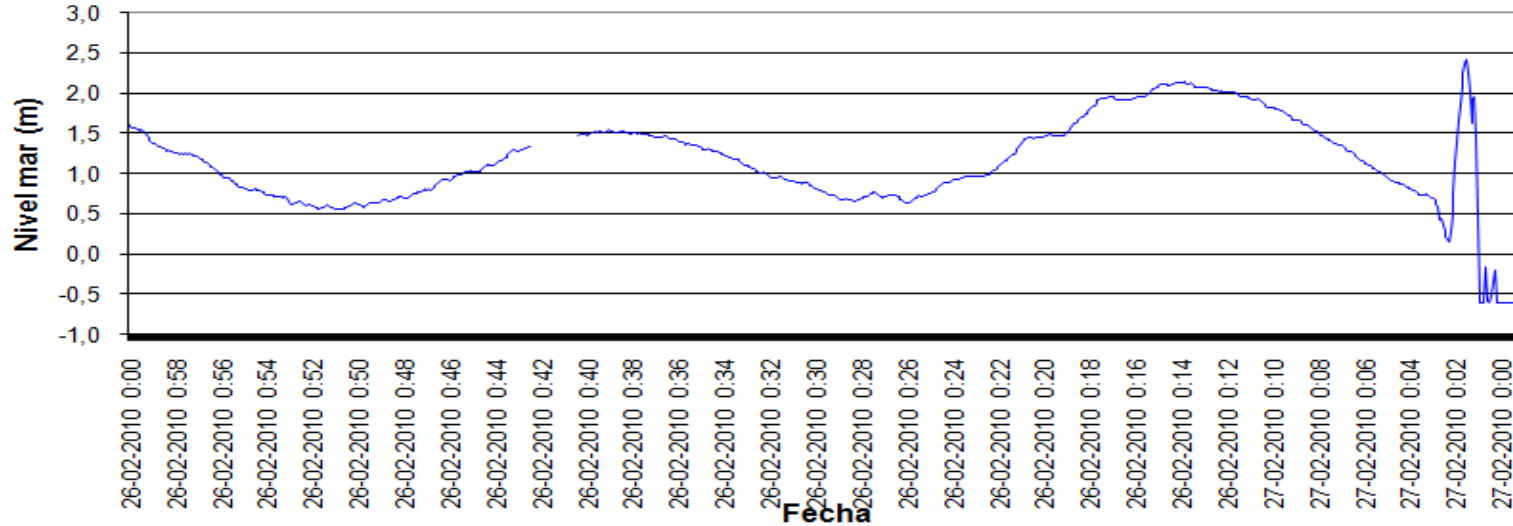


Inland Waters



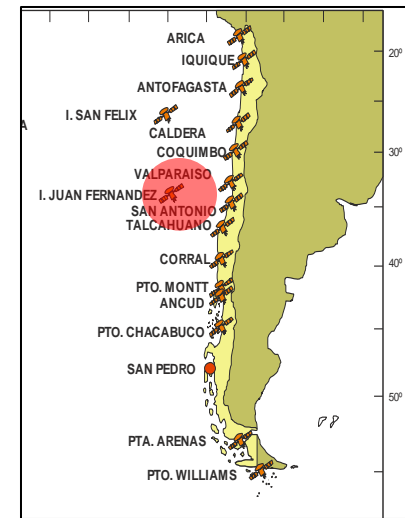
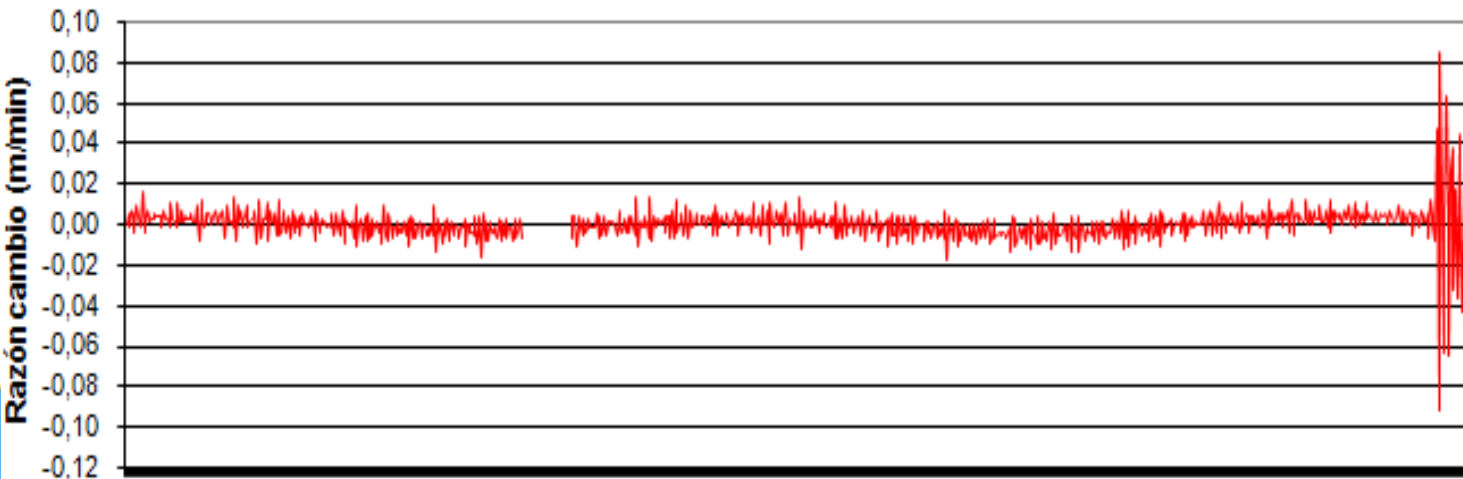
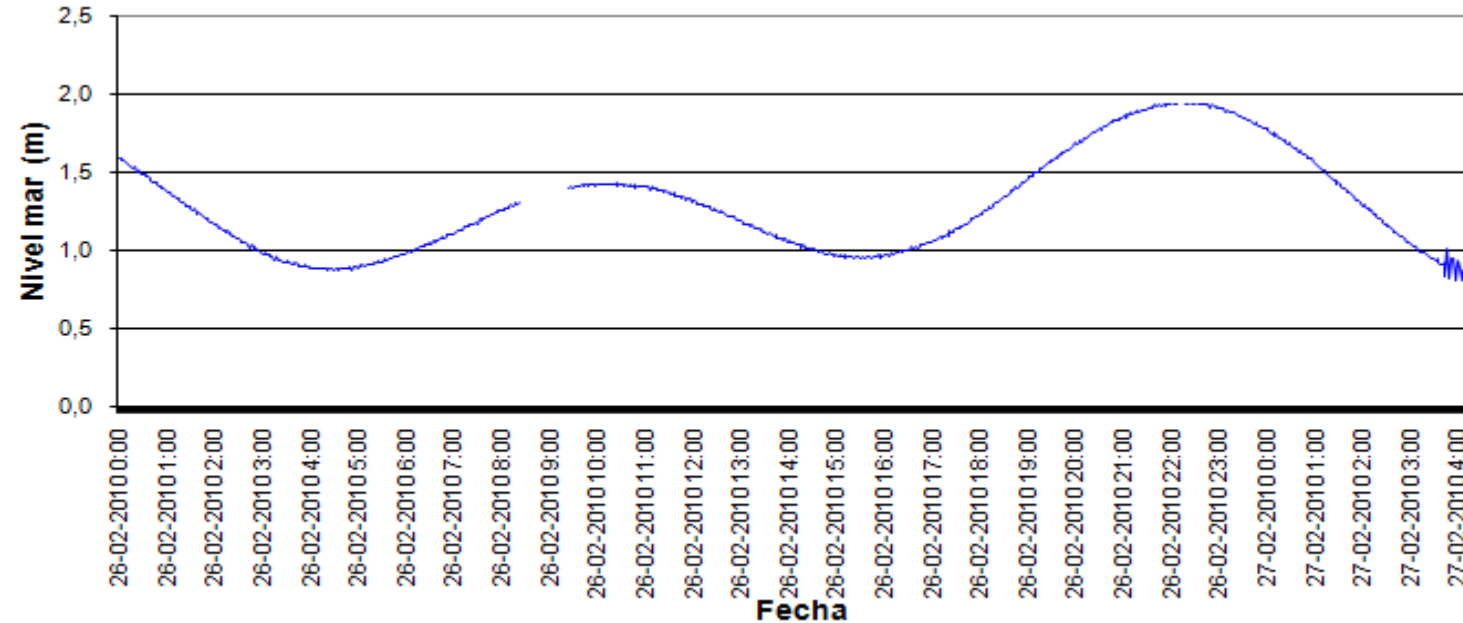
Heights and Rate of Changes of Sea Level

Talcahuano



Heights and Rate of Changes of Sea Level

Juan Fernández Island



Rate of Changes

STATION	SYZYGY		QUADRATURE		27-28 FEBRUARY 2010	
	MAX (+)	MAX (-)	MAX (+)	MAX (-)	MAX (+)	MAX (-)
ARICA	0,024	-0,021	0,021	-0,020	0,533	-0,602
IQUIQUE	0,020	-0,020	0,018	-0,018	0,302	-0,288
ANTOFAGASTA	0,024	-0,024	0,018	-0,020	0,221	-0,236
CALDERA	0,026	-0,023	0,026	-0,027	0,468	-0,570
I. SAN FÉLIX	0,018	-0,020	0,018	-0,021	0,584	-0,690
I. PASCUA	0,044	-0,043	0,125	-0,108	0,887	-1,195
COQUIMBO	0,021	-0,021	0,027	-0,024	0,536	-0,625
VALPARAÍSO	0,026	-0,018	0,018	-0,017	1,045	-1,027
A. JUAN FERNÁNDEZ	0,011	-0,011	0,009	-0,009	0,085	-0,091
SAN ANTONIO	0,032	-0,018	0,018	-0,020	0,023	-0,026
TALCAHUANO	0,024	-0,018	0,021	-0,020	0,509	-0,788
CORRAL	0,014	-0,014	0,011	-0,014	0,509	-0,750
PTO. MONTT	0,029	-0,029	0,017	-0,011	0,027	-0,032
ANCUD	0,015	-0,015	0,011	-0,009	0,117	-0,107
PTO. CHACABUCO	0,018	-0,012	0,017	-0,015	0,020	-0,027
PTA. ARENAS	0,024	-0,034	0,021	-0,024	0,010	-0,010

Destroyed at 04:22 local time
 No Operative since 03:33 local time
 Destroyed at 05:28 local time



Typical Heights of Sea Level

STATION	SYZYGY		QUADRATURE		27-28 FEBRUARY 2010	
	Max Height (m)	Min Height (m)	Max Height (m)	Min Height (m)	Max Height (m)	Min Height (m)
ARICA	1,31	0,53	1,21	0,75	2,28	-0,73
IQUIQUE	1,25	0,09	1,06	0,43	1,63	-0,20
ANTOFAGASTA	1,62	0,42	1,26	0,56	1,85	-0,14
CALDERA	1,70	0,41	1,90	1,18	2,15	-0,01
I. SAN FÉLIX	1,20	0,32	1,03	0,44	1,39	-0,18
I. PASCUA	1,40	0,80	1,59	0,68	1,72	-0,13
COQUIMBO	1,69	0,31	1,38	0,62	2,57	-1,12
VALPARAÍSO	2,04	0,63	1,71	0,91	3,04	-0,82
A. JUAN FERNÁNDEZ	1,58	0,42	1,25	0,67	1,94	0,80
SAN ANTONIO	1,72	0,29	1,39	0,64	1,79	0,33
TALCAHUANO	2,09	0,44	1,66	0,80	2,41	-0,61
CORRAL	1,87	0,21	1,32	0,57	2,62	-0,79
PTO. MONTT	6,45	0,80	4,55	2,46	6,86	0,16
ANCUD	2,54	0,42	1,89	0,93	2,70	-0,43
PTO. CHACABUCO	3,08	0,71	2,35	1,18	3,10	0,03
PTA. ARENAS	2,70	0,92	2,53	0,98	2,72	0,96

Destroyed at 04:22 local time

No Operative since 03:33 local time

Destroyed at 05:28 local time



GENERAL NOTES FOR DISCUSSION

- Rate of changes of Sea Level is an appropriate procedure for triggering warnings in the framework of tsunami alarms systems.
- The detection criteria should define a threshold, no matter by how much it is crossed.
- Max/Min Rate of changes coupled with expected max and min levels could keep false detections as infrequent as possible. False detections could be avoided if redundant sensors are available and the data are compared.
- One minute sea level sampling has been defined for tsunami monitoring. However small tsunamis generate waves with shorter period than the big ones, in these cases more frequently sampling could be necessary (15, 10, 5 or 1 sec.?)
- The sea level station should resist catastrophic tsunami waves. Strong mounting structures, datalogger protective cabinet installed as high as possible is required and submerged sensors fixed below CD, deep enough to provide sea level data during recession of the sea .



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THANKS



