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SEA LEVEL CHANGE IN ITALY UNTIL 400 Ka: COMPARING GLOBAL SEA LEVEL CURVES WITH OBSERVED DATA

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ABSTRACT: Antonioli F. *Sea Level change in Italy.* (IT ISSN 0394-3356, 2011)
This paper report a review of the sea level change data published for Italy for the last 400 ka and the markers used to constrain the curves. In particular it is underlined the importance to distinguish between Global, Local and Predicted sea level curves.

RIASSUNTO: Antonioli F. *Sea Level change in Italy.* (IT ISSN 0394-3356, 2011)
In questo lavoro viene effettuata una review di quanto recentemente pubblicato in Italia in relazione alle variazioni di livello del mare a partire da 400 ka. Viene distinta e spiegata la differenza tra curve Globali, Locali e Predette. Le prime basate sui dati provenienti da foraminiferi campionati sul fondo degli oceani e analizzati rispetto al rapporto isotopico dell'ossigeno. Le seconde basate sui dati osservati datati e misurati su markers costieri, le ultime ricostruite attraverso complessi modelli geofisici.

Key words: relative sea level, Italy

Parole chiave: livello relativo del mare, Italia

1. INTRODUCTION

Sea level change can be reconstructed from dated fossil coral reef terraces, and these data are complemented by a compilation of global sea-level estimates based on deep-sea oxygen isotope ratios at millennial-scale resolution or higher (SPECMAP, IMBRIE *et al*., 1988). Because of the lack of coral reefs in the Mediterranean sea, results on late Quaternary sea-level changes have been difficult to obtain in comparison with typical sites such as Barbados) the Huon Peninsula, Tahiti Florida, and others. On the contrary the very low tidal range of Italian seas offers a good opportunity to produce precise palaeo-sea level curves.
Sea level change along the Italian coast during last 10 ka is the sum of eustatic, glacio-hydro-isostatic, and tectonic factors. The first is time-dependent while the latter two also vary with location (LAMBECK *et al*., 2004a). This means that at the same time slices the relative sea level (the sum of 3 different movements) should be different in different coastlines. For any palaeo reconstruction of an ancient coastline it is necessary to take into account all components. It is important to distinguish beteween **Global** sea level curves (s.l.c.), **Local** s.l.c. or **Predicted** s.l.c., costrained using geophysical models. Aim of the paper is to put together all sea level change data collected for Italian seas to be compared with Global sea level curves.

1.1. Global s.l.c.

Global s.l.c. are generally constrained analyzing $\delta^{18}O$ ratio on fossils foraminifera series, sampled on mud core of the ocean bottom. The $\delta^{18}O$ ratio infact, show a direct correlation with sea level variations, and allows to calculate the sea level changes. This kind of curves do not take in account any isostatic component. The most recently published s.l.c. are reported in WOALBREAK *et al.* (2002) show that robust regressions can be established between relative sea-level data and benthic foraminifera oxygen isotopic ratios from the North Atlantic and Equatorial Pacific Ocean over the last climatic cycle. SIDDAL *et al.* (2003) s.l.c. came from Red Sea

1.2. Predicted and Local s.l.c.

To constrain a Local s.l.c. it is necessary to collect and date fossils shells, Biological markers, living at intertidal environment (i.e. Dendropoma reef) or salt marsh lagoon are considered the best: maximum error bars infact is the mean annual tide. Precose archaeological markers as fishtanks are also used (LAMBECK *et al.,* 2004b) Predicted slc are buitl from geopysical model (LAMBECK *et al.*, 2004a) and take in consideration isostatic movements, calculation of tectonic ratea are based on predicted slc checked on stable area (ANTONIOLI *et al.,* 2009)

Global sea level	MIS age	Ka	metres	Observed (or predicted) for Italy	Age ka	metres
Lambeck et al., 2010	1		-	Lambeck et al., 2011, Trieste	8 ka cal BP	-11.2
Lambeck et al., 2010	1		-	Lambeck et al., 2011, Nora	8 ka cal BP	-18.7
Waelbroek et al., 2002	2	20	-123	Lambeck et al., 2011	Mis 2	-127
Siddal et al 2003	2	19.5	-114			
Waelbroek et al., 2002	3.1	39.5	-62.1	Carboni et al., 2010	Mis 3.1	Not present at -60
Siddal et al 2003	3.1	33.6	-74	Belluomini et al., 2002		1
Waelbroek et al., 2002	3.3	60.5	-48	Carboni et al., 2010	Mis 3.3	Not present at -48
Siddal et al 2003	3.3	53	-66	Iannace et al., 2003		3-4
Waelbroek et al., 2002	5.1	81.5	-18.7	Dorale et al., 2010	81 ka	1
Siddal et al 2003	5.1	82.9	-28			
Waelbroek et al., 2002	5.3	102	-21.2	Amorosi et al 1999,2004		2 \ -14
Siddal et al 2003	5.3	107	-26.7	Riccio et al., 2001; Iannace et al., 2001	Mis 5.1-5.3	between 5 and 2
Waelbroek et al., 2002	5.5	123.8	6.3	Ferranti et al., 2006	Mis 5.5	between 6 and 8
Siddal et al 2003	5.5	122.5	13.5			
Waelbroek et al., 2002	6.5	167	-49	Bard et al., 2002 Antonioli et al., 2004	Mis 6.5	deeper than -22
Siddal et al 2003	6.5	177	32.4			
Waelbroek et al., 2002	7.1	197	-9.7	Dutton et al. 2009	201.5-189.7	-18\ -17
Siddal et al 2003	7.1	193	-4.5			
Waelbroek et al., 2002	7.3	215	-3.5	Dutton et al. 2009	217.2-206.0	-18.5
Siddal et al 2003	7.3	212	-24			
Waelbroek et al., 2002	7.5	236	-9.4	Dutton et al. 2009	248.9-231.0	Between -18 and -10
Siddal et al 2003	7.5	234	-12.6			
Waelbroek et al., 2002	9.1	287	-16.4			
Siddal et al 2003	9.1	287	-38			
Waelbroek et al., 2002	9.3	314	-17			
Siddal et al 2003	9.3	315	-25.3			
Waelbroek et al., 2002	9.5	332	3.4			
Siddal et al 2003	9.5	331	-4.7			
Waelbroek et al., 2002	11	401	6.5			
Siddal et al 2003	11	405	-5.4			

2. CONCLUSION

A general agreement for the Holocene and MIS 5.5, 7.1, 7.3, 7.5 Italian aged fossil marine deposits or submerged speleothem are found (Table 1). Discrepancies in sea level observations on stable area with Global data are found for MIS 5.1-5.3, all that could be explained by the influences of glacio-hydro-isostasy (POTTER *et al.,* 2004). MIS 3 are not preserved in cores as marine facies. The first two rows of Table 1 shows the differences in isostasy for the same time slice in different stable coastal areas

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