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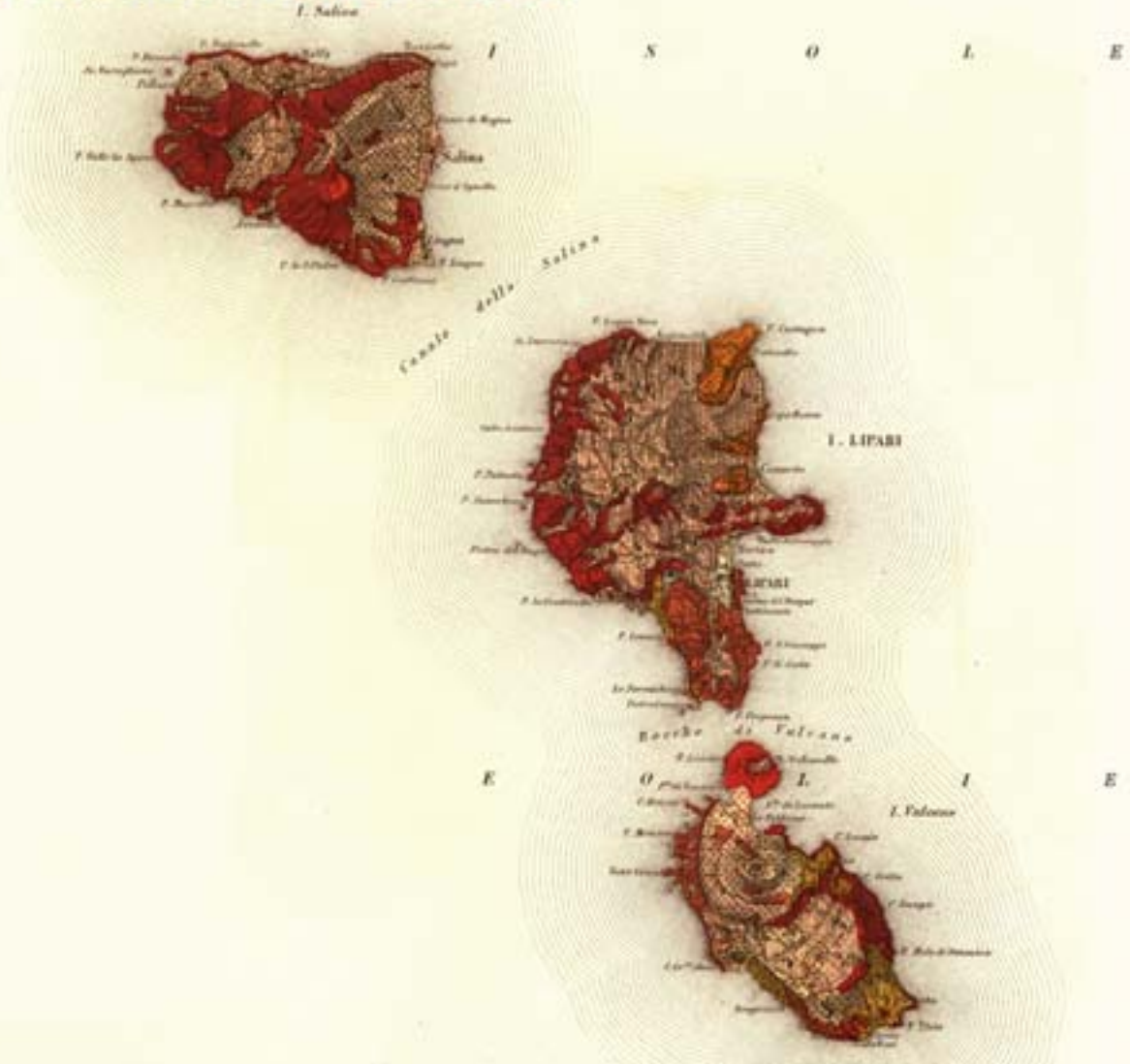
DIPARTIMENTO DIFESA DEL SUOLO
Servizio Geologico d'Italia
Organo Cartografico dello Stato (legge n. 68 del 2.2.1960)

MEMORIE
DESCRITTIVE DELLA
CARTA GEOLOGICA D'ITALIA
VOLUME LVIII

ATLAS OF SUBMERGED DEPOSITIONAL TERRACES ALONG THE ITALIAN COASTS



Editors
CHIOCCI F.L.
D' ANGELO S.
ROMAGNOLI C.

on the cover: Aeolian Islands geological map - Sheet n°244
1:100.000 scale of the Regio Ufficio Geologico
(detail)

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IUGS UNESCO

IGCP464
Continental Shelves during Last Glacial Cycle

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ATLAS OF SUBMERGED DEPOSITIONAL TERRACES ALONG THE ITALIAN COASTS

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SYSTEMCART
Roma - 2004

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ROMA 2004

Mem. Descr. Carta Geol. d'It.
LVIII (2004), pp. 5-8

Introduction

CHIOCCI F.L.*, D'ANGELO S.**, ROMAGNOLI C.***

This volume collects a number of case history of terraced submarine morphologies present on the Italian sea floor. The collection of articles follows a previous initiative organised during the 15th Regional Meeting of the International Association of Sedimentologists, held in Ischia in April 1994; there it was presented a poster entitled "Lowstand depositional terraces: a case-history collection from the Italian coasts", due to many research groups who contributed in the realisation of this atlas. The good results of the initiative and the editorial availability of the National Geological Service, allowed the realisation of an atlas that could give, not only the compilation of the observed cases, but also a description and a mapping, as homogeneous as possible, of the main SDT morphologic and depositional features, and a depositional interpretation based both on the data studied by every single research group and on the comparison between all the collected data. All articles follow a similar standardand have been accepted after a scientific cross-reference of the contributors, with the cordination of the Editors and under the scientifc supervision of F. Ricci Lucchi. In order to give more emphasis to the data exposition, we have deliberately chosen an iconographic layout of the volume where the text is mainly commenting the images (maps, seismic profiles, submarine images). All articles follow a similar standard and have been accepted after a scientific cross reference of the contributors, with the coordination of the Editor and under the scientific supervision of F. Ricci Lucchi.

The depositional structures, object of this atlas, are sedimentary bodies outcropping on the sea floors at a shallow depth (generally within -150 metres), having a wedge-shaped geometry and a terraced morphology (Fig. 1). The internal structure (where depicted) is always prograding; the dimensions are generally of about some tens of metres as for the thickness, of some hundreds metre as for the extension perpendicular to the slope and of about some thousands metre (or some tens of thousands) as for the extension parallel to the slope. The depositional terraces have always been found on rather steep and narrow continental shelves as those typical of insular, volcanic or tectonic-controlled coasts. From time to time the depositional bodies lie on pre-existent abrasion platforms.

Never depositional bodies or terraced erosive forms have been taken into account; they only have been described if in relation with the SDT outcropping on the sea floor. The origin of the depositional terraces dates back to very recent geologic history, the last glaciation (Würm), when the sea-level was much lower than present, as a great volume of the oceanic water was immobilised in the continental glacial masses.

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In the realisation of the atlas one would not expect all the cases have been given the same relevance, since it is a case-history collection of SDT along the Italian coasts, often "casually" depicted during marine surveys having different targets. This aspect emerges in the data entity and in the variety of the prospection methodology; the different contributions in fact include high-resolution seismic profiles (mainly), R.O.V. and side scan sonar images and core and grab samplings. However, the main result of this atlas is to underline the presence of depositional terraces with similar features on marine areas which may be far away from each other and may have very different tectonic and sedimentological framework.

As SDT have limited extension and are difficult to recognise, only a comparative analysis among several case histories might allow a better comprehension of the processes causing the formation and preservation of such bodies, formed during sea-level lowstands. This is a very important scientific topic even in the international literature and its is rich in potential applied aspects, even if not immediate. On one hand the study of the environmental changes of the recent geologic past might give indications on the variations of the next future, on the other it is possible to use the SDT in the same way as the emerged coastal terraces are used, to underline recent crustal movements (for possible links with seismicity) that affect a great part of the Italian coasts.

Finally, a general observation: this scientific initiative, maybe because it is based on a limited and well-identifiable aspect, has managed to involve almost all the research groups who work in the high-resolution seismic stratigraphy. This aspect benefits the national scientific community, that gathered with neither specific funds nor strict co-ordination and it shows the possibility to make the results of different researches converge to common objectives.

The submerged depositional terraces (SDT) described in this atlas are mostly located along the Tyrrhenian coasts (Tuscan and Pontine Archipelagos, Campanian and Calabrian coasts, Aeolian and Egadi Islands, North-west Sicily, East Sardinia), and some other cases in the Sicily Channel (Linosa Isle) and along the Ionic margin (Fig. 2).

The SDT observed at a 100 m depth along the western part of the Elba Ridge and on the southern part of Capraia Isle (Roveri & Corregiari) show homogeneous lithologic and geometric features (both internal and external), despite the great variability of depositional and morphologic aspects of the shelves where they set out. Moreover, the SDT development seemed to be conditioned by the gradient (between 0.5 and 2) and by the width of the shelf, the latter made up of prograding Plio-pleistocenic units. Thanks to the observation of the sedimentologic and paleontologic aspects (supported by radiometric dating), and according to the depth of the depositional edge, the Authors consider the observed SDT as beach bodies developed in a relatively high gradient coast, during the sea-level lowstand phase at the last glacial acme of 18 kyr ago.

Ferraro *et alii,* describe the submerged depositional terraces along the eastern and southern part of Sardinia coasts; SDT are mainly found in Cagliari Gulf, in Orosei Gulf, and between Capo Comino and Capo di Coda Cavallo. The SDT are shallower than usual, being found between -50 and -90 m, and are made up of fine sediments.

Around the Pontine archipelago (Islands of Palmarola, Ponza, Zannone, Ventotene and S.Stefano) Chiocci & Orlando describe the presence of a SDT with a depth consistent with the last glacial sea-level lowstand. The terraces distribution and depth on the different islands match very well with the emerged volcanic apparatus characters (subsidence in Ventotene-S.Stefano, made up of subaereal deposited units, uplift in Palmarola, made up of submarine depositional units, with Ponza-Zannone intermediate situation). A possible tilt of the western part of the archipelago has been highlighted (Islands of Zannone, Ponza and Palmarola), with a east to west gradual uplift of the SDT.

On the southern part of the Sorrento Peninsula, Budillon *et alii* identify prograding depositional bodies considered as SDT, extending for some km parallel coast near Capo Massa.

In the Gulf of Policastro, De Pippo Pennetta describes the occurrence of SDT at the edge of some sectors of the continental shelf showing different steepness and morphologic setting. According to their depth, the SDT have been reladed to the last glacial Maximum-level lowstand.

Near Capo Suvero-Calabria, (Mongardi *et alii*) a SDT is present on the outer shelf that has an extension of only 5-10 km. The depositional terrace (with the edge at 140-150 metres) is somehow connected with a more internal erosional slope-break of a marine abrasion platform, that seems to mark the shoreline position during the last glacial sea-level lowstand. Based on lithologic and biofau-

nistic data, the SDT is interpreted as a relict lowstand deposit, sedimented in high-energy condition and in relatively starved conditions.

In the southern part of S.Eufemia Gulf (Calabria), CHIOCCI & ORLANDO describe a terrace with a steep internal stratification which is present for about fifteen km on the steep sea floor sloping down to the Angitola canyon. There are no terraced forms older than those outcropping on the sea floor, probably because of the regional geodynamics that might have caused the uplifting of older SDT and their removal during the shelf emersion during sea-level lowstands.

AGATE *et alii* describe a SDT present on the north-west Sicily continental margin (offshore Carini Bay), considering it within the Late Quaternary evolution of the margin. The SDT shows a depositional edge at a 140-160 m depth that, generally, coincides with the shelf-break; its thickness and extension towards the sea seem to be controlled by the gradient of the basal depositional surface (the shelf shows a rather limited extension, lower than 10 km, and an average steepness of 1.5°) and by the location of the feeding points. The SDT is considered as a sea-level lowstand body, deposited in a deltaic-littoral environment with high sedimentary rates, on the edge of a restricted, irregular shelf lapped by littoral drift currents.

The SDT observed in the volcanic areas of Linosa (ROMAGNOLI) and of the Aeolian archipelago (CHIOCCI & ROMAGNOLI) show several analogies: their presence seems to be connected with the distribution of submerged abrasion platforms (on which SDT prograde with good lateral continuity) and with the availability of volcanoclastic material produced by the dismantling of eruptive centres. The SDT are present at different depths (an upper SDT with a 30-50 m edge is always present and often there is a second SDT with a 75-100 m deep edge); they are often policyclic and overimposed each other. Their development seems to be controlled by the gradient and by the with (transversal to the coast) of the abrasion platforms below, as well as with the presence of morphologic irregularities on volcanic bedrock. If discontinuity of volcanotectonic and structural origin are present, they control the lateral variability as well as the external and internal geometries of SDT. A further controlling factor of the SDT depth at the Aeolian Isles is the wave energy, i.e. fetch exposition.

D'ANGELO *et alii* around the Egadi Islands found a SDT similar to the rest of the case histories but that is at present re-worked by current that erodes the terrace slope.

SENATORE describes the situation along the Ionic margin of Apulia. Here, despite the limited penetration of the acoustic signal caused by the presence of coarse sediments on the sea floor, it is possible to distinguish, with very high resolution seismic profiles, different kinds of prograding depositional terraces.

In conclusion CHIOCCI describes some acoustic effects affecting the SDT geophysical imaging, whilst SPOSATO shows the state of the art concerning the study of coastal marine terraces and their use for the definition of the coastal sectors vertical mobility. MASSARI describes an outcrop study that may be regarded as a fossil example of SDT.

A conclusive article summarises the comparison among the different case-history, and it is based on the results of two scientific meetings held in Bologna and Rome by a number of the researchers participating to the atlas.

The mapping of different data set has been homogenized, by adopting the same bathimetric map for the location of the studied areas (from the map at the 1:750.000 scale of I.I.M.) and simbols (Fig.3) to represent the main morphological lineament in plain view.

A table at the end of each article summarized the main depositional parameters of described TDS.

FIGURES CAPTIONS

Fig. 1 - Sketch of a typical submerged depositional terraces

Fig. 2 - Location of SDT described in the atlas.

Fig. 3 - Cartographic representation of main morphological lineaments of SDTS adopted in this volume.