P-26 HIGH RESOLUTION SR ISOTOPE STRATIGRAPHY IN THE TURONIAN-MAASTRICHTIAN CARBONATES OF THE PERIADRIATIC DOMAIN

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Abstract

This poster shows briefly how in ENI Agip Division the Strontium Isotope Stratigraphy (SIS) is being applied as a stratigraphic tool. SIS is considered in addition to the classical paleontological analyses for dating purposes, when sedimentary rocks have no diagnostic fossil or when fossil assemblages are affected by bio-provincialism problems, and/or when a marked dependency on the facies/depositional mechanisms is observed.
STIG, Agip's Stratigraphy Department, recently developed a tool which can provide information on sequences which are challenging in terms of their paleontology. The potential of this method required further development and so Agip created its own data base on which experimental isotopic curves both of the Mesozoic and the Tertiary have been set up. SIS involves the use of the $^{87}Sr/^{86}Sr$ ratio which represents the strontium composition in sea water as a function of geological times and that is expressed by a curve known as the *Strontium Sea Water Curve (SSWC).*
This poster aims to show the basic criteria and application potential of this tool through an application to Turonian-Maastrichtian carbonates belonging both to basin and shelf settings of the Periadriatic Domain – Italian area. In this case, in order to validate the tool, a good biostratigraphic control was obtained by using selected material through microcorings mainly of the calcite shell of Rudist bivalves.
This group of extinct molluscs lived in carbonate platform settings and is well reliable for isotopic and diagenetic analyses due to their shell composition.
For these purposes 245 stratigraphically well defined samples have been collected: 115 in outcrops and 130 in 15 wells drilled in the italian area (Fig.1).

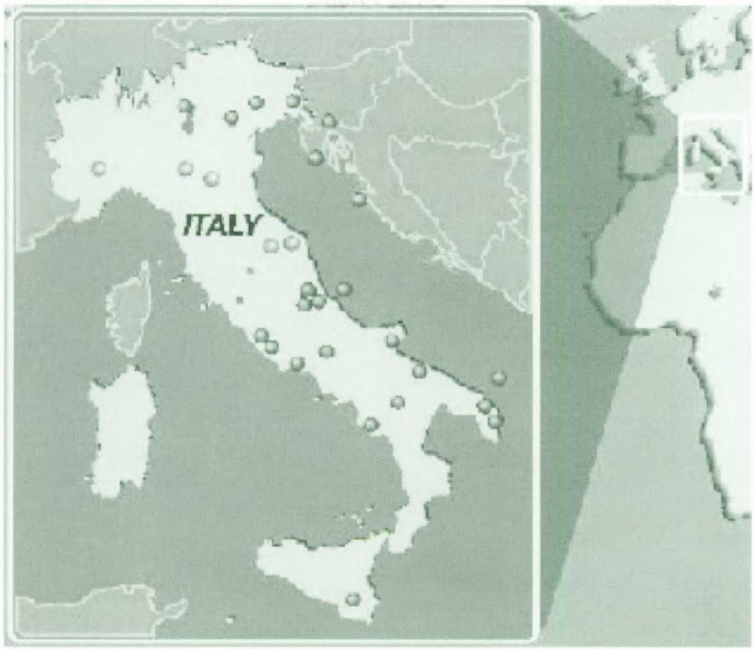

Fig.1 – Sampling sites in the Periadriatic domain.

Methodology

Only the Turonian-Maastrichtian interval of the *SSWC* is here discussed (Fig.2), it corresponds to the higher dip and most reliable part of the global curve; it is this part of the curve that is being experimentally applied in the regional context belonging to the Periadriatic domain.

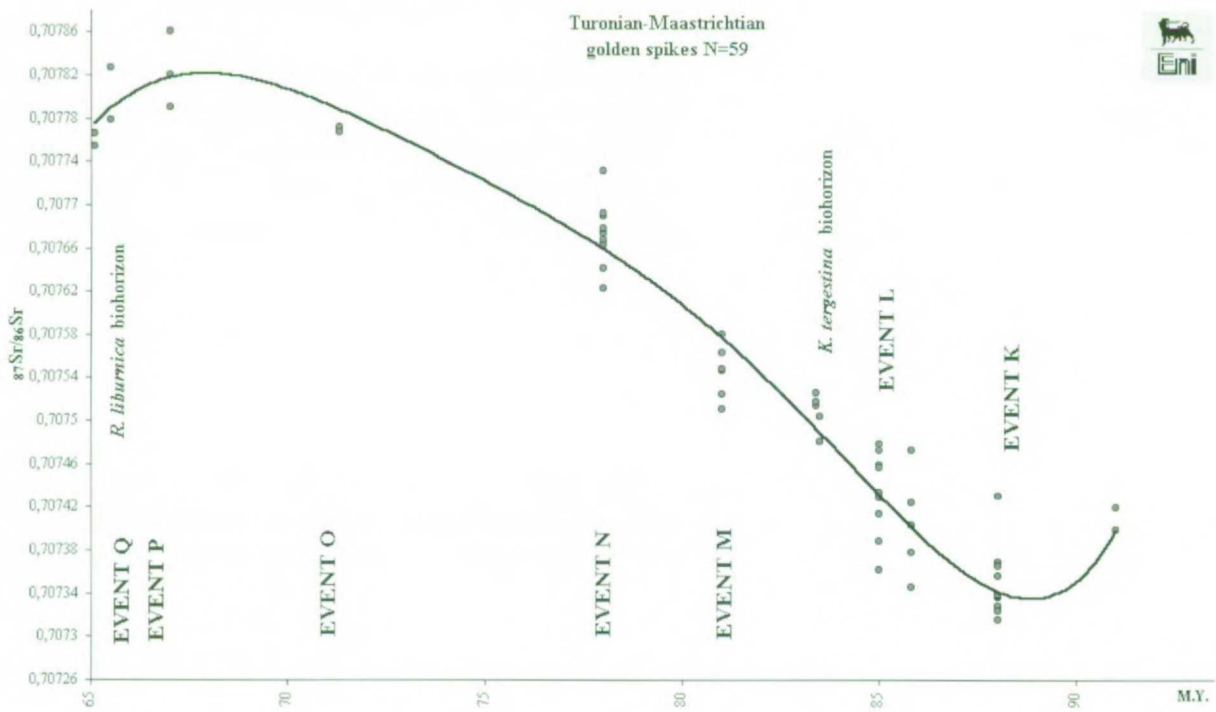

Fig.2 – Turonian-Maastrichtian frame of the SSWC

Out of all the samples collected, priority was given to those corresponding to specific bio-events of known stratigraphic attribution. For this purpose and for calibration reasons, we often analysed the same samples described in "Rudists and facies of the Periadriatic domain" (Agip, 1995), ordered according to the scale of Gradstein et al, 1995. Further studies on these events are ongoing.

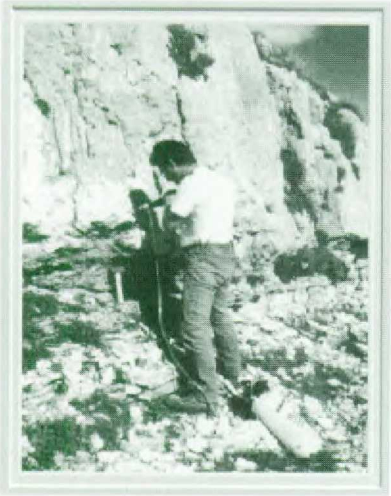

Fig.3 – Sampling using portable equipment (left); collecting a microcore with rudist shell (above). Ocre

The control of the degree of reliabilty of samples has been performed through several stages:
- general evaluation of the succession;
- optical microscope analysis for the bio- and chronostratigraphic interpretation and for the preliminary diagenetic analysis;
- selected mineralogic analysis;
- ^{18}O and ^{13}C ratios analysis as a preliminary test to detect the diagenetic overprinting.

Samples coming from outcrops have been collected in 40 localities by picking selected material in defined well dated and georeferenced beds. In order to obtain a better biostratigraphic attribution and more reliable correlation with drilled subsurface formations, 15 succession have been also reconstructed. Results have then been compared to subsurface cores taking into account 15 wells distributed in the Periadriatic domain, belonging to the following tectono-stratigraphic Units and Basins:

- Apennine carbonate platform;
- Apulian carbonate platform;
- Umbria-Marche and Ionian basins.

The corresponding isotope data represent reliable calibration points (golden spikes) over time of the SSWC. The results obtained, once problems of biostratigraphic calibration and of diagenetic overprinting have been solved, were extremely positive and showed that this frame of the curve is suitable for industrial applications.

Chronostratigraphic interpretation and exploration implications.

The plotting of analytical data on the reference curve (Fig.4) is performed by using a mathematical solver (Windows option) which makes it possible to calculate the age in millions of years (output) corresponding to a given isotope value (input data).

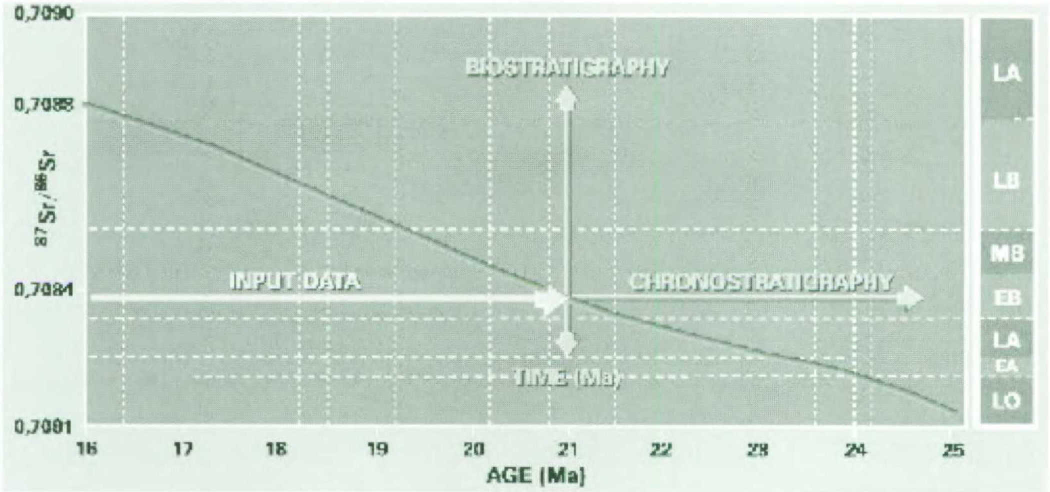

Fig.4 – Chronostratigraphic interpretation methods of Sr isotope ratios.

Drilling samples (i.e. cuttings and cores) are specifically prepared for SIS investigations, with the aim of dating sediments in sequences with poor biostratigraphic constrains.
This isotopic method was already tested for experimental purposes in the carbonate reservoirs of the M.Alpi-Costa Molina and Aquila fields.
It was possible to:

- check the consistency of the $^{87}Sr/^{86}Sr$ values obtained from cores, ordered according to their relative stratigraphic position, as defined through biostratigraphic studies and the FMI tool;
- achieve a greater resolution potential both in carbonate platform and basin sequences;
- establish the basis for a further development which would include the possibility of dating time intervals comprised between major events (golden spikes).