Il Triassico terminale - Giurassico del Bacino Lagonegrese. Studi stratigrafici sugli Scisti Silicei della Basilicata (Italia meridionale).

Amodeo F.

The Lagonegro Basin is a Mesozoic paleogeographic domain represented by Triassic-Neogenic basinal sequences outcropping in the Campano-Lucano Apenine, a segment of the Neogenic Apennine chain located in southern Italy (See figs 1.1, and 1.2). The uppermost Triassic-Jurassic Scisty Silicei Formation (SSF), overlies the Calcari Con Selce Formation (Upper Triassic) and is overlain by the Flysch galestrino (lower Cretaceous) (see fig. 1.3). The SSF is composed of siliceous pelites, radiolarites and redeposited, shallow-water-derived carbonates. The SSF ranges from 60 m to more than 150 m in thickness, owing to varied carbonate and terrigenous sediment content.

Lithostratigraphy and paleoenvironmental interpretation

This work deals with the SSF condensed sections. Lithofacies associations consist of terrigenous and carbonate fine grained turbidites, alternating with hemipelagic sediments, commonly forming very thin beds. radiolarians are the most common biofacies, bioturbation (Chondrites type) is rare.

The following four stratigraphically superposed members are formally defined in the thinner (Condensed) sections of the SSF (see figs 2.2, 2.5, and2.6):

(1) Buccaglione Member (upper Norian - Rhaetian p.p.)
(2) Nevera Member (Rhaetian p.p.-Toarcian p.p.?)
(3) Serra Member (Toarcian p.p.? - Bajocian?)
(4) Acqua Sulfurea Member (Bajocian?-Tithonian)

A fifth member (fig. 2.2, tavv. 3.1, and 6.1), the (5)Chiatamone Member (Bathonian-Tithonian), is formally defined from the uppermost part of thicker sections of SSF: it is heteropic with the (4) Member of the condensed sections.

Lithofacies changes in the SSF depend on (in decreasing order of importance): a) detrital carbonate input from surrounding carbonate platform-slope areas, b) fine grained terrigenous input (Clays, c) biosiliceous input (radiolarian tests, and locally sponge spicules). Low energy sedimentation processes, low sedimentation rates (<1 m/Ma, figs. 5.2, and 5.3), and disaerobic buttom waters characterised the depositional environment. Northern outcrops (Sasso di Castalda, Monte Cugnone, and Calvello sections) include lenticular coarse-grained carbonate deposits, and should be closer to the carbonate source area than ssouthern outcrops (Madonna di Sirino, and Lagonegro sections). A bathial or deeper bathimetry in the Jurassic is suggested. Deep water environments such as the continental rise, with "lobe fringe2 turbidite sediments, could be a present day equivalent. AGE OF SSF LITHOSTRATIGRAPHIC BOUNDARIES. The lower boundary is diachronious, rnaging from upper Norian to Rhaetian in age. The upper boundary appears to be diachronic too (from Kimmeridgian to Tithonian).

Biostratigraphy e palaeobiogeography

RADIOLARIAN ASSEMBLAGES. Owing to the poor preservation of radiolarian faunas, no local zonation is proposed. Carter's (1993) zonation is used for the Triassic and UAZones 95 (Baumgartner et alii, 1995a) are applied to the Middle-Upper Jurassic assemblages. Radiolarian assemblages of upper Norian, rhaetian, Middles and Upper Jurassic age were found in six stratigraphic sections. They allowed to correlate outcrops, and to date the main depositional phases (tavv. 3.1, and 6.1).

For the first time, radiolarian assemblages belonging to the Betraccium deweveri Zone (upper Norian) and Proparvicingula moniliformis Zone (lower Rhaetian) were recognised in the Lagonegro Basin. Middle Jurassic radiolarian assemblages belong to the UAZones 5-6 (upper Bajocian - middle Bathonian): characteristic taxa are Unuma echinatus, U. latusicostatus, Stichomitra (?) takanoensis and Tricolocapsa plicarum plicarum. Upper Jurassic radiolarian assemblages belong to the UAZones 9-1 (middle Oxfordian - lower Kimmeridgian), UAZ 11 (upper Kimmeridgian - lower Tithonian), and UAZ 13 (upper Tithonian - Berriasian?); characteristic taxa are Archaeodictyomitra apiarium, A. excellens, A. minoensis, Podocapsa emphitreptera, Zhamoidellum ovum and Z. ventricosum. The Tothonian - Berriasian? is characterized by Canoptum banale, Cinguloturris cylindra, and Sethocapsa zweilii.

The uppermost Triassic - Jurassic radiolarian assemblages from the Lagonegro Domain contain cosmopolitan taxa, similar to the oceanic radiolarian assemblages from Japan and Pacific Ocean. This similarity could be partly due to similar lithologies and to the same laboratory techniques. However, a Mesozoic oceanic connection of the Lagonegro Basins to the Paleopacific is likely.

CONODONTS. The upper Norian conodont Epigondolella bidentata is found in the basal beds of the SSF in the Madonna di Sirino section. A badly preserved specimen of (?) Misikella hernsteini (upper Norian - Rhaetian) is found in the basal beds of the SSF in the Lagonegro section.

REWORKED SHALLOW-WATER FAUNAS. Benthic forams and algae assemblages is found in the detrital shallow-water carbonate beds from the (3) Member of the Sasso di Castalda section, containing Biokovina sp., Orbitopsella sp. e Paleomayncina sp. (Pliensbachian benthic forams), (?) Protopeneroplis striata (Dogger foraminifer), as well as many specimens of the algae Cayeuxia, Paleodasycladus sp., Thaumatoporella parvovesiculifera, and rare Upper-Triassic conodonts. The rosion and resedimentation of the above-named carbonate beds occurred between the upper Aalenian and the lower Bathonian.

PALYNOFOSSILS AND DYNOFLAGELLATES. A Rhaetian spores and pollens assemblage is found in the organic matter rich beds from the (2) Member of the Sasso di Castalda section, containing Triadispora verrucata, Trachysporites fuscus, Corollina meyeriana, Corollina torosus, (?)Rhaetipollis gumanicus, Granuloperculatipollis rudis, Todisporites sp., Cycadopites sp. The organic matter from the organic-rich carbonate beds of Members (1) and (2) is terrestrial in origin; dynoflegellates are absent.

Mineralogy and geochemistry

CLAY MINERALS. Diffractometric analyses and x-ray fluorescence indicate that the lutitic fraction in the SSF beds consists of detrital minerals, partly transformed during the diagenesis, and of biogenic quartz.

The clay mineral assemblages (fig. 4.1) contain varied percentages of illite, chlorite, illite/smectite, and kaolinite. They are similar in composition to common marine clays. The clay mineral assemblages and illite crystallinity (fig. 4.4) indicate a deep burial diagenesis. A layer of authigenic glaucony (fig. 2.14), overlying a radiolarite, is recognized in the Middle Jurassic of the Pignola section. It indicates a moment of low sedimentation rate, and not a precise bathimetry, as authigenic glaucony may form at more than 1000 m in depth. Several montmorillonite-rich layers (bentonites) are found in the section of Calvello (figs. 2.12d and 4.11): they can be correlated with similar layers located in the Upper Jurassic of the Lombardy Basin, which would indicate volcanic activity during the (Upper?) Tithonian. An increase of kaolinite content in the clay mineral assemblages is found in the uppermost Jurassic beds (fig. 4.11). This could indicate a climatic change (towards more humid climate) or erosion of kaolinite from older beds.

GEOCHEMISTRY. The geochemical composition of the SSF rock samples is similar to the dominant oceanic siliceous muds and red clays, with common detrital trace elements (Zr, Rb, V, and Ba) and rare hydrogenous trace element (Mn, Pb, Zn, Cu, Ni, and co) (see tab. 4.1 and fig. 4.6).

Si is mostly biogenic in origin (fig. 4.5), detrital Si is negligible. During diagenesis silica, as quartz, replaced partly or totally the carbonate redeposits.

Sedimentary evolution

A reconstruction of the sedimentary history of the Lagonegro Basin during the uppermost Triassic - Jurassic is proposed. Several sedimentary events are described and grouped in 6 time intervals (see cap. 6, tav. 6.1, an fig. 6.4). They are compared with the sea level fluctuations, climatic changes and tectonic events as recorded in other domains (Fig. 6.3). Several sedimentary events have a regional or larger extension and can be correlated with the main rifting phases of the Liguro-Piemont Ocean or with important climatic changes. The decrease of detrital carbonate input in the upper Norian, which marks the lower boundary of the SSF, is interpreted as a signal of carbonate platform crisis in the source areas, owing to a more humid climate and/or a more intense tectonic activity lasting throughout the Rhaetian until the Jurassic oceanisation of the Liguro-Piemont Ocean. From the late Norian onwards, in the condensed facies, the detrital carbonate input becomes episodic. Two main episodes are recognizable at a regional scale:

a) Early Rhaetian - Lias: increase of resedimented, organic matter-rich, carbonate input. This episode corresponds to the Liassic grey-black limestones deposition of the Foraporta-Monte Monna Units, to many intraplatform anoxic basins in southern Italy originated by strike-slip tectonics, and perhaps to the Liguro-Piemont oceanisation (late Lias-early Dogger).

b) Late Aalenian - Bajocian (?): deposition of Liassic resedimented, coarse grained, shallow-water carbonates. This episode is recognizable in the Foraporta-Monte Monna Units, and in the Budva and Pindos basins. It corresponds to uplift of source areas during early Dogger, and to a second order regressive sea level fluctuation.

From the Bajocian(?)-Bathonian, a fine-grained detrital carbonate sedimentation occurred again, alternating with hemipelagic biosiliceous sediments. This event corresponds to the beginning of Tethian Jurassic radiolarites, and to the Bajocian-Bathonian second order transgressive sea level fluctuation.

The clay input increase and the benthonitic layers at the SSF upper boundary could be a tectonic signal (subduction?). Alternatively, clay and kaolinite increase could indicate a climatic change (locally more humid climate).