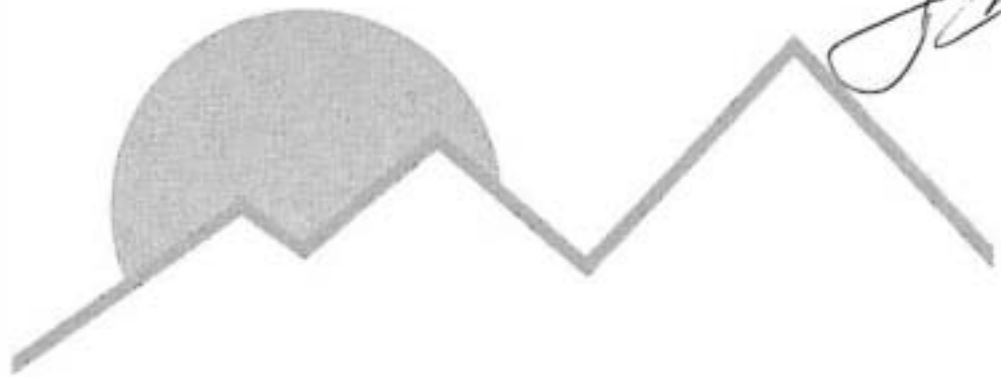


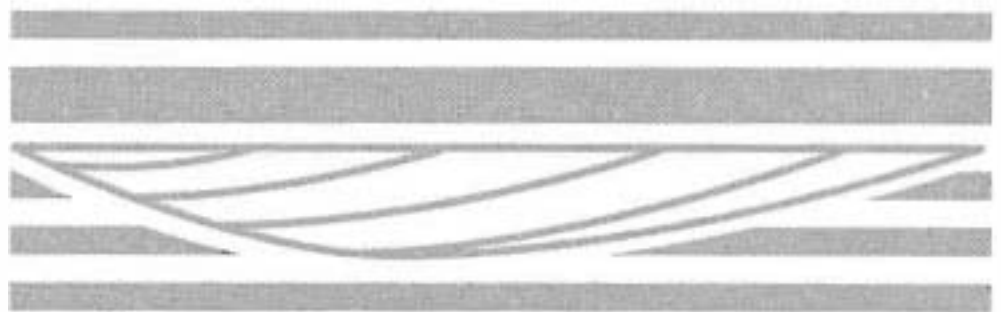
INTERNATIONAL ASSOCIATION OF SEDIMENTOLOGISTS

Josep G. G. G.



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Various geochemical processes are involved in sedimentary environments throughout weathering, leaching, and transportation oxidation states of elements the first transition series (Sc, Ti, V, Cr, Mn, Fe, Co, Ni, and Cu). Ligand-field theory has been used extensively to clarify various aspects of the chemistry of transition elements in sedimentary processes. Factors controlling the concentration of dissolved transition elements in sedimentary environments were investigated. Results, presented here demonstrated that, in sediments, only the ligand - field stabilization energy coupled to the distribution of transition elements. Theoretical considerations suggested that, at steady - state conditions, concentrations transition elements are primarily dependent upon the ligand field stabilization energies (LFSE's) characteristics of the sedimentary processes. Therefore certain transition - metal ions may acquire higher crystal - field stabilization energies by entering compressed sites. The transition elements concentrations associated with the specified predominant terminal electron accepting reactions in bottom sediments of a variety environments the predicted orders of uptake are: Ni > Cr > Cu > Co > Fe > Mn, Zn for M (II) ions and Cr > Mn > Co > V > Ti > Fe, Sc for M (III) ions. Using the octahedral and tetrahedral results together, another interesting data may be explained. The N^{2+} ion, because of its high octahedral site - preference energy, occupies preferentially octahedral sites in the minerals and enters tetrahedral sites only when thermal energy is comparable with site - preference energy. The enrichment of nickel in nodules that formed in oxidizing environments may be related to oxidation of Ni (II) to Ni (IV), which enters into solid solution with Mn (IV), in δ -MnO. The magnitude of the octahedral site - preference energy parameter gives of indication of the relative affinity of an ion in sedimentary environments for minerals. Co^{2+} ions in seawater are oxidized to hydrate Co (III), oxide, which is enriched with hydrated Fe (III) oxide in manganese nodules that formed in oxidizing environments. The oxidation of Co^{2+} to Co^{3+} is accompanied by a large increase in LFSE for cobalt. The high Mn/Fe ratios in manganese nodules are related to reduction and diffusive migration of manganese in the upper liquid layer of sediments. Such mechanism is proved by dissolved manganese distribution in interstitial waters and occurrence of Mn^{2+} in these sediments.

Sandstone provenance study of the East Carpathian Oligocene and Miocene sequences (Romania): mineralogical approach and source areas reconstitution

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Keywords: Sandstone, Provenance, Carpathians The East Carpathian belt (Romania) comprises several geotectonic units, composed of flysch- and molasse- type sequences.

Oligocene and Miocene sandstones argue important changes of the quality of source areas involved, and of associated environments.

On the basis of mineralogical features (i.e. grain types/ associations, microstructures, inclusions) and textural data (roundness, sorting of compositional populations) - the following considerations could be taken into account:

1. At Oligocene level petrotypes are mainly represented by quartz- arenites, subordinately by lithic sandstones. The rock

fragments are of metamorphic (metagraywackes, fillites, micaschysts) or sedimentary (shales, sandstones) origin. The heavy minerals associations are mainly composed of zircon, rutile, staurolite, almandine, pirop. Sorting is moderate- good, with roundness ranging from 0.2 to 0.8.

2. At Miocene level the petrotypes are mainly lithic. The rock fragments are very different, being represented by plutonic (granites, diorites), volcanic (andesites, glasses), metamorphic (quartzites, fillites, micaschysts, gneisses, amphibolites) and sedimentary (limestones, quartz- arenites, lithic sandstones/graywackes, shales) types. Heavy minerals are represented by: zircon, staurolite, garnets, hornblende, epidote. These petrotypes are poorly- sorted, clasts being variably rounded (from 0.1- 0.8).

Areal and temporal distribution of clastic petrofacies show a sensitive change of the petrographic framework of source areas.

During Oligocene the active sources have been identified as being extrabasinal cratonic blocks and recycled orogenic terrains (s. Dickinson- Suczec, 1979). Clastics derived from the main, primary, sources represented by Est- European Platform have intermittently been contaminated with green clasts- type detritus, of Central- Dobrogean origin, and supplied a complex turbidite system developed on a lowstand regime. Quartz- rich petrographic types are interpreted as related to relative enrichment by selective alteration of primary associations.

During Miocene the quality of source areas changed from magmatic arcs (Burdigalian) to recycled orogenic areas (Badenian), and further suggests an evolution from plutonic and crystalline rocks (associated to continental crusts) to sedimentary complexes related to collisional and postcollisional orogenic belts. Strong compositional and textural variations laterally and vertically argue an active geotectonic regime (as suggested either by diagnostic physical structures), that also controlled differential subsidence/ uplift movements and, consequently, secondary (intra-basinal) sources. The receiving systems were represented by fan deltas and shallow-water settings.

The role of the structural arrangement of Hercynian units on the petrogenesis of siliciclastic deposits from the western Cameros Basin (Late Jurassic - Early Cretaceous Iberian Rift), North Spain

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Keywords: Sandstone composition, Rift, Cameros basin, Spain The Cameros Basin in Central Spain is an intraplate rifting basin that was filled up by a thick pile of clastic sediments (about 9.000 m of stratigraphic record) from Tithonian to Early Albian. The sedimentary record mainly consists of continental deposits arranged in seven depositional sequences, each of one constituted by a basal fluvial unit that evolves upwards into lacustrine carbonate levels. The younger depositional sequences show well developed coarse grained fluvial units, lacking the upper lacustrine carbonate unit. The basement of the basin is represented by the Hesperian Massif (Variscan Belt)

that is covered by marine Jurassic and Triassic (Germanic facies) deposits. From Late Jurassic to Early Albian, as the basin evolved, important paleogeographic changes took place, affecting feeder source terrains. Two main megasequences, formed from different bedrock complexes, can be distinguished. The first megasequence (Tithonian - Berriassian) was generated during the initial rifting phase, along NW-SE trending troughs, being the Western Asturian Leonese zone of the Hesperian Massif (low- to medium-grade metamorphic rocks) and the Mesozoic cover, the main sources. Three depositional sequences are identified: a basal sequence that is characterized by quartzolithic petrofacies ($Qm_{85}F_2Lt_{12}$) generated by the erosion of the Mesozoic sedimentary cover, and two other sequences with quartzofeldspathic deposits ($Qm_{82}F_{14}Lt_4$; P/F: 0.75 and $Qm_{89}F_9Lt_2$; P/F: 0.79) with a dominant metamorphic provenance. The second megasequence (Valanginian - Early Albian) was formed during the most subsiding phase of the basin and is related with the propagation to the SW of bounded through fractures. These fractures affected the Central Iberian zone of the Hesperian Massif (crystalline rocks) and the overlying Mesozoic sedimentary cover (mainly Triassic arkoses). As a consequence, four depositional sequences were generated. The first one is constituted by quartzarenites ($Qm_{95}F_3Lt_2$) from the recycling of the arkosic cover. The other three depositional sequences show quartzofeldspathic petrofacies (from $Qm_{86}F_{13}Lt_1$; P/F: 0.24 to $Qm_{74}F_{26}Lt_0$; P/F: 0.0) originated from the erosion of crystalline Hesperian sources. In addition, a detailed analysis of sandstone composition during sedimentation of depositional sequences provides consistent information about the hierarchy of these sequences and its relation with the tectonic evolution of the basin.

Provenance and Geochemistry of Upper Cretaceous Sediments from Southern Jordan

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Keywords: Provenance, Geochemistry, Statistics The Upper Cretaceous sediments of southern Jordan accumulated along the southern Tethyan continental margin. Repeated sea level fluctuations are recorded in an approximately 150 to 250 m thick sedimentary succession consisting of a mixture of non-marine, marginal marine, and open marine mixed carbonate-siliciclastic deposits. These deposits can be easily studied along an escarpment in south Jordan. Samples from different stratigraphic levels along the escarpment were used for provenance studies. Heavy mineral analysis and thin section analysis were combined with bulk rock geochemistry.

The mature, quartz rich composition of the highly friable Cretaceous sediments yield clear results. Recycled sediments and passive margin provenance areas are the main source. The most reasonable source area representing this provenance is the African-Arabian plate to the S and SW of the Cretaceous Jordan. The source material was most probably provided by Palaeozoic quartz rich sediments and basement rocks. Such source materials are exposed further south in Jordan in the Wadi Rnm area.

Due to the high maturity, the Cretaceous sediments of southern Jordan represent an ideal material to analyse the effect of heavy mineral and accessory mineral content on the bulk rock geochemistry. Without lithoclasts and almost no authigenic minerals other than quartz, the bulk analysis represent the pure

clastic composition. Several statistical methods, including cluster analysis and multivariate methods are used to evaluate mineral features in large data sets. In our study slight changes in the geochemistry are attributed to the heavy mineral content. They might also support the provenance analysis.

In addition to provenance studies the geochemical data were used with SEDNORM to recalculate the data to modal mineral composition. The calculated composition was compared with the results from petrographic studies. The results show that bulk rock analysis of friable quartz arenites might be used to classify the rocks instead of lavishly petrographic analysis on that material. It also supports the use of bulk rock geochemistry as a provenance tool.

Facies analysis, Ar/Ar dating and mineral chemistry: tools for studying paleogeography in a subsiding collisional belt (Ligurian Alps, Italy).

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Integrated facies analysis, ⁴⁰Ar/³⁹Ar dating on white micas and electron microprobe analyses on phengites, amphiboles and garnet from the Molare Formation are used to study the paleogeography of the Ligurian Alps which constitute the substratum of the primary basin infill. Facies analysis was carried out in order to recognise environmental changes, which potentially affect sedimentary transport patterns (transversal vs. long-shore).

Mineral chemistry and ⁴⁰Ar/³⁹Ar dating on white micas allow the division of the study area into two sectors, which directly mirror the substratum of the clastic sequence (Voltri Massif in the NE and Briançonnais units in the SW). The NE sector is characterised by a main age family around 50 Ma and phengite celadonite contents of Si 3.4-3.7 a.p.f.u. suggesting a provenance from high pressure rocks such as the metasediments of the Voltri Group. The SW sector is characterised by ages around 300 Ma and lower phengite celadonite contents of Si < 3.2 a.p.f.u. suggesting a provenance from the Briançonnais basement; both age groups and phengite compositions resulted only in samples covering Briançonnais Voltri Massif boundary region. Amphiboles allow further provenance distinctions within each sector, as they reflect the heterogeneous metamorphic overprint of the Voltri Group. In particular, Alkali-amphiboles occur mainly in the northern sector, where basement was faintly affected by retrograde metamorphism, whilst calcic and alkali-calcic amphiboles occur in the south, where retrogression was stronger. Glaucofanite is the only amphibole occurring in SW samples, suggesting provenance from the Bagnaschino (blueschists facies) or Pamparato-Murialdo and Calizzano-Savona units (glaucofanite-bearing greenschists facies). Garnets mainly occur in samples from the NE suggesting provenance from the Voltri Group. This signal however is not distinct enough to recognise specific source rocks within the massifs.

As a whole, facies analysis, mineral chemistry and geochronology clearly reflect local provenance of the Molare Formation, without significant long-shore drift or mixing during transgression, and surprisingly record an Oligocene belt exposed very close to the present day one. Furthermore, among the differ-