Reconstructing the paleoenvironment of nummulitid strata: transport, erosion and deposition.

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Larger foraminifera occur abundantly in many Paleogene shelf carbonate platforms and, although they cover a wide range of platform environments, these biotas were influenced by global and local factors. Ecology (e.g. temperature, water chemistry, trophic resources), geology (e.g. sea level changes, plate tectonics) and evolution (e.g. population dynamics, fitness) affect the abundance and structure of larger foraminiferal communities.

Water motion is the most important physical factor in carbonate platform environments directing the distribution of living individuals, and the distribution of empty shells mainly follows the input produced by water motion. The relation between the biotic composition and the fossil association must always be taken into account for interpreting the paleoenvironment.

The shape of nummulitids and its relation with systematics on the one and water motion on the other side allows fascinating results. Concerning larger foraminifera, especially nummulitids, shape variation, size and internal structures are highly correlated with taxonomy. These parameters strongly influence the distribution of foraminiferal tests on a slope induced by water motion, the same as concerning sand grains: coarser sediments are displaced in shallower and higher energetic scenarios, finer particles are more common in deeper and more quiet regions. Because of these correlations, estimations of paleodepth can be based on the species distribution in the fossil environment.

The calculation applied to obtain the hydrodynamic answer of nummulitid tests was provided on species belonging to the genera *Nummulites* and *Assilina* and on some operculinids.

The directly measured parameters on the test are: largest diameter (length), intermediate diameter (width), smallest diameter (height or thickness), equatorial section area, axial section area and density. The following parameters are derived from these direct measurements: true nominal diameter, volume, dimensionless size of the equivalent sphere, critical shear stress, critical shear velocity, shape entropy, drag coefficient, terminal settling velocity and Reynolds number. The value of the hydrodynamic answer of a single test considers size, shape and density, and it is the combination of these variables which express the hydrodynamic behaviour of the specimen. Consequently, the diversity of forms collected within a layer is characterized by the same hydrodynamic behaviour. From a paleoenvironmental point of view, due to sorting induced by

water motion, transported tests with similar hydrodynamic behaviour are deposited in the same hydrodynamic environment. According to the obtained results, measured tests in the same sample possess the same hydrodynamic parameters and trends of such parameters along a geological profile showing variations of the energetic input (e.g. shallowing upwards, maximum flooding, sea level changes) can be detected.

Combining the form and intensity of energy input with the hydrodynamic response of the test will give an upgrade on the paleoenvironmental reconstruction in terms of physical variables and the geographic setting in each area. The correlation between the energetic input and the systematic distribution of taxa on a ramp can give much information about the ecology and biology of the initial biotic input.