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NEW FEATURES OF SIMSAFADIM NUMERICAL MODEL: inclusion of nutrients as a carbonate production factor and sediment compaction

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Carbonate-sedimentary environments are characterized by different groups of organisms living together and competing for space, nutrients and other life-determining factors.

The 3D simulation model SIMSAFADIM is used to simulate these environments. In its original state, SIMSAFADIM was a 3D forward process-based model for simulation of stratigraphic architecture and facies distribution in sedimentary basins. It was developed by Bitzer, Salas and Gratacós and considers clastic and carbonate sediments.

In a first step, the model simulated carbonate production and sedimentation controlled by water depth, presence of clastic sediments, carbonate mud and predator-prey factors among three species. However other factors are important in carbonate producer species like nutrient supply, which is included in the new version of this code.

Nutrients play an important role in species life, because nutrients control which species can appear and how do they grow. Each species needs a specific range of nutrient concentration to grow. Then marine environments are classified in three main groups, depending on their nutrients concentration: oligotrophic, mesotrophic and eutrophic.

To model the new environmental variable, the code works with nutrients like any other 'sediment'. These are incorporated into the fluid and flow like clastic sediments, but nutrients are consumed by species and not settled down.

The code considers a special situation, when a marine transgression occurs. In this case, when the sea level rises and floods new areas, these flooded areas contribute with an extra concentration of nutrients inflow.

Furthermore the program adds a new module to calculate compaction of clastic and carbonate sediments using the deMarsily formulation that follows Terzaghi's consolidation theory.