



Upper Pennsylvanian carbonate buildups in a siliciclastic-dominated environment (Donets Basin, Ukraine)

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Carbonate buildups are ubiquitous parts of Late Paleozoic deposits worldwide. Pennsylvanian examples were reported from various basins and are particularly widespread in the North American Midcontinent, the Arctic realm, the Urals, the Carnic Alps, and the Cantabrian Mountains.

Here we report on carbonate buildups occurring in seven stratigraphic levels in the Donets Basin (Ukraine) ranging in age from Bashkirian to Kasimovian. Siliciclastic deposits dominated the basin, but apparently short time intervals suitable for limestone deposits allowed carbonate buildups to grow. Overall, the buildups range from few decimeters to several meters in thickness, and from few to tens of meters lateral extension.

In the stratigraphic nomenclature used by Ukrainian geologists, buildups occur in Limestones F₂, K₃, K₈, L₅, M₃, N₃, and O₆¹. Based on the main buildup constructor(s), these are (from the oldest to the youngest):

F₂: *Masloviporidium* buildups

These buildups occur in the Kryven'ky Yar section. Individual mounds do not exceed 50 cm in thickness. Sheet-like, branched thalli of the alga *Masloviporidium* built a complex network that encloses internal sediment and various bioclasts (smaller foraminifers, brachiopods, bryozoans, and rare fragments of the alga *Beresella*).

K₃: Algal buildups

Algal buildups occur in the Malinovskaya section. Whereas the mounded areas reach 120 cm thickness, the limestone K₃ is only 50 to 70 cm thick in the bedded part, four to 10 m away from the mound. A low-diversity, mud-rich algal boundstone represents the characteristic texture. This contrasts to the high-diversity beds forming the substrate for buildups (fusulinids, smaller foraminifers, brachiopods, ostracods, and rare trilobites and crinoids were noted). Bryozoan-rich beds cover the buildups.

K₈: Coral buildups

Well-exposed coral buildups occur in the Karaguz section. Buildups approximately three m thick are composed of coalescent, 20 to 30 cm thick mounds. Colonial corals contributed to build an obvious depositional relief at the actual seafloor. The coral framework encloses a matrix that consists of wackestone and packstone including fusulinids, multiple smaller foraminifers (*Textularids*, *Bradyina*, and *Tuberitina*), rare crinoid stems and gastropods. Multiple sheets of chaetetid sponges covered the coral-dominated basal part.

L₅: Coral and chaetetid sponge buildups

L₅ is a dark-gray, mounded limestone, best exposed at the Izvarino section. The thickness varies with the relief of mounds from 150 to 190 cm within a lateral distance of 20 m. The mound facies consists of coral and chaetetid sponge boundstone. Columnar to domal, head-like *Chaetetes* growth forms occur in the lower part of the mound, and laminar growth forms in the upper part. Further fossils in the boundstone facies include algae (*Donezella* sp.), crinoids, and foraminifers. The upper part of the mound is indistinctly bedded, and composed of bioclastic wackestone and packstone. Brachiopods are common. The flanks of mounds are bedded wackestone and packstone, commonly including fusulinids, smaller foraminifers, and the alga *Beresella*.

M₃: Algal buildup

Buildups occur within M₃ in the Gurkova section. M₃ is 90 to 100 cm in the bedded part and 120 cm in the mounded areas. A low-diversity algal, peloid-rich boundstone represents the characteristic texture. A few colonial corals, crinoids, and brachiopods occur atop of the algal buildups. Overall, smaller foraminifers (particularly *Bradyina*) are common.

N₃: Phylloid algal and chaetetid sponge buildups

Forty to 50 cm thick buildups occur within N₃ in the Kalinovo section. The basal part consists of multiple sheets of chaetetid sponges. Above chaetetid-dominated areas, phylloid algae grew. Among the phylloid algae, a few well-preserved thalli show internal cell structure of *Ivanovia*, possibly *Eugonophyllum*, and *Anthracoporella*. Bio-

clasts in the matrix of wackestone and packstone include *Tubiphytes* and brachiopod spines.

O₆¹: *Palaeoaplysina* buildups

Palaeoaplysina buildups typically occur in the Kalinovo section. Buildups are tabular or, rarely, have a mound shape. *Palaeoaplysina*, intertwined with a few thalli of phylloid algae constitutes the main components. The peloidal clotted matrix represents approximately 40% of the rock volume. Further fossils include brachiopods, bryozoans, *Tubiphytes* and multiple smaller foraminifers (*Tetrataxis*, *Calcitornella*, *Hedraites*, *Tuberitina* and rare *Bradyina*).

Although predominantly siliciclastic deposits filled the Donets Basin, some of the intercalated limestone beds include carbonate buildups of variegated composition and size. Obviously, the constructors (phylloid algae, corals, and chaetetid sponges) were able to temporarily colonize these supposedly hostile environments and grow fast enough to build a depositional relief on the actual seafloor prior to getting buried by siliciclastic input.