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## Middle Triassic radiolarians from the Southeastern Pamirs (Republic of Tajikistan)

*Radiolaires du Trias moyen du Pamir sud-oriental (République de Tadjikistan)*

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### Abstract

Triassic radiolarians were studied from a limestone/chert succession of the Dzhangisu and Boztere formations, Southeastern Pamirs, Republic of Tajikistan. The middle part of the Dzhangisu Formation is characterized by a Late Anisian assemblage with *Eptingium nakasekoi* Kozur and Mostler, *Archaeospongoprimum bispinosum* Kozur and Mostler, *A. mesotriassicum mesotriassicum* Kozur and Mostler, *Paroertlispongus multispinosus* Kozur and Mostler, *P. rarispinosus* Kozur and Mostler and *Hozmadia rotunda* (Nakaseko and Nishimura) that belongs either to the upper part of the *Tetraspinocyrtis laevis* Zone or to the *Spongosilicarmiger transitus* Zone (Kozur, 2003). The lowermost part of the Boztere Formation is characterized by a Late Ladinian assemblage with *Muelleritortis cochleata* (Nakaseko and Nishimura), *M. expansa* (Kozur and Mostler), *Spongoserrula rarauana* Dumitrica that corresponds to the *M. cochleata* Zone. Pamirian localities have a transitional position between the Western Tethys (Alpine–Mediterranean region) and the Eastern Tethys–Pacific junction (Southern China and Thailand). The assemblages are Tethyan in affinity.

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**Keywords:** Radiolaria; Middle Triassic; Stratigraphy; Pamirs; Tajikistan

### Résumé

Des radiolaires du Trias ont été étudiés à partir d'une série de calcaires et de chert des formations de Dzhangisu et de Boztere du Pamir sud-oriental, République de Tadjikistan. La partie moyenne de la Formation de Dzhangisu se caractérise par un assemblage d'âge Anisien supérieur avec *Eptingium nakasekoi* Kozur et Mostler, *Archaeospongoprimum bispinosum* Kozur et Mostler, *A. mesotriassicum mesotriassicum* Kozur et Mostler, *Paroertlispongus multispinosus* Kozur et Mostler, *P. rarispinosus* Kozur et Mostler et *Hozmadia rotunda* (Nakaseko et Nishimura) qui appartient soit à la partie supérieure de la Zone à *Tetraspinocyrtis laevis* Zone ou à la Zone à *Spongosilicarmiger transitus* (Kozur, 2003). La partie inférieure de la Formation de Boztere se caractérise par un assemblage du Ladinien supérieur avec *Muelleritortis cochleata* (Nakaseko et Nishimura), *M. expansa* Kozur et Mostler et *Spongoserrula rarauana* Dumitrica qui correspond à la Zone à *M. cochleata*. Les localités étudiées du Pamir ont une position transitoire entre la Téthys occidentale (région Alpes-Méditerranée) et la jonction entre Téthys orientale-Pacifique (Chine du Sud et Thaïlande). Les assemblages sont d'affinité téthysienne.

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**Mots clés :** Radiolaires ; Trias moyen ; Stratigraphie ; Pamir ; Tadjikistan

### 1. Introduction

Triassic radiolarians have been studied intensively in the recent decades due to their high biostratigraphic and paleobiogeographic potential (O'Dogherty et al., 2010; Bragin, 2015;

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Hori et al., 2015). Previous investigations have resulted in abundant information on Triassic radiolarians from various regions of the world including even remote and not easily accessible places. Many important localities belong to the Tethyan Realm – from the Alpine region (Dumitrica et al., 1980; Kozur and Mostler, 1994) to Turkey (Tekin, 1999), Oman (Dumitrica, 1999), China (Feng et al., 2001, 2009; Wang et al., 2002, 2005) and Thailand (Saesaengseerung et al., 2007; Thassanapak et al., 2011).

The Pamir Mountains (Tajikistan) are located at the junction of the Himalayas with the Tian-Shan, Karakoram, Kunlun and Hindu Kush ranges and represent an important link within the Tethyan Realm. Triassic deposits of the Pamirs have been well studied (Dronov and Leven, 1961; Dronov and Kushlin, 1962; Dronov et al., 1964; Dronov and Mel'nikova, 1985; Dronov and Polubotko, 1988; Dagis and Dronov, 1989; Dronov and Mel'nikova, 1992; Dronov, 1994; Dronov et al., 1995; Dronov, 2001; Raimbekov and Dronov, 2014) but some stratigraphic problems remain. The fossil record of faunas classically used for biostratigraphy (ammonoids, bivalves, conodonts) is generally poor and full of gaps and most Ladinian faunas show a large degree of provincialism, which hampers inter-regional biostratigraphic correlation. Triassic successions of the Southeastern Pamirs, especially those in relatively deep-water slope and basinal settings, contain numerous units of radiolarian-bearing cherts that can now be used for precise regional, interregional and global correlation. Radiolarians from the Pamirs were first studied in thin sections (Gol'tman, 1969), but only generic determinations were made and no images were added.

Here, we present the first data of Triassic radiolarians from the Southeastern Pamirs illustrated by SEM photos. This material was collected by A.V. Dronov and Y. Raimbekov during field works in 2013. These authors provide description of the geological setting and studied section. The samples were processed and studied in the Geological Institute of the Russian Academy of Sciences in Moscow, Russia by N.Yu. Bragin who provides radiolarian determinations and biostratigraphy.

## 2. Geological setting

The Pamirs are located north of the Hindustan craton and the Indus-Tsangpo suture at the junction of the main mountain ridges of the Central Asia (Tian Shan, Hindu Kush, Kunlun, Karakoram and Himalaya). The southeastern Pamirs represents a part of the Karakoram microcontinent. It is bounded by the Shyok-Bangong suture in the south and by the Rushan-Shuanghu suture in the north. The Karakoram block is equivalent to the Quiangtang Terrane of the Tibet. The Pamirs-Karakoram strike-slip fault represents the boundary between these continental blocks (Burtman, 2010) (Fig. 1).

Triassic deposits are widespread in the territory of southeastern Pamirs. This territory has been subdivided into four facies zones based on the composition of Triassic sections. From the center to the periphery, these are the Axial, Transitional, Intermediate and Peripheral zones (Dronov and Leven, 1961; Dronov and Kushlin, 1962; Dronov et al., 1964; Dronov and Mel'nikova,

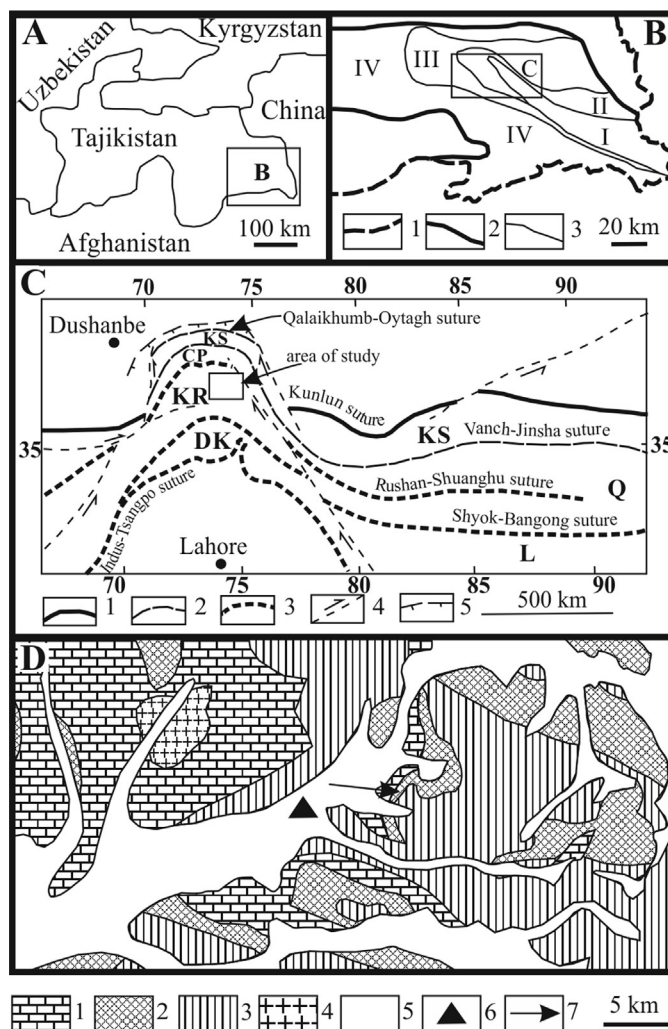


Fig. 1. Geographical and geological position of the Mamazairbulak Section, Tajikistan. A. Tajikistan and adjacent countries. B. Triassic facies zonation of the Southeastern Pamirs (after Dronov, 1994), 1 – state boundaries; 2 – major faults bounding the Southeastern Pamirs; 3 – boundaries of facies zones; I – Axial Zone; II – Transitional Zone; III – Intermediate Zone; IV – Peripheral Zone. C. Sutures of Phanerozoic oceanic basins of Pamirs and Tibet (Burtman, 2010), 1 – Neoproterozoic sutures, 2 – Carboniferous sutures, 3 – Permo-Triassic sutures, 4 – strike-slip faults, 5 – thrusts. Terranes with continental crust (continents, microcontinents): CP: Central Pamirs; DK: Dras-Kokhistan; KR: Karakoram; KS: Kurgovat-Songpan; Q: Qiangtang; L: Lhasa. D. Geological scheme of the Naizatash Pass area (after Malzam et al., 1984), 1 – Carboniferous and Permian limestones, siltstones, cherts, tuffs, sandstones; 2 – Triassic limestones and cherts; 3 – Jurassic limestones; 4 – Cretaceous granites; 5 – Quaternary alluvial and proluvial deposits; 6 – Naizatash Pass; 7 – The Mamazairbulak section.

1985, 1992; Dronov, 1994) (Fig. 1). The Axial Zone is characterized by shallow-water sediments represented by a thick reef complex and thick-bedded to massive back-reef lagoonal dolomites (1000 m of total thickness) that were presumably deposited on the paleo-uplift. The transitional Zone corresponds to the upper fore-reef slope of this uplift. Here, dolomites intercalate with relatively thick-bedded light-grey bioclastic limestone and cherts (40–150 m total thickness). Deeper water sediments are represented by thin-bedded dark calcarenites, calcilutites and cherts of the Intermediate Zone formed on the distal part

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