

New Evidence of Megaclasts from the Russian South: The First Report of Three Localities

Dmitry A. Ruban ^{1,2,*}  and Natalia N. Yashalova ³

¹ K.G. Razumovsky Moscow State University of Technologies and Management (the First Cossack University), Zemlyanoy Val Street 73, 109004 Moscow, Russia

² Southern Federal University, 23-ya Linija street 43, 344019 Rostov-on-Don, Russia

³ Cherepovets State University, Sovetskiy Avenue 10, 162600 Cherepovets, Russia; natalij2005@mail.ru

* Correspondence: ruban-d@mail.ru

Abstract: Megaclast research has intensified recently, and its further development needs new factual information from various places of the world. Three new megaclast localities are reported from the Russian South, namely, Shum, Merzhanovo, and the Red Stones. These localities host blocks of all grades, sometimes with certain flatness and angle roundness. Megaclasts from Shum and Merzhanovo result from poly-phase slope processes. At the Red Stones locality, a group of residual megaclasts will appear in the future due to weathering processes. This evidence together with the examples brought by the virtual journeys and the literature interpretations prove the genetic diversity of megaclasts and stress the urgency of their further investigations in various depositional environments.

Keywords: colluvial deposits; large clasts; remote sensing; Russian South; weathering



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1. Introduction

Large clasts are important study objects to contemporary sedimentologists. Significant progress in the development of their grain-size classification and the understanding of their origin has occurred since the beginning of the 21st century (see overview in [1]). Initially, all detrital rock particles larger than 256 mm in size were called as boulders. This view was based on the early developments by Udden [2] and Wentworth [3] that are well-known as the Udden–Wentworth grain-size classification [4–6]. In the alternative classifications, boulders are particles larger than 100 mm [7,8]. Anyway, this term is too general. Attempts to differentiate between true boulders and much bigger clasts have facilitated revisions of the former grain-size classification and triggered coining new terms, the most important from which is megaclast [9–12].

Megaclasts are the biggest clasts measured by meters (even dozens and hundreds of meters) in diameter (Figure 1). These have been studied intensively on modern coasts with attention to transport mechanisms linked to extreme storms and tsunamis [13–19]. However, it is also known that megaclasts are genetically diverse and occur in various depositional environments, both marine and terrestrial [1,9,20–22]. Additionally, it is clear that megaclasts can occur not only individually but also in groups (even fields) to compose true deposits [17].

The megaclast research needs more information on the world distribution of megaclasts and megaclast deposits. This research direction is too young, and the experts are too few to accumulate a globally representative set of information quickly (evidently, megaclasts were considered in many previous works, but they are rarely treated as megaclasts [1]). The more or less detailed understanding of the origin of coastal megaclasts has to be equated with the same knowledge of the other depositional environments. More generally, the present state of the megaclast research resembles the state of geology at the

time of its dawn in the 19th century, and this research needs a lot of elementary factual information derived from descriptive, rather simple studies.

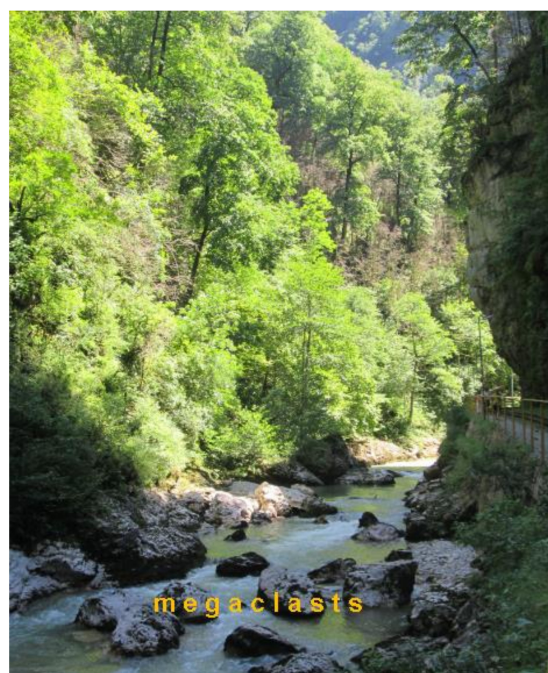


Figure 1. Typical megaclasts with the size of 1–3 m in the Guama Gorge (Krasnodar Region, Russia).

The objective of the present, essentially empirical paper is to report new megaclast findings in the Russian South, where three megaclast localities have been found in the course of geological investigations (Figure 2). In addition to their general description, i.e., providing a new portion of the demanded elementary factual data and, thus, contributing to the worldwide cataloguing of megaclast occurrences, this paper sheds light into the somewhat unusual origin of these megaclasts. It does not pretend to reconsider the genetic classifications (apparently, the previous reviews by Ruban et al. [1] and Blair and McPherson [9] still matter). However, the reported evidence gives opportunity to emphasize on the genetic diversity of megaclasts and to claim for intensifying their studies. A comparison to some other examples of megaclasts facilitates solution of these tasks.



Figure 2. Megaclast localities considered in the present article.

2. Methods

The field investigations focus on three localities of the Russian South, which is a vast geographical domain encompassing the southern part of European Russia (Figure 3). The Shum locality is situated in the Mountainous Adygeya geodiversity hotspot in the western part of the Greater Caucasus mountains. The importance of this area to the megaclast research was demonstrated by Lubova et al. [21], Ruban [23], and Ruban et al. [24]. Two other localities are found in the Ciscaucasus, which is a large territory, which includes the northern foreland of the Greater Caucasus and the southern edge of the Russian Plain. More information on these localities setting is provided together with the descriptions of the relevant megaclasts below. The Shum and Merzhanovo localities were studied in the field by the first author, and the Red Stones locality was examined in the field by the second author.



Figure 3. Megaclast localities of the Russian South considered in the present article.

In all cases, megaclasts are characterized as follows. First, size, shape, and composition of megaclasts are established. Second, geometry of megaclast occurrences is recorded, with emphasis on how large particles are spatially distributed and densely packed. Third, attention is paid to the local geological context to explain the origin of the reported megaclast occurrences. The templates for such interpretations can be found in the previous works by Ruban [23] and Ruban et al. [24].

Several grain-size classifications of megaclasts exist. One particular difference is linked to the lower limit of megaclasts, which is also the upper limit for boulders. This limit is placed by different researchers within the range of 1–4 m [9–12]. In this paper, the classification proposed by Bruno and Ruban [11] is followed (Table 1), especially because of its easiness-to-apply in both field and remote investigations. Anyway, the authors do not insist on the ultimate importance of the employed classification, and one can easily justify the outcomes of the present work against the alternative classifications.

Table 1. The Megaclast Classification Proposed by Bruno and Ruban [11].

Category	Class	Grade	Size, m
Megaclasts	Superblocks (SB)		>100.0 m
	Megablocks	Coarse (CM)	>50.0–100.0 m
		Medium (MM)	>25.0–50.0 m
		Fine (FM)	>10.0–25.0 m
	Blocks	Coarse (CB)	>5.0–10.0 m
		Medium (MB)	>2.5–5.0 m
		Fine (FB)	>1.0–2.5 m
	Boulders		>0.1–1.0 m

3. Results

3.1. Shum

The Shum locality is situated in the western part of the Greater Caucasus, which is the Late Cenozoic orogen [25,26] stretching along the southwestern border of Russia (Figure 3). More precisely, this locality occurs near the mouth of the Syryf (Rufabgo) canyon, which is a western branch of the Khadzhokh canyon system formed by the Belaya River and its tributaries. The geographical, geomorphological, and geological setting of this area is characterized comprehensively by Mikhailenko et al. [27]. The locality has a stairs-like morphology (Figure 4). The canyons are incised in the Triassic limestones cropping out along the Belaya and Syryf rivers. These limestones are overlain by the Lower–Middle Jurassic sandstones and shales (terraces and steep slopes) capped by the Upper Jurassic carbonates (cuesta scarps).

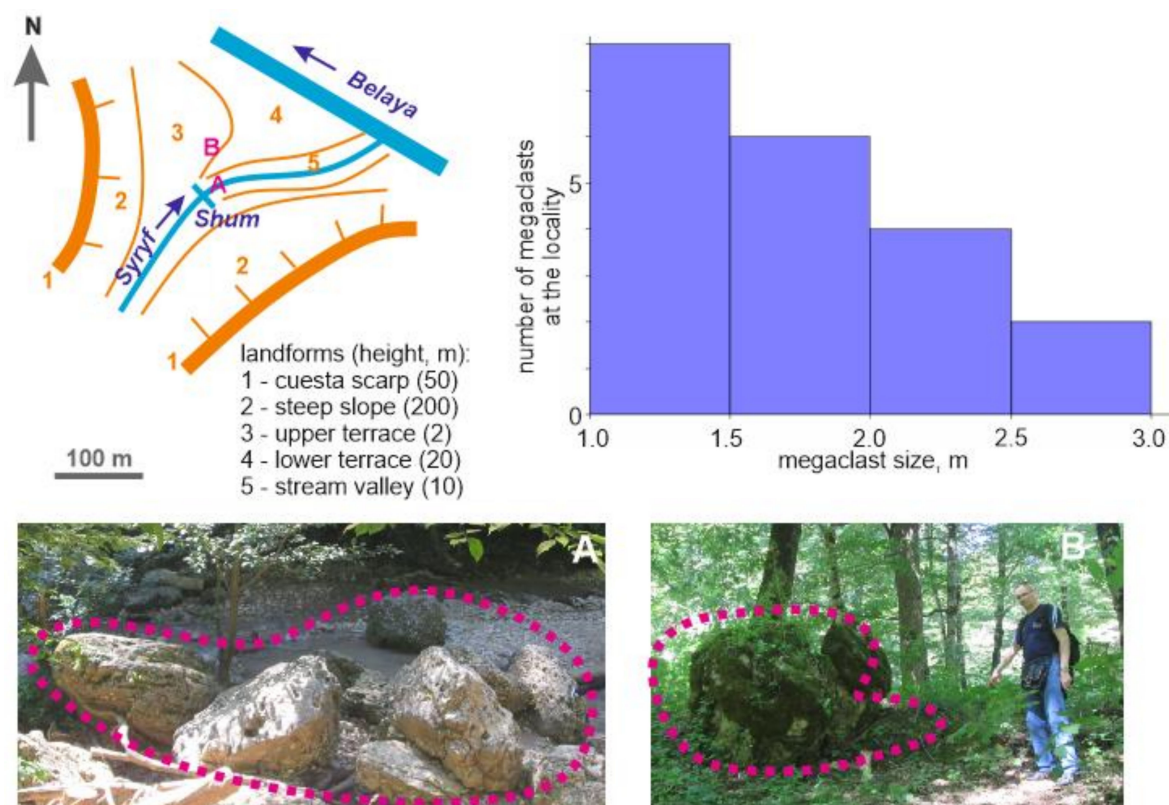


Figure 4. Megaclasts at the Shum locality: **A**—canyon bottom, **B**—upper terrace (see Figures 2 and 3 for location). Photos by D.A.R.

Megaclasts of the Shum locality (Figure 4) differ in size, but these are chiefly fine blocks of carbonates with irregular and angular shapes. The maximum length (a-axis) is usually below 2 m, and the other axes (b- and c-axis) are a bit shorter (<1.5 m and even <1 m), which makes some (but not all) clasts flat and rarely elongated. Certain flatness is linked to the layering in the parent rocks. Another interesting feature is angle roundness. Its careful examination implies that it results from the karst-related “polishing” of the parent rocks along joints. Pre-detachment conditions (layering, jointing, and karstification) almost fully determined megaclast shapes, although breakage in the course of downslope movement also matters.

At the bottom of the Syryf canyon, there is a group of megaclasts with very limited spatial distribution and moderate density of package. Near the edge of the upper terrace, rare individual megaclasts and their small groups occur. This means that the locality hosts both true megaclast deposits and scattered megaclast occurrences (Figure 4).

The origin of megaclasts from the Shum locality is linked to collapses of the cuesta scarps with fractured (due to tectonic stress) and karst-weakened Upper Jurassic carbonates and slope failures in the lower part of the Syryf canyon. The origin of these megaclasts is evidently linked to slope processes in the Khadzhokh canyon system, i.e.; they are colluvial. Nonetheless, one needs to note that the megaclasts from the upper terrace are located quite far from the slope toe, from which they are separated by a wide, flat surface of the densely forested terrace (Figure 4). When the canyon-bottom megaclasts can be related to the modern slope processes, the upper-terrace megaclasts cannot be related to this mechanism (alternatively, these would occur at the slope toe, not near the terrace edge). The only plausible explanation is that these upper terrace megaclasts formed at the toe of the former slope that retreated later to its present position. Such a genetic model was argued by Ruban [23] for the other part of Mountainous Adygeya with the comparable geological and geomorphological setting. Generally, the depositional environment of megaclasts of the Shum locality is characterized by poly-phase colluvial processes on mountainous canyon slopes.

3.2. Merzhanovo

The Merzhanovo locality is situated on the northern shore of the Taganrog Bay, which is an elongated eastern bay of the shallow-water, epeiric Azov Sea (Figure 3)—a remnant of the Late Cenozoic Eastern Paratethys watermass [28–30]. Geologically, this area corresponds to the transition between the East European (Russian) and Scythian platforms where the Mesozoic–Cenozoic sedimentary sequences cover the Precambrian crystalline basement [31,32]. More precisely, the locality occurs near the village of Merzhanovo where a narrow shore of the Taganrog Bay is bounded by a steep, 30-m high slope susceptible to active landsliding. The local geology is characterized by Ruban [33,34], and it is dominated by the Upper Miocene–Pliocene deposits (shales, sands, and detrital limestones) of the Eastern Paratethys, which are exposed in the noted slope.

Megaclasts of the Merzhanovo locality (Figure 5) have the size of 1–3 m, and the biggest of them reach 7 m, i.e.; these are chiefly fine blocks and rare medium and coarse blocks. Their shapes are irregular and angular. The noted size parameters correspond to the a- and b-axis, whereas the c-axis is much shorter, sometimes <1 m. As a result, some megaclasts look flat, and this flatness inherits the parent rock layering (pre-detachment condition). These rocks are composed of the Upper Miocene detrital limestones with sharply developed layering, and the layering surfaces often serve as lower and upper surfaces of the megaclasts.

These megaclasts form long (up to a few hundreds of meters in length) chains subparallel to the shoreline. The distance between the blocks may reach several meters. Notably, these chains of megaclasts tend to occur both at the toe of the slope and close to the shoreline, i.e.; about 20 m far from the modern slope (Figure 5). Principally, these chains can be judged as megaclast deposits with very low-dense package.

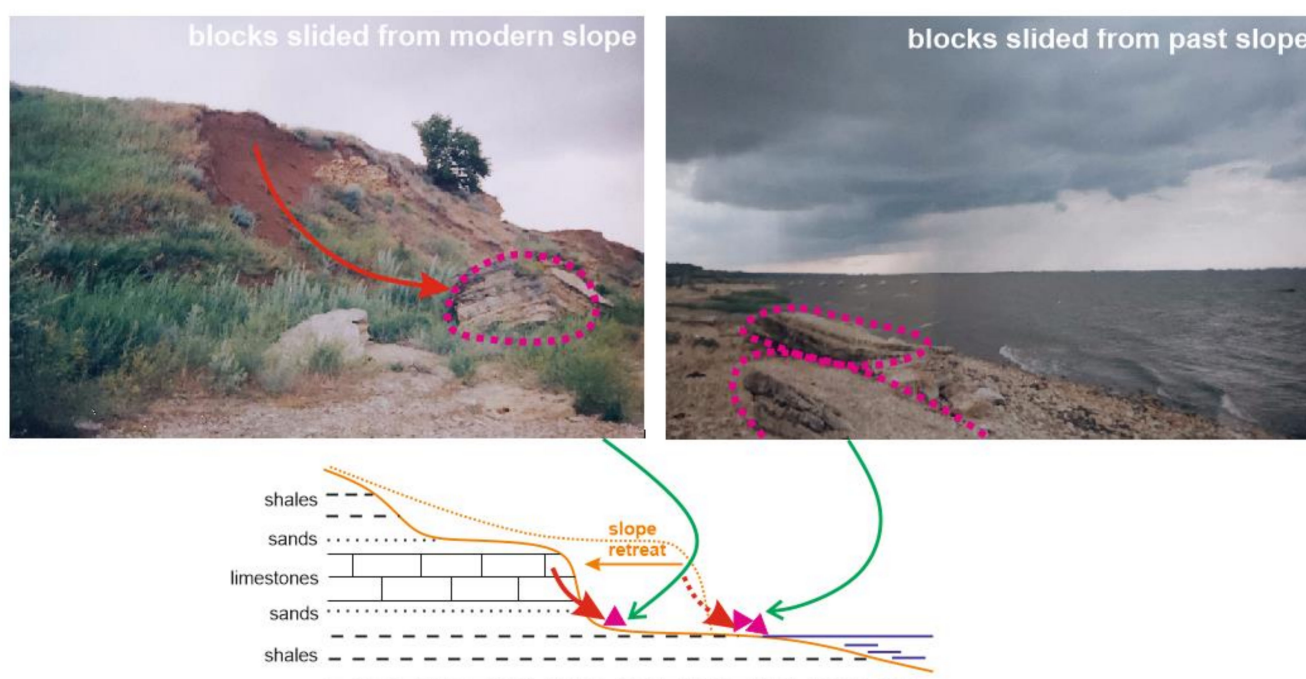


Figure 5. Megaclasts at the Merzhanovo locality (see Figures 2 and 3 for location). Photos by D.A.R.

The origin of these megaclasts is linked evidently to the active landsliding when blocks of the detrital limestones are detached from the parent rocks and moved down and forth by the underlying black shales. The megaclasts established at the toe of the slope are very recent, whereas those near the shoreline resulted from past landslides that pushed large clasts to the shoreline and also contributed to the slope destruction and retreat (Figure 5). The main landslide bodies, which consisted of the red clays and the yellow sands overlying the limestones, were quickly eroded due to sediment softness, whereas megaclasts consisted of the harder rocks remained near the shoreline. Generally, the depositional environment of megaclasts from the Merzhanovo locality is characterized by the poly-phase landsliding along the bay coast.

3.3. Red Stones

The Red Stones locality is situated in the central part of the Greater Caucasus foreland, to the south of the Stavropol High of the Scythian Platform [35] (Figure 3). On the territory of the Kislovodsk National Park, which is one of the most important tourist attractions of the Russian South [36], a series of small outcrops of the Lower Cretaceous red sandstones occur on the gentle slopes of the Dzhinal Range [37–40]. These are medium- and coarse-grained sandstones with the thickness of 12 m. Their Upper Barremian age is based on ammonites. The striking peculiarity of these rocks is the abundance of iron oolites. Apparently, their red color results from iron oxidation together with weathering. The upper horizons of this sandstone sequence boast most intense color. With regard to the common model of formation of oolitic ironstones [41–43], it is supposed that iron was derived from the neighboring volcanism-affected areas of the Caucasus, enriched warm shallow sea, and precipitated together with sand particles. This locality serves as a regional reference section of the Upper Barremian, and, potentially, it provides valuable regional information about the geological time interval, the stratigraphical framework of which is permanently improved [44–46]. The Red Stones are shaped (“sculptured”) by weathering and look like either bulges (~1 m in height) on gentle slopes or isolated hillocks (up to 5–7 m in height) (Figure 6). They have deserved the protection status of federal level.

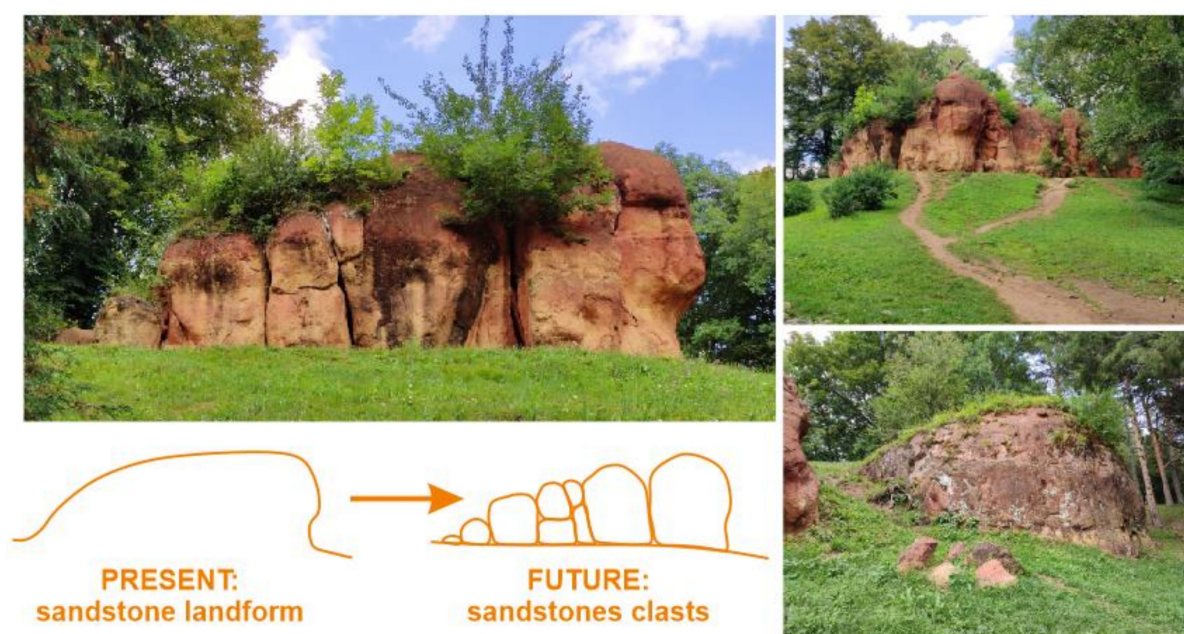


Figure 6. The Red Stones locality (see Figures 2 and 3 for location). Photos by N.N.Y.

These rocks are deeply fractured (a sign of tectonic stress), and their massifs are partly disintegrated (physical and chemical weathering of the iron-rich parent rocks along joints). Some large particles with the size of boulders and even fine blocks are already detached and occur either at the very toe of rock exposures and down on the slopes. The Red Stones are local topographic highs that are subject of active denudation. Their general view and the noted disintegration permit one to hypothesize their destruction in the near geological future (Figure 6). Nonetheless, the sandstones are rather hard, and their total denudation seems to be unrealistic. According to Migoń [47], sandstone landforms can finish their evolution with their total disappearance accompanied by the accumulation of residual large clasts. This scenario is suitable to the Red Stones locality. Megaclasts will separate from one another by the already-visible fractures to remain in situ or to slide for a short distance down the slope.

The present size of the rock fragments bounded by deep fractures allows to hypothesize that the future residual megaclasts will be fine and medium blocks, i.e.; their size may reach 3–5 m. Certain roundness of their angles is expected due to pre-detachment, weathering-related “polishing” of the rocks. The pre-detachment fracturing will control the shape of megaclasts. These will be either isometric (with more or less equal *a*-, *b*-, and *c*-axis) in the case of brick-like fracturing or flat and elongated in the case of close position of vertical fractures (Figure 6). Generally, the Red Stones locality represents the specific environment where the formation of megaclasts has only started in the course of the final sandstone landform evolution. Apparently, further denudation will result in accumulation of a group of megaclasts, which can be judged as a megaclast deposit with moderate package. However, this deposit will be very local.

4. Discussion

4.1. Putting into the Broader Context

In their pioneering work devoted to large clasts, Blair and McPherson [9] considered various modes of their origin; for instance, megaclasts can be detached from parent rocks via weathering, tectonic motions, earthquakes, and extraterrestrial impacts and transported by waves, glaciers, gravity flows, and volcanism. Lubova et al. [21] paid attention to colluvial, karst, and artificial origin of megaclasts. Ruban et al. [1] proposed a broad spectrum of detachment and transport mechanisms, and they also noted that the modern megaclast-related research is characterized by a kind of overemphasis on the coastal zone

and the transport by extreme events. The three megaclast localities from the Russian South imply that the origin of megaclasts can be complex and rather diverse. Of special interest are co-occurring generations of megaclasts observed at the Shum and Merzhanovo localities, which reflect slopes retreat and higher resistance of large clasts to erosion relatively to the rest of slope debris.

It appears interesting and important to compare these findings to some other megaclast localities. The available knowledge remains scarce: one sedimentologist (and even all experts in megaclasts taken together) cannot visit many localities, especially remote ones, whereas they need as much field data as possible. Fortunately, modern sedimentology does not depend on the only time-consuming and high-cost field investigations, but it can employ high-tech tools of remote sensing for data collecting; additionally, the bibliographical databases allow collecting a lot of precious information from the already published literature. Several examples of megaclast localities are found with virtual journeys and literature interpretations to be compared to the localities of the Russian South. The geographical focus of these cases is rather random and depends on the personal research experience of the authors.

Virtual studies employ *Google Earth Engine*, the importance of which is explained by Belisle [48], Gorelick et al. [49], Liang et al. [50], Mutanga and Kumar [51], and Warnasuriya et al. [52]; the principle for application of this tool in megaclast studies is demonstrated by Ruban [17,53] who also proposed to call this approach as virtual journey (the relevant studies look like explorations of land surface along any route or within any territory and then general descriptions of the found megaclasts—such a virtual analysis resembles geological exploration by individual geologists in unknown domains). Virtual journeys are necessary to provide sedimentologists with elementary megaclast information because. The present study employs the *Google Earth Pro* version 7.1.8.3036 for characterizing several localities (Figure 2).

A lot of megaclasts were either described or illustrated in the geoscience literature, although not named as such. Particularly, geomorphologists deal with modern sediments and depositional environments, and huge detrital rock particles often constitute either small-scale landforms or elements of bigger landforms. Surprisingly, the term “megaclast” and the other relevant terms (e.g., the term “block”) are not used in the high-class geomorphological studies as frequently, as one would expect (e.g., [54]). Many influential articles mention boulders, although their figures illustrate true megaclasts. This published information seems to be essential for collecting the elementary factual information about the world distribution of megaclasts. This is especially so as these publications bear professional knowledge of the origin of megaclasts. From the huge amount of geomorphological contributions, four articles published in 2020–2021 in a top international journal “Geomorphology” are selected. Importantly, these articles focus on large clasts and allow judgements of four localities (Figure 2).

Field investigations, virtual journeys, and literature interpretations prove the idea that megaclasts are not so uncommon on the global scale, and these often include particles >10 m in size, i.e., megablocks (Table 2). More importantly, the same examples imply megaclasts form under the influence of different mechanisms, some of which are really peculiar (for instance, seismicity-driven transport or denudation of sandstone landforms) (Table 2). Sometimes, megaclast concentrations are polygenetic and result from poly-phase processes (with the subsequent co-occurrence of several generations of megaclasts). The genetic analysis of megaclasts requires equal attention to their detachment, transport, and accumulation. For instance, detachment of blocks depends on tectonic stress of the parent rocks and the related joint systems in many cases. It is established that karst processes do not only weaken massifs but also smoothen surfaces of the rocks, and, thus, they shape megaclasts before detachment. It is not always easy to reveal the true origin of megaclasts. For instance, making clear distinction between the possible roles of slope and glacial processes in the formation of megaclast-bearing deposits in southern Norway

became highly challenging [55]. This is also the case of the Zermatt locality considered in the present paper.

Table 2. Summary of the origin-related information from the considered megaclast Localities.

Locality	Basic Sources	Megaclast Occurrence	Size Grade *	Clast Shape	Parent Rocks	General Setting	Origin-Related Processes **
Field cases							
Shum (Greater Caucasus, Russia)	This study	Group and individual	FB, MB(r)	Irregular, flat, angle roundness	Limestones	Canyon (mountains)	Slope collapse, slope retreat, karst
Merzhanovo (Azov Sea, Russia)	This study	Group	FB, MB(r), CB(r)	Irregular, flat, angular	Limestones	Coastal (epeiric sea)	Landsliding, slope retreat, erosion
Red Stones (Southern Ciscaucasus, Russia)	This study	Future group	FB, MB	Irregular, angle roundness	Sandstones	Top-hill (sandstone landform)	Denudation, chemical weathering
Virtual cases ***							
Angelokastro (Corfu, Greece)	[56,57]	Group	FB, MB, CB, FM(r)	Irregularity, angular	Limestones	Coastal	Cliff collapse, water action, seismicity?
Blå Jungfrun (Kalmar Strait, Sweden)	[58]	Group	FB, MB, CB, FM	Irregular, elongated, angular	Granites	Top-hill and coastal	Weathering, slope transport, wave abrasion
Chiringashima (Kagoshima Bay, Japan)	[59,60]	Group and individual	FB, MB, CB(r)	Irregular, angular	Pyroclastic flow deposits	Coastal	Slope failures, wave abrasion
Hunza River (Karakoram, Pakistan)	[61]	Megaclast-bearing sediment	FB, MB, CB, FM, MM(r)	Irregular, angular	Granitoids; deposits of natural dam	Valley (mountains)	Landsliding, weathering
Kilimanjaro (Crater Camp) (Tanzania)	[62]	Group	FB, MB, CB(r)	Irregular, spherical, angular, subrounded	Volcanic rocks	Volcanic	Slope failure, volcanism?
Kueitou (Kueishan Island, Taiwan)	[63–65]	Group	FB, MB, CB, FM, MM(r)	Irregular, angular	Pyroclastic flow deposits	Coastal and volcanic	Cliff collapse, volcanism, wave abrasion?
Simba Hill (Dodoma, Tanzania)	[66]	Group	FB, MB, CB, FM, MM(r)	Irregular, elongated, angular, subangular	Granites	Top-hill	Weathering, slope transport
Soyak (Soyak Island, Malaysia)	[67]	Group	FB, MB, CB, FM	Irregular, angular, smoothened, "rillenkarrén"	Granitoids	Entire island	Weathering, wave abrasion
Zermatt (Gornergletscher, Switzerland)	[68–71]	Megaclast-bearing sediment	FB, MB, CB(r), FM(r)	Irregular, angular	Eclogitic rocks	Glacier edge	Glacial, slope transport
Literature cases							
Valley and Ridge	[72]	Group and individual	FB, MB, CB	Irregular, angular, smoothened	–	Colluvial	Erosion, slope transport
Stołowe Mountains	[47]	Group	FB	Irregular, angular	Sandstones	Former top-till	Denudation
Atacama	[73]	Megaclast-bearing sediment	FB	Irregular, angular, subangular	–	Desert	Seismic-driven transport, weathering
Truckee River	[74]	Group and individual	FB, MB, CB, FM	Irregular, spherical, angular, subangular	Granites	Valley	Glacial outwash-

* see Table 1 for abbreviations, (r) determines rare occurrence. ** in many, if not all cases, megaclasts are separated along joints and, thus, tectonic deformations create important conditions to their origin. *** see Supplementary Materials Supplement S1 for satellite images of all localities or their parts (plots) considered in the present study.

The reported megaclast localities of the Russian South, as well as the other considered examples (Table 2) make urgent further refining of the genetic classifications of megaclasts [1,9]. Particularly, more attention should be paid to colluvial and weathering-related megaclasts. Colluvial processes have various triggers and controls in addition to gravity force, including jointing, volcanism, wave abrasion, etc. The Shum locality stresses the importance of karst processes in detachment and shaping colluvial blocks (Figure 5). Weathering is another notable phenomenon, as demonstrated by the Red Stones locality in the Russian South (Figure 6) and the Stołowe Mountains in Poland [47]. However, the present study also stresses that accumulation of information about megaclasts from numerous localities of the world is required for the development of really comprehensive genetic classifications.

4.2. Methodological Note

The previously published literature may be very important for finding new megaclast localities because a lot of works considered such localities. Similarly, important is correct consideration of megaclasts in the current publications, and the advantages of this require special attention.

The literature evidence considered in the present paper (Table 2) comes from the very fresh geomorphological literature (the preference of the works from this discipline is explained above). One should note that the authors of the four sources [47,72–74] focus on megaclasts, but use a mixed terminology naming these as boulders, blocks, and/or large blocks (several terms are applied to the same objects in some papers). It would be wrong to criticize these authors for improper terminology (megaclast studies remain a purely sedimentological research direction, which is only gaining importance).

Several advantages of megaclast recognition in geomorphological studies can be outlined, irrespective of which grain-size classification of them [9–12] to prefer. First, all four noted sources themselves bear evidence of the distinction between megaclasts and smaller particles. Chilton and Spotila [72] explained that clasts >1 m are important in topography preservation. Sager et al. [73] confirmed resistance of larger, megaclast-size particles to erosion during seismic-driven transport; these particles are also of greater methodological importance as they allow better visibility of submerged clasts into a finer matrix to argue against a fluvial origin. Wesnousky and Owen [74] showed that the boulder-bearing sediments differ genetically from megaclast-bearing sediments. Migoń [47] illustrated how residual megaclasts form a specific genetic type. Second, megaclast deposits are highly specific. At least, they are characterized by the relatively small number of detrital particles, high porosity, and erosion at the level of individual clasts. These accumulations provide important clues for linking terrestrial and extraterrestrial geomorphology and sedimentology [11,75–78], which is clearly demonstrated by Sager et al. [73]. Third, megaclasts form due to specific processes and accumulate in specific depositional environments.

Fourth, experts in megaclasts are really a few and they cannot visit all places where megaclasts occur [17,53]. However, they need as much information about megaclasts as possible for comparisons and conceptualizations. As geomorphologists can easily encounter megaclasts in their own studies, why not report these so to facilitate the work of those sedimentologists, who are megaclast experts? Fifth, megaclasts as notable landscape elements are often of cultural value due to their aesthetic properties and tourism importance [1,21,24,79,80]. If so, these are important objects of the (geo)tourism research, and geomorphologists can provide sufficient evidence for the latter.

5. Conclusions

Three new megaclast localities are found in the Russian South, namely, Shum, Merzhanovo, and the Red Stones. These are dominated by fine and medium blocks, shaping of which is controlled by the pre-detachment conditions. The importance of these localities is related to their genetic peculiarities. They stress the role of colluvial and weathering processes in formation of megaclasts. The Shum and Merzhanovo locality also highlight

the poly-phase nature of megaclast accumulations linked to slope processes. This evidence makes urgent further extensions and updates of the genetic classifications of megaclasts. However, these cannot be achieved without massive, world-scale cataloguing of megaclast localities, and virtual journeys and literature interpretations can feed experts with valuable information together with field investigations.

The importance of the megaclast research is not dictated by the only “pure” scientific needs. The catastrophic nature of some (if not many) large clasts was mentioned by the previous researchers [9,16,20], especially in relation to coastal hazards [14,18]. Landsliding along the Azov Sea coast in Merzhanovo considered in the present study and megablock formation due to the Attabad landslide (Hunza locality in Table 2) prove the relevance of megaclasts to natural hazards and the practical importance of their studies. For instance, the presence of large clasts in natural dams may affect their stability, which is of concern for the local communities and the national governments. Such practical aspects need to be addressed better in the contemporary megaclast research.

Supplementary Materials: The following are available online at <https://www.mdpi.com/2076-3263/11/3/129/s1>, Supplement S1.

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