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# U–Pb Age and Hf Isotope Geochemistry of Detrital Zircons from Cambrian Sandstones of the Severnaya Zemlya Archipelago and Northern Taimyr (Russian High Arctic)

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**Abstract:** U–Pb and Lu–Hf isotope analyses of detrital zircons collected from metasedimentary rocks from the southern part of Kara Terrane (northern Taimyr and Severnaya Zemlya archipelago) provide vital information about the paleogeographic and tectonic evolution of the Russian High Arctic. The detrital zircon signatures of the seven dated samples are very similar, suggesting a common provenance for the clastic detritus. The majority of the dated grains belong to the late Neoproterozoic to Cambrian ages, which suggests the maximum depositional age of the enclosing sedimentary units to be Cambrian. The εHf(t) values indicate that juvenile magma mixed with evolved continental crust and the zircons crystallized within a continental magmatic arc setting. Our data strongly suggest that the main provenance for the studied clastics was located within the Timanian Orogen. A review of the available detrital zircon ages from late Neoproterozoic to Cambrian strata across the wider Arctic strongly suggests that Kara Terrane, Novaya Zemlya, Seward Peninsula (Arctic Alaska), Alexander Terrane, De Long Islands, and Scandinavian Caledonides all formed a single tectonic domain during the Cambrian age, with clastics predominantly sourced from the Timanian Orogen.

**Keywords:** Severnaya Zemlya; Taimyr; Arctic; Cambrian; detrital zircon; paleogeography; provenance

## 1. Introduction

The study area is located in the Arctic Ocean, between the Kara Sea (in the west) and the Laptev Sea (in the east), and includes the Severnaya Zemlya archipelago and northern Taimyr (Figure 1). The Severnaya Zemlya archipelago consists of four big islands, i.e., October Revolution, Bol'shevik, Pioneer, and Komsomolets, and a few small islands (Figure 1). The Severnaya Zemlya archipelago and northern Taimyr, along with the marine shelf region in between, form the so-called Kara Terrane (or North Kara Terrane), which is considered to be exotic to Siberia [1–3]. The Kara Terrane is delineated to the south by the Main Taimyr Thrust and Diabase Fault (Figure 1) from the Central Belt of Taimyr, which is considered to have formed a part of Siberia after the late Neoproterozoic [4,5]. In the north, the Kara Terrane is defined by the passive margin of the oceanic Eurasia Basin. However, its western and eastern boundaries are ill-defined [6,7]. There is no evidence of a terrane boundary separating Novaya Zemlya and the Barents Shelf from the Severnaya Zemlya archipelago, and the distribution of detrital zircon U–Pb ages [2] shows that the Kara Terrane was attached to Baltica during the Early–Middle Paleozoic (see [8]). There are a few different models regarding the tectonic affinity of the study region. Zonenshain et al. (1990) [3] suggested that Severnaya Zemlya and northern Taimyr, together with the New Siberian Islands, Chukotka, Alaska, North Greenland, and the Canadian Arctic Archipelago, formed part of a paleo-continent called Arctida. Based on a palaeomagnetic study on October Revolution Island, Metelkin et al. (2000, 2005) [9,10] considered Kara Terrane as a separate tectonic block. A number of researchers also assumed that it represented a discrete microplate or microcontinent [4,11,12]. The main aims of this study were (1) to identify the maximum depositional age, and subsequently improve the understanding of stratigraphy, of the study area based on the youngest ages of detrital zircons, and (2) to identify the provenance of outcropping Meso- to Neo-proterozoic metasedimentary rocks on Kara Terrane in both northern Taimyr and the Severnaya Zemlya archipelago (Bol'shevik Island).

## 2. Stratigraphy

For several decades, the study region has been mapped at various scales and by several research groups, resulting in a number of different stratigraphic schemes for the various parts of the area [13–18]. Here, we provide a short description of the stratigraphy of the sampled succession. The correlation of metasedimentary units across the study area is difficult to interpret because of the locally-developed, high-grade metamorphism and the lack of fossils. The succession of formations has been mainly uncovered by rare findings of acritarchs [16–18].

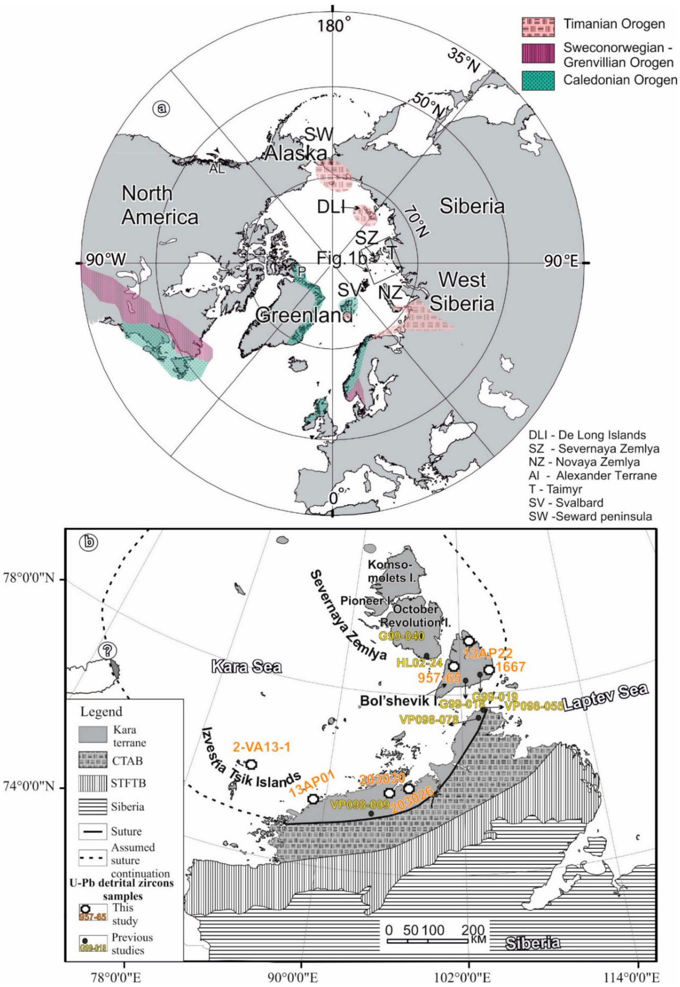


**Figure 1.** (**a**) Regional setting of the study area; (**b**) Simplified geological map of Kara Terrane (from [13,20]) with locations of the studied samples. In addition, the locations of the samples from [1,19] are shown.

## *2.1. Northern Taimyr*

The sedimentary succession comprises rhythmically-alternating clastic metasediments (e.g., sandstones, siltstones, and mudstones); however, subsequent metamorphism and a lack of fossils have made the stratigraphic correlation difficult to interpret. Therefore, the age of most of the succession outcropping in northern Taimyr has been considered to be late Mesoproterozoic to Neoproterozoic (Figure 2) [16–18]. However, the few published detrital zircon U–Pb ages from the eastern part of northern Taimyr indicate a maximum depositional age of less than 450–500 Ma, suggesting that rocks previously considered as Neoproterozoic are, in fact, of Cambrian–Ordovician age [13,19].

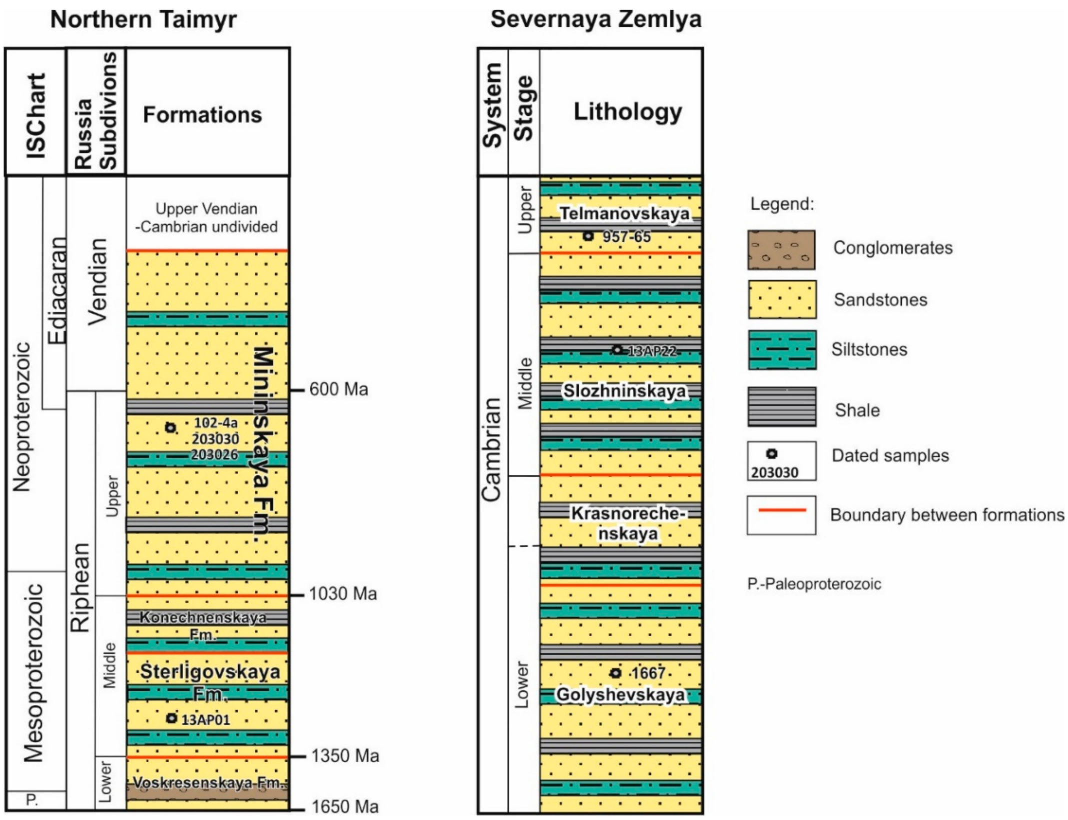


**Figure 2.** Generalized stratigraphic framework of Precambrian–Lower Paleozoic strata of Bol'shevik Island and northern Taimyr, based on [13–18]. Numerical ages from [21]. For the Mininskaya Formation, a Cambrian age has been proposed [19].

The Voskresenskaya Formation comprises alternating greenish-grey metasandstones and metasiltstones, with layers of dark grey shales. The upper part of the formation is dominated by shales, while sandstones and siltstones occur sporadically. Deposits of this formation have locally been subsequently metamorphosed to gneiss and schist. The stratigraphic thickness varies from 700 to 1200 m [17,18].

The Sterligovskaya Formation comprises alternating greenish-grey and dark-grey metasandstone and metasiltstone, with rare shale layers. Subsequent metamorphism has led to the local formation of gneiss and schist. The total thickness was estimated to be 1400–2000 m. However, our field observations near the Sterligovo polar station found that cleavage was misinterpreted as sedimentary bedding during geological mapping, possibly resulting in an overestimation of the true stratigraphic thickness [17,18].

The Konechnenskaya Formation comprises alternating dark grey and greenish metasandstones, metasiltstones, and shales. The total thickness is about 1500–1600 m. Deposits of the Konechnenskaya Formation are highly deformed and locally metamorphosed [17,18].

The Mininskaya Formation comprises alternating dark grey and greenish-grey sandstones, siltstones, and shales, and has a thickness of 1000 m. The Mininskaya Formation is overlain by the Khutudinskaya Formation, consisting of intercalating sandstones, siltstones, and shales containing fragmented trilobites and megascleres of sponges, indicating a Cambrian age [18].

The metasedimentary succession of northern Taimyr was intruded upon by Late Paleozoic granites during the continental collision with Siberia [4,14,19,20,22].

### 2.2. *Izvestia Tsik Island Group*

The Izvestia Tsik island group comprises a few small islands located in the south-eastern part of the Kara Sea to the north of Taimyr, where outcrops of deformed greenish-grey, alternating metasandstones, metasiltstones, and shales of the Mininskaya Formation occur. These deposits are considered to be Mesoproterozoic–Neoproterozoic on published geological maps [18].

### 2.3. *Severnaya Zemlya Archipelago*

Based on acritarch stratigraphy, the oldest strata mapped in the eastern part of the archipelago across Bol'shevik Island and the south-eastern part of October Revolution Island were previously considered as Mesoproterozoic–Neoproterozoic [14,15]. They are represented by metamorphosed sandstones, siltstones, and shales on Bol'shevik Island, and by intercalating sandstones and siltstones on October Revolution Island. Recent detrital zircon studies on Bol'shevik and October Revolution islands suggest that the age of these strata could be Cambrian [13] (Figure 2).

Bol'shevik Island comprises predominantly Cambrian deposits with locally-developed younger strata, and consists of the following sedimentary units.

The Golyshevskaya Formation (Lower Cambrian) is widespread in the eastern part of Bol'shevik Island. It is composed of alternating sandstones, siltstones, and shales with subordinate lenses and layers of quartzose conglomerates, reaching a thickness of 490–500 m [13].

The Krasnorechenskaya Formation (Lower-Middle Cambrian) conformably overlies the Golyshevskaya Formation and consists of alternating fine-grained sandstones, siltstones, and shales, reaching a thickness of 250–260 m [13].

The Slozhninskaya Formation (Middle Cambrian) lies conformably on the Krasnorechenskaya Formation, and consists of green sandstones intercalated with greenish-grey siltstones and shales, reaching a total thickness of 300 m [1].

The Telmanovskaya Formation (Upper Cambrian) is composed of 300–450 m of varicolored sandstones, interbedded with shale and siltstone. Sandstones are predominant in the lower part of the formation [14].

Lower Ordovician clastic strata conformably overlie the Upper Cambrian rocks. Devonian and Carboniferous strata have a very scattered distribution across the island and are separated from the Cambrian–Ordovician deposits by an angular unconformity. Igneous rocks reported from Bol'shevik Island are composed of Early–Middle Carboniferous granites [13].

## 3. Methods and Dated Samples

Samples 2-VA13-1, 203030, 203026, and 13AP01 were collected from metasandstones of the Mininskaya Formation in northern Taimyr and the Izvestia Tsik islands, from rocks that were previously considered as Riphean in age (i.e., Late Mesoproterozoic to Early Neoproterozoic) (Pogrebitskiy and Lopatin, 1999 [18]). Three dated samples were collected from the Severnaya Zemlya archipelago (Bol'shevik Island), i.e., sample 13AP22 (Slozhninskaya Formation), 957-65 (Telmanovskaya Formation), and 1667 (Golyshevskaya Formation).

Samples were crushed and the heavy minerals were concentrated using standard techniques at the Institute of Precambrian Geology and Geochronology, Russian Academy of Sciences (Saint Petersburg, Russia). The zircon grains were mounted in epoxy and polished. U–Pb and Lu–Hf analyses were carried out by laser ablation inductively-coupled plasma mass spectrometry (LA-ICP-MS), using a Nu Plasma HR multicollector mass spectrometer equipped with a CETAC Nd-YAG 213 nm solid-state laser at the Department of Geosciences, University of Oslo (Oslo, Norway). Correction for common lead was difficult because of a small contribution from $^{204}$Hg on mass 204. The signal on mass 204, in addition to that recorded from common-lead-free reference samples, was assigned to common lead. Corresponding amounts of $^{206}$Pb and $^{207}$Pb were removed, using the composition of the average crustal lead proposed by Stacey and Kramers (1975) [23] at the $^{206}$Pb/$^{238}$U age of the (uncorrected) zircon. Additional information about the U–Pb analyses undertaken in this study is given in the analytical protocols of Andersen et al. (2009, 2019) [24,25] and Rosa et al. (2009) [26], whereas those of Elburg et al. (2013) [27] were followed for Lu–Hf measurements. The $^{207}$Pb/$^{206}$Pb ages were reported for >1.0 Ga grains, and the $^{206}$Pb/$^{238}$U ages for ≤1.0 Ga grains. Analyses with greater than 10% discordance were excluded. Data tables are provided in Supplementary Materials.

## 4. Results of Detrital Zircon U–Pb Dating

### *4.1. Detrital Zircon U–Pb Ages*

**Sample 957-65:** The Precambrian grains comprise 86% of the total population, with no grains of Archean age (Figure 3). Precambrian zircons consist of Neoproterozoic and Mesoproterozoic grains, which comprise 60% and 17%, respectively, of the total population. The Mesoproterozoic zircons mainly yielded ages between 1500 and 1200 Ma. The Early Neoproterozoic grains yielded ages between 925 and 1000 Ma, and do not form a significant peak. The Late Neoproterozoic grains were found with prominent peaks at 610 and 570 Ma. Early Paleozoic grains comprise 13% of the total population, and form a peak at ca. 540 Ma.

**Sample 13AP22:** Paleoproterozoic grains comprise 5%, while Mesoproterozoic zircons comprise 10% of the total population. These zircons do not form any prominent peaks. Neoproterozoic grains (70%) were found within the dated grains and form a major peak at 570 Ma, and Cambrian zircons formed at 520 Ma.

**Sample 1667**: Six percent of the dated grains are Paleoproterozoic in age and do not form a prominent peak, while Mesoproterozoic zircons (17%) mainly have an age range between 1000 and 1250 Ma. Neoproterozoic grains (68%) were found within the Precambrian zircons and form multiple peaks at ca. 700, 670, 625, and 575 Ma. Early Paleozoic zircons (8%) do not form prominent peaks.

**Sample 13AP01**: Seventeen percent of the dated grains are Precambrian in age. Paleoproterozoic (2%) and Mesoproterozoic (8%) grains do not form any significant peaks. Neoproterozoic grains (59%) were found with peaks at 700, 600, and 570 Ma. Cambrian zircons (30%) formed a major peak at 530 Ma.

**Sample 203026:** Fifteen percent of the dated grains are Paleoproterozoic in age, with most ages concentrated between 1800 and 1600 Ma (Figure 3). Sixteen percent of the dated zircons are of Mesoproterozoic age and form a major peak at 1450 Ma. Neoproterozoic grains form peaks at 670, 630, 600, and 570 Ma. Early Paleozoic zircons (15%) form a major peak at 525 Ma.

**Sample 203030:** Paleoproterozoic and Mesoproterozoic grains comprise 4% and 6%, respectively, of the total population, and they do not form any significant peaks. Neoproterozoic grains are predominant and comprise 65% of the dated grains, forming a major peak at 640, 600, and 570 Ma. Twenty-five percent of the dated zircons are of Early Paleozoic age, of which 18% are Cambrian and form a major peak at 535 Ma.

**Sample 2-VA13-1:** Paleoproterozoic (6%) and Mesoproterozoic (11%) zircons do not form significant peaks. Neoproterozoic grains are predominant (70%) and form peaks at 640 and 570 Ma.

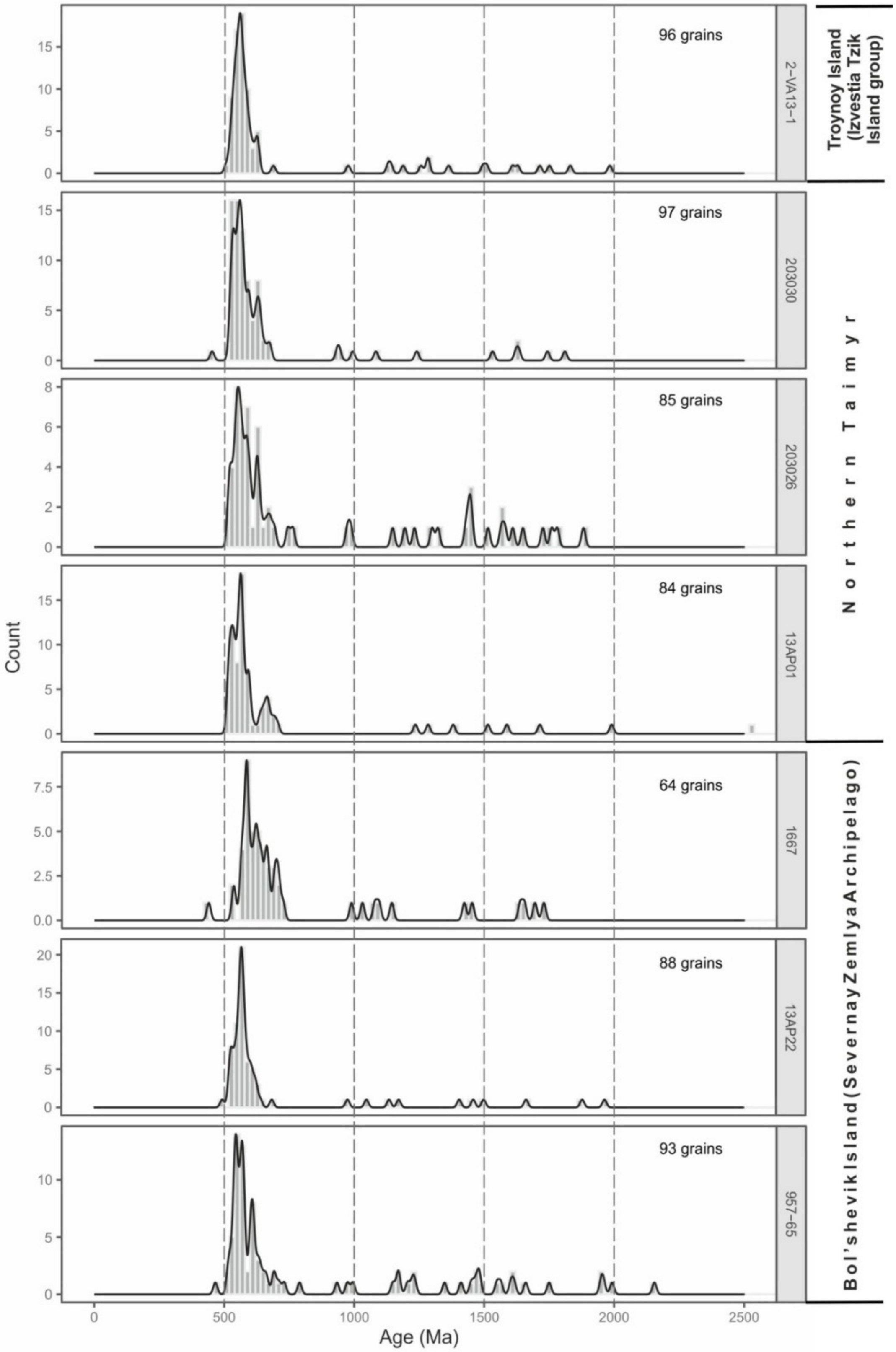


**Figure 3.** Combined histogram and kernel density estimate plots of all dated samples. Ages are given as $^{206}Pb$–$^{238}U$ ages if equal to or younger than 1000 Ma; otherwise, the $^{207}Pb$–$^{206}Pb$ ages have been used. Diagrams were produced in detzrcr, an R-package developed by Kristoffersen et al. (2016) [28].

The detrital zircon signatures of the seven dated samples are very similar (Figure 3). A few Archean grains were found in only two samples (i.e., 203026 and 13AP01). The Paleoproterozoic grains comprise 4–10% of the grains and do not form significant peaks. Mesoproterozoic grains typically comprise 7–21% of the total population and form a peak varying in age from 1580 to 1170 Ma. The highest number of Mesoproterozoic grains was documented in sample 203026 (21% of the total population), with peaks at ca. 1515, 1440, 1300, and 1195 Ma. Neoproterozoic grains are predominant and comprise 55–75% of the dated grains, forming numerous peaks. However, all dated samples fall outside the age gap between ~900 and 700 Ma. The majority of Neoproterozoic zircons show dominant peaks between 650 and 550 Ma. Cambrian grains comprise 8–29% of the grains and form prominent peaks between 535 and 520 Ma. The youngest clusters of detrital zircons of all dated samples, except for sample 203026, suggest an Early–Middle Cambrian or younger depositional age. Sample 203026 has a small peak at 492 Ma indicating a Late Cambrian or younger age.

### *4.2. Results of Detrital Zircon Lu–Hf Isotopes*

Hf isotopic analyses (504 grains) were conducted on detrital zircons with ages between the earliest Paleozoic and Neoarchean (Figure 4). Cambrian detrital zircons yield a wide range of εHf(t) values, ranging from −6 to +14 (Figure 5), with 60% of the analyses restricted between +12 and +6 (48 of 80 analyses). The Late Neoproterozoic zircons (700–542 Ma) yield εHf(t) values between +14 and –26, with 59% of the analyses restricted between +6 and –6 (181 of 306 analyses). The Early Neoproterozoic cluster of detrital zircons (1000–935 Ma) yield a narrow range of εHf(t) values ranging from –5 to +4. Positive εHf(t) values are generally observed for Mesoproterozoic (52 of 63 analyses; 82%) and Paleoproterozoic zircons (22 of 32 analyses; 68%).

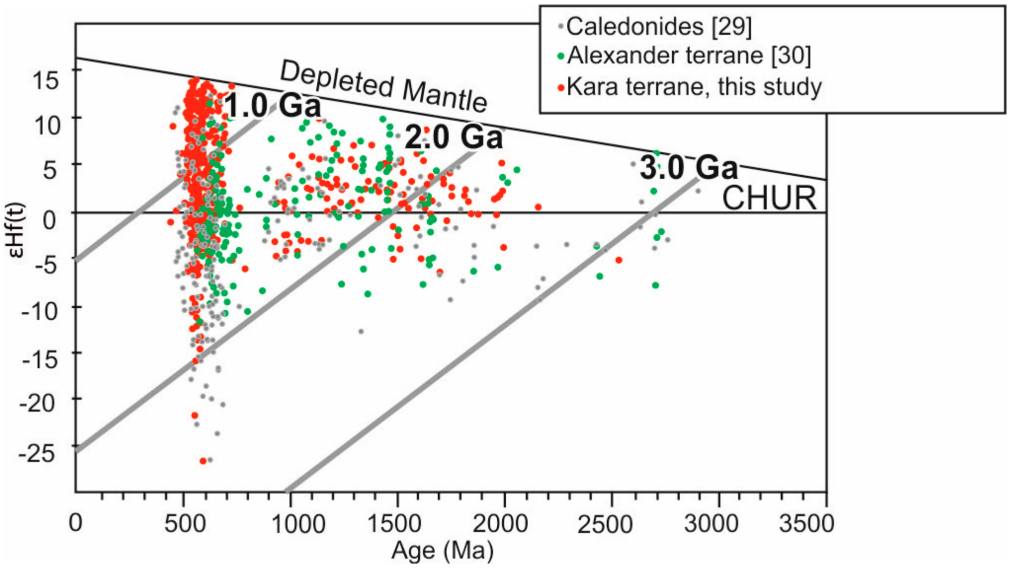


**Figure 4.** Initial εHf values plotted against age. Ages are given as $^{206}Pb/^{238}U$ ages if equal to or younger than 1000 Ma; otherwise, $^{207}Pb/^{206}Pb$ ages have been used (our data and data from [29,30]).

| | | 203026 | 13Ap01 | 2-va13 | 957-65 | 203030 | 1667 | 13AP22 | G98-018 | G98-019 | HL02-24 | G99-040 | VP98-078 | VP98-055 | VP98-009 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Pairwise difference (*1-O*), U-Pb ages | | | | | | | | | | | | | |
| 203026 | | | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.24 | 0.06 | 0.05 | 0.11 |
| 13Ap01 | | 0.10 | | 0.00 | 0.00 | 0.00 | 0.02 | 0.00 | 0.01 | 0.00 | 0.00 | 0.26 | 0.00 | 0.00 | 0.02 |
| 2-va13 | | 0.00 | 0.00 | | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.00 | 0.25 | 0.00 | 0.00 | 0.02 |
| 957-65 | | 0.00 | 0.11 | 0.00 | | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.25 | 0.01 | 0.01 | 0.03 |
| 203030 | | 0.05 | 0.00 | 0.00 | 0.07 | | 0.02 | 0.00 | 0.03 | 0.00 | 0.00 | 0.26 | 0.00 | 0.00 | 0.01 |
| 1667 | | 0.15 | 0.00 | 0.07 | 0.20 | 0.00 | | 0.01 | 0.00 | 0.00 | 0.01 | 0.24 | 0.02 | 0.02 | 0.03 |
| 13AP22 | | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.07 | | 0.00 | 0.00 | 0.00 | 0.25 | 0.00 | 0.00 | 0.02 |
| G98-018 | | | | | | | | | | 0.00 | 0.00 | 0.23 | 0.14 | 0.15 | 0.17 |
| G98-019 | | | | | | | | | | | 0.00 | 0.21 | 0.09 | 0.09 | 0.14 |
| HL02-24 | | | | | | | | | | | | 0.22 | 0.00 | 0.00 | 0.00 |
| G99-040 | | | | | | | | | | | | | 0.26 | 0.26 | 0.27 |
| VP98-078 | | | | | | | | | | | | | | 0.00 | 0.01 |
| VP98-055 | | | | | | | | | | | | | | | 0.01 |
| VP98-009 | | | | | | | | | | | | | | | |
| | | Pairwise difference *(1-O)*, Lu-Hf model ages | | | | | | | | | | | | | |

**Figure 5.** Degree of overlap between confidence intervals of cumulative distribution curves according to [31,32] for Lower Paleozoic rocks from Kara Terrane. Green shows full overlap, yellow shows less than 5% difference, and red shows more than 5% difference.

### 4.3. Statistical Comparisons

The pairwise similarity or difference between detrital zircon samples can conveniently be measured by the degree of overlap of simultaneous confidence intervals (confidence bands) that can be assigned to each cumulative distribution curve of U–Pb ages or Lu–Hf model ages [31,32]. Where the confidence bands of two cumulative distribution curves overlap over the whole probability domain, the two samples are formally indistinguishable within the error associated with a random sampling of zircons for the analysis. Where the overlap is only partial, the fraction of the probability domain over which the confidence bands overlap (denoted by O) is a measure of the degree of similarity between the two distributions, and the 1-O of the difference between them. Hf isotope data are the most suitable for comparisons of model age distributions. Model ages can be calculated by extrapolation from the initial Hf isotopic composition of the zircon at its crystallization age to the intersection with a mantle evolution curve, either at the observed $^{176}Lu/^{177}Hf$ ratio of the zircon, or at an assumed ratio of a crustal reservoir from which Hf was extracted from the mantle to the crystallization of the zircon. The latter gives a more realistic estimate of the crustal residence time of the hafnium, but for comparison purposes, the choice of model parameters does not matter, as long as they are kept constant. In the present study, an assumed average continental crust of $^{176}Lu/^{177}Hf = 0.01$ has been used. The results of a pairwise comparison for Lower Paleozoic rocks from Kara Terrane (our data and [1,19]) are shown as a matrix of 1-O values in Figure 5. The upper right triangle shows a pairwise comparison of U–Pb age distributions, and the lower-left triangle shows a comparison of the ages of the Lu–Hf model. The diagram has been color-coded: green shows full overlap, yellow shows less than 5% difference, and red shows more than 5% difference.

## 5. Discussion

A significantly larger data set of this study, along with the addition of Hf signatures, allowed us to identify provenance areas, and therefore, the affinity of the Kara Terrane during the Cambrian age.

The distribution of detrital zircon ages within dated samples is very similar, strongly suggesting a common provenance area for all of the studied clastic rocks. The majority of the dated grains belong to late Neoproterozoic to Cambrian ages, which suggests the maximum depositional age of the enclosing sedimentary units to be Cambrian. Neoproterozoic–Cambrian zircons show a wide variation in the initial εHf(t) values in the range from 11 to −38. Hafnium isotopes in zircons can be used to estimate the crustal or mantle contribution to magmatism of individual grains [33–35]. This means that the Neoproterozoic–Cambrian zircons were crystallized from magmas derived from a depleted mantle source (juvenile magmas) mixed with different amounts of older crust, which is consistent with a geotectonic setting of a continental magmatic arc.

This led us to assume that the youngest zircons of the studied sedimentary rocks are close to the age of sedimentation. Moreover, sedimentary rocks with the youngest zircon ages close to depositional ages are characteristic of foreland basin settings, located adjacent to a rising mountain range [36].

The Timanian Orogen represents the late Neoproterozoic to Cambrian orogeny in the Arctic region, with coeval magmatic and metamorphic rocks widely reported from the north-eastern margin of the East European Platform (Baltica paleocontinent) [37,38]. It extends from the southern Ural Mountains to the Varanger Peninsula and further to the north. Subduction and collision events took place from ca. 650 to 525 Ma [37,38]. Therefore, our data strongly suggest that the main provenance for our studied clastic rocks was located within the Timanian Orogen. Furthermore, Paleoproterozoic to Early Neoproterozoic zircons can be correlated with the known ages of magmatic and metamorphic rocks found within the basement of Baltica. Zircon ages of ca. 1950–1800 Ma with positive εHf(t) values could be correlated with magmatic rocks within the Svecofennian Orogen, with rocks of these ages described from the northern part of the East European Platform (Baltica paleocontinent) [39,40].

Late Paleoproterozoic zircons (ca. 1800–1600 Ma) can be correlated with the formation of the Transscandinavian Igneous Belt (TIB) [39–41]. The obtained εHf(t) signatures are consistent with the values reported from the TIB granite [24]. The age of 1300–900 Ma zircons is similar to magmatic and metamorphic events associated with the Sveconorwegian–Grenvillian Orogen [42–47]. Moreover, our εHf(t) values for those zircons vary from −8 to +13, which are similar to the εHf(t) values obtained for zircons from Sveconorwegian granitoids [24,46,48,49]. Furthermore, Paleoproterozoic to Early Neoproterozoic zircons are broadly similar in terms of age and the εHf(t) values to those reported from the Timan Range [50,51], which are considered as Mesoproterozoic–Neoproterozoic passive margin deposits of Baltica, and subsequently, reworked during the Timanian Orogeny.

A review of available detrital zircon ages from the late Neoproterozoic to Cambrian strata across the wider Arctic (Figure 6) shows a strong similarity between the coeval zircon signatures of the De Long Islands [52], Kara Terrane (Severnaya Zemlya archipelago and northern Taimyr; our data and Novaya Zemlya archipelago [1,19]), NW Russian Platform (Baltica interior, [53]), Seward Peninsula (Alaska, [54]), Novaya Zemlya Archipelago [19,55], Alexander terrane [30], and Scandinavian Caledonides [29].

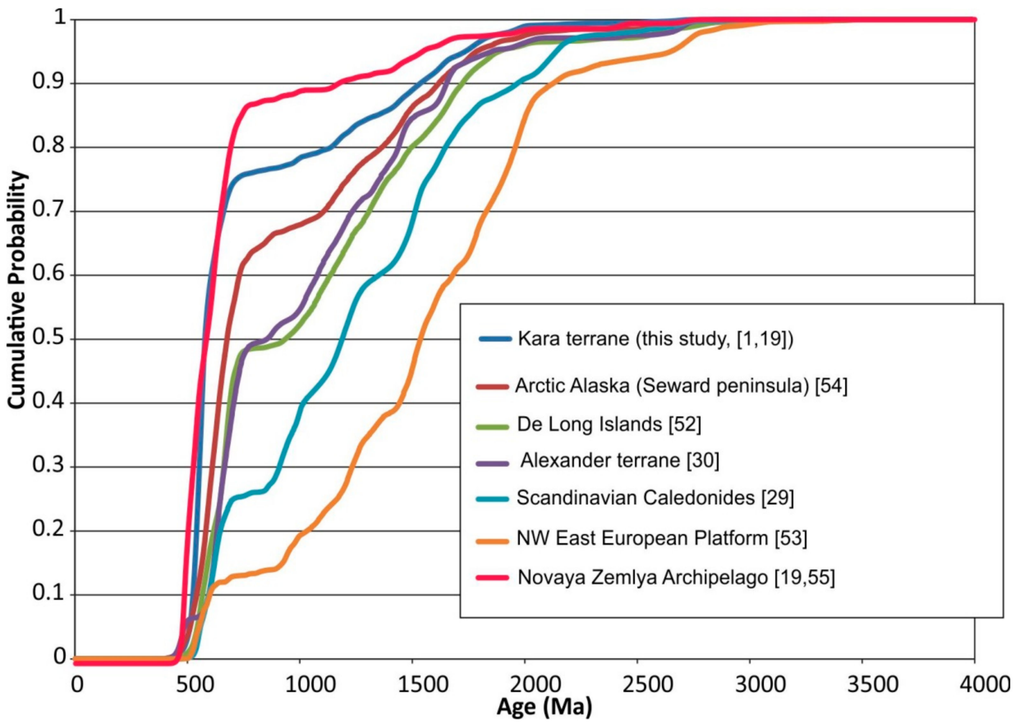


**Figure 6.** Cumulative probability diagram for U–Pb detrital zircon ages from Lower Paleozoic rocks of the Kara Terrane (this study, [1,19]), Alexander Terrane [30], Scandinavian Caledonides [29], De Long Islands (Henrietta and Jeannette islands) [52], Novaya Zemlya Archipelago [19,55], the NW European Platform [53], and Arctic Alaska [54].

Consequently, we suggest that all these Arctic regions possibly formed a single tectonic domain located along the northern margin of Baltica (modern coordinates) during the Cambrian age.

## 6. Conclusions

1. The distribution of detrital zircons from the samples collected from northern Taimyr suggests that deposits previously considered Precambrian are actually Cambrian or younger in age.
2. Our data, together with the data from Pease and Scott (2009) [19] and Lorenz et al. (2008) [1], strongly suggest that poorly-fossiliferous, metasedimentary rocks of varying metamorphic grades in northern Taimyr are Cambrian and younger in age. Therefore, we can tentatively claim that there are possibly no rocks older than Early Paleozoic in age across the northern part of the Taimyr Peninsula. However, further analyses are required to confirm this statement.
3. All dated samples from both northern Taimyr and the Severnaya Zemlya archipelago show similar distributions of detrital zircon U–Pb ages. The late Neoproterozoic to Cambrian ages of younger

detrital zircon clusters strongly suggest that clastics were sourced from the Timanian Orogen. Furthermore, the majority of zircons of that age yield a wide range of εHf(t) values, suggesting a mixing between both juvenile and evolved crust. The detrital zircon age population of our studied samples supports a Baltican affinity for the Kara Terrane during the Early Paleozoic.

4. The results presented in this study provide new constraints on the paleogeographic evolution of the Russian High Arctic.

**Supplementary Materials:** The following are available online at http://www.mdpi.com/2075-163X/10/1/36/s1, Table S1: Results of U–Pb dating of detrital zircons; Table S2: Lu–Hf data for dated detrital zircons; Table S3: Data reporting Information for LA-ICP-MS U–Th–Pb data.

**Author Contributions:** Investigation, V.B.E., A.V.P.; Formal Analysis, D.A.K.; Writing–Original Draft Preparation, V.B.E.; Writing–Review & Editing, V.B.E., K.K., T.A., A.V.P., A.K.K.; Project Administration, V.B.E., K.K.; Funding Acquisition, V.B.E., K.K. All authors have read and agreed to the published version of the manuscript.

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