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Improved Sedimentary Thickness Model for Central-Northern Eurasia Derived from Decompensative Gravity Anomalies

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Abstract: This study presents refined models of the sedimentary cover in northern Eurasia, derived using decompensative gravity anomalies (DGA). The DGA-based models enhance the structural resolution of regions with complex geology, accurately delineating denuded mountain-folded zones, thick sedimentary sequences, and basin depocenters that are not well resolved in the initial datasets. In offshore areas, such as the Laptev Sea Basin, South Kara Basin, and Yamal–Taz Basin, the models provide improved estimates of sedimentary thickness and clearer delineation of major faults and rift structures compared to global datasets like GlobSed. For continental basins, the models reveal localized depocenters and subtle variations in thickness, supporting more detailed structural and stratigraphic interpretations. While these models offer substantial improvements, uncertainties increase with depth due to the lower density contrasts between deep sedimentary layers and the crystalline basement. Intermediate Late Paleozoic–Early Mesozoic units and contributions from the upper folded basement can also affect thickness estimates, highlighting the qualitative nature of the models for deep basins. Despite these limitations, the DGA-based models provide a valuable tool in regions with sparse borehole and geophysical data, filling gaps in coverage and enhancing the understanding of basin geometry. These refined sedimentary cover models offer a robust framework for lithospheric and basin modeling, enabling more accurate reconstructions of basin architecture and tectonic evolution across both continental and shelf regions.

Keywords: Sedimentary cover, gravity field, decompensative gravity anomalies, Northern Eurasia.

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Research Article

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Introduction

Being the uppermost part of the Earth's crust, the sedimentary cover provides valuable insights into the geological history and tectonic evolution of the lithosphere. However, despite decades of geological investigations and extensive mineral prospecting, certain regions of the planet remain insufficiently explored. A prominent example is the Arctic Zone, particularly the Eurasian Arctic [*Chanysheva and Ilinova*, 2021], where many areas are difficult to access due to harsh environmental conditions and logistical constraints. As a result, significant aspects of the region's geology remain poorly understood, with existing interpretations often relying on outdated or incomplete studies. The growing interest in further research on the Arctic lithosphere is driven both by the scientific need to obtain new information on its geological and tectonic evolution and by the increasing demand for mineral prospecting and the exploration of potential resource-rich areas [*Bortnikov et al.*, 2015].

Modern operational geophysical models, based on both satellite and ground-based measurements, offer new opportunities to reveal previously unknown features of geological structures in hard-to-reach regions. Compared to classical geological mapping, which faces significant spatial and logistical limitations, the application of satellite-derived geophysical data provides a powerful tool for overcoming these challenges. Such data are crucial not only for improving our understanding of the lithospheric evolution in specific regions but also for supporting future mineral exploration.

A notable example is the analysis of the gravity field, which reflects density variations within the lithosphere and the upper mantle. This analysis enables the identification of crustal and upper-mantle density heterogeneities, facilitating a wide range of geophysical applications [*Kaban*, 2019]. In our previous research, two models of sedimentary cover thickness for the Eastern Arctic zone of Asia were developed using the calculation of decompensative gravity anomalies. The discrepancies between these models in certain areas arose from differences in the initial modeling conditions. This study [*Sidorov et al.*, 2021] demonstrated the efficiency of the decompensative gravity anomaly approach, confirming its reliability in comparison with previous studies conducted in other regions. The main advantage of this method lies in its ability to refine and, when necessary, adjust existing hypotheses regarding the formation and evolution of geological structures. Moreover, this well-established approach provides a robust framework for obtaining new geological information in regions where traditional data remain sparse or outdated.

The present study focuses on evaluating the reliability and applicability of previously developed sedimentary cover models within a tectonically complex region characterized by structures of diverse origin. The aim is to assess how accurately these models represent the geological and structural features of the area. For this purpose, a central fragment of the Russian Arctic was selected as a case study. This region, highlighted in red in Figure 1, is defined by a polygon with vertices at 104°E, 59°N; 142°E, 73°N; 54°E, 62°N; and 32°E, 82°N. The study area encompasses the central part of Northern Eurasia and includes both continental and shelf domains. Offshore, it covers the northeastern part of the Barents Sea, as well as the Kara and Laptev seas. Onshore, it comprises the Yamal, Gydan, and Taimyr peninsulas, along with several northern islands, such as Novaya Zemlya and Severnaya Zemlya. This geologically diverse region provides an optimal setting to test the consistency of the sedimentary cover models against known tectonic and lithological characteristics.

Tectonic Overview

Most of the continental area is occupied by the West Siberian Plate, the Siberian Platform, and their junction zone. The West Siberian Plate constitutes the largest sedimentary megabasin, filled with thick successions of epi-Paleozoic deposits. The crystalline basement of the plate, formed during several distinct orogenic events (Baikalian, Salairian, Caledonian, and Hercynian), is structurally heterogeneous and composed of rocks ranging in age from the Proterozoic to the Late Paleozoic.

The northern and northwestern margins of the plate are bounded by the Late Hercynian Ural and Early Mesozoic Pai-Khoi–Novaya Zemlya orogens, whereas its northeastern boundary adjoins the Taimyr–Severnaya Zemlya orogen. These orogenic belts are now recognized as structural continuations of the plate's basement. Overlying the basement are several units of Permian–Triassic sandstones, siltstones, and mudstones, which were primarily deposited within rift-related troughs and represent an intermediate structural stage in the plate's evolution. The sedimentary cover is dominated by Mesozoic and Cenozoic strata, with the oldest units belonging to the Lower Jurassic. Owing to repeated marine transgressions and regressions during the Mesozoic, sedimentation across the Paleozoic basement was highly variable. Consequently, the thickness and lithological composition of the cover exhibit significant lateral heterogeneity, with alternating marine and continental facies. In the northern part of the basin, the sedimentary cover reaches a thickness exceeding 10–12 km.

The Taimyr orogen (fold belt) extends extensively across the Kara and Laptev Sea shelves and is subdivided into three major structural segments: the Northern Taimyr (including the Severnaya Zemlya archipelago), the Central Taimyr, and the Southern Taimyr segments. The Northern Taimyr segment was primarily formed during the Late Paleozoic [*Drachev*, 2016], although some studies suggest that its tectonic evolution may have initiated as early as the Cambrian. The Central Taimyr segment also developed predominantly during the Late Paleozoic, with the final stage of orogenic deformation occurring in the Carboniferous–Permian interval.

The Southern Taimyr segment is commonly regarded as part of the broader Pai-Khoi–Novaya Zemlya–Southern Taimyr fold belt [*Drachev*, 2016; *Timonin et al.*, 2004], reflecting the approximately synchronous timing of tectonic processes across these regions. However, given that the primary focus of this study is the analysis of sedimentary basins, we treat the Southern Taimyr as an independent segment within the Taimyr orogen for the purposes of this article.

The eastern continental part of the study area is underlain by the ancient Siberian Craton. This region encompasses the Anabar Shield, where the sedimentary cover is minimal, as well as the extensive Siberian Traps province, which was formed by a large igneous event involving voluminous basaltic and tholeiitic eruptions associated with a mantle plume.

Sedimentary Basins in the Study Area

The sedimentary basins within the continental domain exhibit significant variability in thickness, primarily reflecting differences in their geological evolution. The relatively deep sedimentary basins of the region are associated with the Arctic shelf and were formed as passive continental margin structures following the opening of the Arctic Ocean. Their development was driven by crustal extension, seafloor spreading, and subsequent marine transgressions, which affected the northernmost portions of pre-existing mountain-fold systems. In contrast, the largest continental basins were predominantly formed in response to major tectonic events that controlled regional subsidence and sediment accumulation.

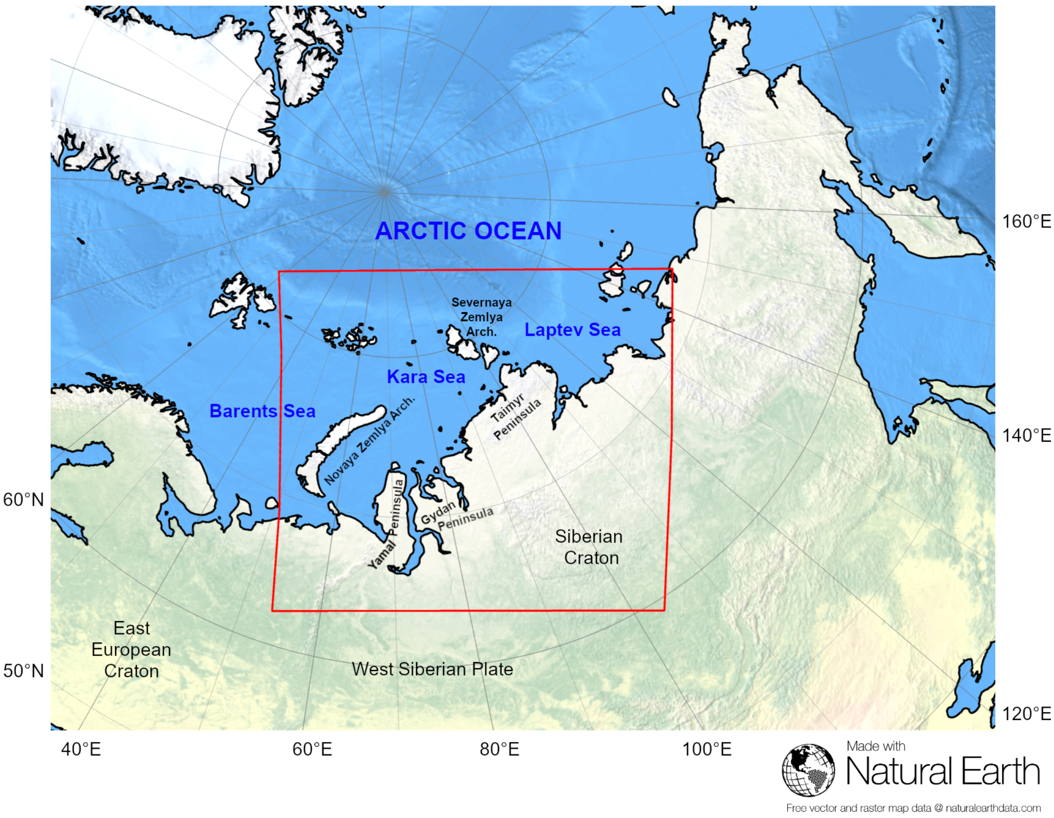

Figure 1. The study area on the physical map.

The study area encompasses both the Arctic Ocean shelf basins, including those of the eastern Barents Sea, Kara Sea, and Laptev Sea, as well as major continental sedimentary basins such as the Yamal–Taz Basin and the Yenisei–Khatanga Basin. The structural framework of the region is illustrated in Figure 2, which shows the spatial distribution of these basins alongside other key geological features, including major orogenic systems (e.g., the

Taimyr orogen) and crystalline basement provinces (e.g., the Anabar Shield, a component of the ancient Siberian Platform). Understanding the spatial relationships between these sedimentary basins and surrounding tectonic structures is critical for reconstructing the region's geodynamic evolution and assessing the factors controlling basin formation and sediment accumulation.

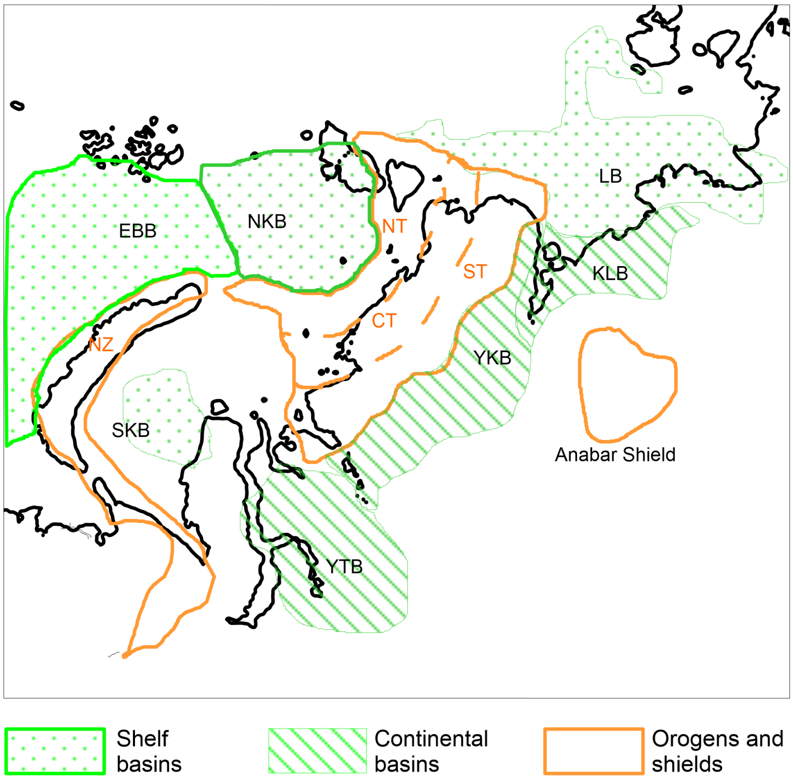

Figure 2. Structural scheme of the study area. Offshore sedimentary basins: EBB – East Barents Sea Basin, NKB – North Kara Basin, SKB – South Kara Sea Basin, LB – Laptev Sea Basin. Continental sedimentary basins: YTB – Yamal–Taz Basin, YKB – Yenisei–Khatanga Basin, KLB – Khatanga-Lena Basin. Orogens: NT – Northern Taimyr, CT – Central Taimyr, ST – Southern Taimyr, NZ – Novaya Zemlya and Pai-Khoi Orogen.

The geological evolution of the East Barents Sea Basin (EBB) remains a subject of considerable debate, with competing interpretations attributing its origin to different geological periods, including the Vendian–Cambrian, Permian–Triassic [*Daragan-Sushchova et al.*, 2020], and Late Devonian [*Malyshev et al.*, 2012; *Startseva et al.*, 2017]. According to the basin reconstruction proposed by *Startseva et al.* [2017], which incorporates seismic and stratigraphic data from *Ivanova et al.* [2011], the maximum thickness of the sedimentary cover within the EBB reaches approximately 15 km, of which Triassic deposits account for up to 7–9 km.

The North Kara Basin (NKB), occupying the northern part of the Kara Sea, is a sedimentary basin underlain by a Late Proterozoic (Timanian) basement. In contrast, the southern Kara Sea region and the Yamal Peninsula are developed on an Early Mesozoic basement. Seismic studies have identified Triassic strata within the Kara Sea, which, by analogy with coeval deposits on the Yamal Peninsula, are interpreted as coastal–marine formations that transgressively overlie Paleozoic rocks. Together with the underlying Paleozoic succession, these units constitute a rift-related rock complex that is widely distributed across the Arctic region.

The infill of the NKB is dominated by Mesozoic terrigenous sediments. During the Jurassic, sedimentation across much of the Kara Sea and the northern part of the West Siberian Plate occurred within a unified, shallow-marine basin characterized by repeated episodes of sea-level rise and fall. These fluctuations controlled the accumulation of alternating sandy and clayey deposits, which represent the primary lithologies of the Jurassic succession.

The South Kara Basin (SKB) represents a deep sedimentary basin whose formation is associated with multiple geodynamic processes, including crustal subsidence, Permian–Triassic riftogenesis [*Nikishin et al.*, 2011], and a major marine transgression during the Late Jurassic. Its evolution is likely linked to the opening of the Amerasian Basin in the Arctic Ocean. During the Late Jurassic and Early Cretaceous, the basin experienced the deposition of marine sandy–clayey successions, consisting of alternating sandstones, siltstones, mudstones, and clays [*Galushkin*, 2023]. In the Late Cretaceous, possibly in connection with the initiation of the Eurasian Basin, the North Siberian Threshold formed, separating the SKB from the Arctic Ocean. Subsequently, the basin developed as part of a passive continental margin, accumulating deep-marine clay-rich deposits, followed in the Cenozoic by predominantly clayey strata interbedded with sandy–silty formations. Seismic surveys across the SKB [*Daragan-Sushchova et al.*, 2013; *Deev et al.*, 2022] indicate a maximum sedimentary thickness of ~8 km in the central basin. However, in rift-related troughs that crosscut the basin, the total sedimentary thickness locally reaches up to ~9.5 km, including syn-rift deposits dated as either Lower Jurassic or Upper Triassic, depending on the interpretation of various studies.

The Laptev Sea Basin (LB) represents another major sedimentary structure formed within an extensive rift system [*Andieva*, 2008; *Drachev*, 2016]. The basin basement is partly composed of Mesozoic units similar in composition to the Verkhoyansk–Chukotka orogen; however, seismic transect models [*Drachev*, 2016] also depict the southwestern margin of the Siberian Craton beneath the basin. The sedimentary cover reaches its maximum thickness of ~12–13 km in this southwestern sector. The basin extends onto the continental domain, with its southeastern portion underlain by a Cenozoic rift system that encompasses the Lena River delta [*Andieva*, 2008]. This region is characterized by substantial accumulations of Miocene–Holocene alluvial deposits.

Three of the largest continental sedimentary basins within the study area are the Yamal–Taz Basin (YTB), Yenisei–Khatanga Basin (YKB), and Khatanga–Lena Basin (KLB). The YTB, partly underlying the Yamal and Gydan peninsulas, occupies the northern part of the West Siberian Plate and is structurally adjacent to the SKB. Consistent with the broader structural framework of the West Siberian Plate, the YTB comprises three main stratigraphic components: (i) a deformed Paleozoic (Hercynian) basement, (ii) an intermediate Permian–Triassic succession, and (iii) an overlying sedimentary cover of Jurassic to Cenozoic age. Drilling and seismic data reveal that the upper crust of the Yamal region consists of a weakly deformed, layered sedimentary cover overlying a strongly folded basement, separated by a pronounced angular unconformity. The folded basement occurs at significant depths, reaching >8 km in the northern sector [*Ivanov et al.*, 2021]. Mapping by Podurushin [*Podurushin*, 2010] indicates sedimentary thicknesses exceeding 6 km in the depocenter beneath the Gydan Peninsula, which effectively separates the YTB from the SKB.

The Yenisei–Khatanga Basin (YKB) forms a large structural depression along the northern margin of the Siberian Platform, immediately south of the Taimyr Orogen. Seismic and drilling data [*Afanasenkov et al.*, 2016] demonstrate a total sedimentary thickness of ~20–22 km in its central part, with deposits ranging in age from Riphean–Lower Vendian to Cretaceous–Eocene. During the Middle to Late Triassic, the YKB acted as a marginal depression located between the South Taimyr segment and the northern Siberian Platform.

The Khatanga–Lena Basin (KLB) lies to the east of the YKB, with their mutual boundary being largely conventional. For the purposes of this study, we treat them as separate basins. Stratigraphically, the KLB shares many similarities with the YKB; however, significant differences exist in sediment distribution. The YKB contains thicker Jurassic–Cretaceous successions, reaching ~7–11 km, whereas the KLB is characterized by more substantial accumulations of Paleozoic and Triassic strata.

Results

A comprehensive description of the computational methodology used to derive decompensative gravity anomalies is provided in detail by *Kaban et al.* [2016] and *Sidorov et al.* [2021]. The procedure involves two principal stages. In the first stage, isostatic gravity anomalies are calculated based on a reference lithospheric model that assumes local isostatic equilibrium. These anomalies represent the deviation of the observed gravity field from the gravitational effect expected under a perfectly compensated lithosphere, thereby integrating the contributions of both shallow and deep density heterogeneities. In the second stage, decompensative gravity anomalies are derived by adding a decompensative correction to the computed isostatic anomalies. This correction accounts for the gravitational effect of deep-seated density variations within the lithosphere and upper mantle, which can obscure or compensate for the gravitational signals generated by near-surface structures. By effectively removing the influence of these deeper density anomalies, the resulting decompensative anomalies become more sensitive to lateral density variations within the upper crust, which are not adequately captured in the initial lithospheric model.

The decompensative gravity anomalies are therefore particularly valuable for refining sedimentary basin models and for improving estimates of crustal structure. They enable a more accurate representation of shallow density distributions by minimizing the masking effects of deep lithospheric compensation. As a result, these anomalies are directly incorporated into the adjustment of the initial sedimentary model, providing a more realistic assessment of basin geometry and thickness.

All mathematical formulations, input parameters, and computational procedures underlying the calculation of isostatic and decompensative anomalies are described in detail in [*Kaban et al.*, 2016] and [*Sidorov et al.*, 2021]. The input topography and gravity data are represented by the satellite-derived models ETOPO-1 [*Amante and Eakins*, 2009] and EIGEN-6c4 [*Förste et al.*, 2014], respectively. The initial sedimentary cover model (Figure 3, left) was based on GlobSed data [*Straume et al.*, 2019] and a relation between the density and the depth [*Mooney and Kaban*, 2010] for sea sedimentary basins and [*Kaban*, 2001; *Stolk et al.*, 2013] for continental basins. Two models with a spatial resolution of 11 km were calculated based on the DGA approach [*Sidorov et al.*, 2021; *Soloviev et al.*, 2023]. Based on the computed decompensative gravity anomalies (DGA), we refined the initial model of the sedimentary cover by constructing two alternative scenarios. In the first model, the entire gravity signal is assumed to result exclusively from variations in sedimentary cover thickness. In contrast, the second model follows the approach proposed by *Kaban et al.* [2021], where the DGA amplitudes are attributed equally to changes in both sediment thickness and the average density of the sedimentary column.

To ensure geological plausibility, several constraints were applied during model construction [*Kaban et al.*, 2021]:

1. The maximum sedimentary thickness was limited to 20 km, consistent with estimates from existing seismic studies.
2. The reduction of sediment thickness was constrained so that it could not exceed 75% of its initial value, preventing unrealistic thinning.
3. For the second model, the final average sediment density (depth-integrated) was restricted to the range of 1.9–2.72 g/cm^3, in agreement with laboratory and experimental observations ([e.g., *Kaban and Mooney*, 2001]).

All resulting sedimentary cover models chiefly reproduce the large-scale features of the sedimentary sequence, although several notable differences are apparent. As described above, the second model, constructed using the decompensative gravity anomaly (DGA) approach, assumes that half of the DGA amplitude is attributable to variations in sedimentary thickness and the remaining half to changes in rock density. Despite local variations in thickness, the overall spatial distribution of sediments in this model remains largely consistent with that of the first model. However, significant differences are observed in specific regions, particularly within the Novaya Zemlya folded belt. The following

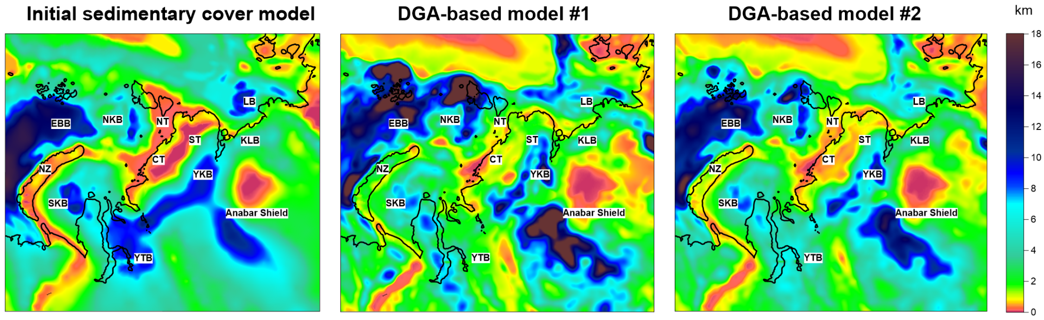

Figure 3. Thickness of sediments: the initial sedimentary cover model (left), and the DGA-based sedimentary cover models, 1 (center) and 2 (right) for the structures of the study area.

subsections highlight the key features and structural responses captured in the DGA-based sedimentary thickness models, emphasizing contrasts with the initial sedimentary model.

Sea Shelf Basins and the Coastal West Siberian Plate area

The northeasternmost Laptev Sea Basin (LB) is generally well represented in the initial model. However, the maximal sedimentary thickness in this basin—primarily in its central region associated with the Ust'-Lena Rift and other rift structures—is only ~9–10 km in the initial model, whereas previous studies suggest values up to 14–15 km in these zones [*Andieva*, 2008; *Drachev*, 2016]. Consequently, the first DGA-based model provides a more geologically plausible estimate. Additionally, the deepest zones of the basin shift position in the DGA-based models, particularly in the first model, where the depocenter moves northwest along the Ust'-Lena Rift, aligning with the deepest portion of the basin.

For the East Barents Basin, the initial model indicates sedimentary thicknesses of 12–13 km in the eastern part of the basin. Both DGA-based models, however, yield thicknesses of ~15 km, which correspond closely with seismic observations reporting a maximum of 15 km along the eastern seismic profile [*Startseva et al.*, 2017]. This demonstrates that the DGA approach improves the initial estimates of sedimentary distribution and generally supports the basin origin hypotheses proposed by *Startseva et al.* [2017]. While the second model identifies smaller areas of maximal thickness, it remains consistent with the seismic profile data.

A similar increase in sedimentary thickness is observed in both DGA-based models for the North Kara Basin (NKB). This basin was previously characterized by ~12 km of Paleozoic sediments near the Severnaya Zemlya Archipelago [*Drachev*, 2016]. In the first DGA-based model, overall sedimentary thickness reaches 16–18 km. Notably, these models do not contradict existing geological information regarding the NKB depocenter location but result in higher maximum density values.

Both DGA-based models offer greater detail than the GlobSed database, effectively delineating the depocenters of the Yamal–Taz Basin (YTB) and South Kara Basin (SKB) in agreement with [*Drachev*, 2016]. Overall, sedimentary thickness correlates well with depressions corresponding to stages of development in the South Kara region. The SKB depocenter shifts eastward, and its continental continuation corresponds to the depression in the northern Yamal Peninsula, which also shows a lateral displacement in the DGA-based models.

In the YTB, the DGA-based models indicate a ~1 km decrease in sedimentary thickness relative to the initial model, although the lateral distribution of sediments remains largely unchanged. For instance, in the northwestern Yamal Peninsula, the initial model shows ~8 km of sedimentary cover, whereas the first DGA-based model indicates ~9.5 km. Furthermore, the first DGA-based model identifies an approximately longitudinally oriented zone of sedimentary cover variation extending southward from the SKB across Yamal and onto the continental interior.

Continental Basins

Both DGA-based sedimentary cover models indicate a thicker sequence of YKB deposits in the northern and central parts of the basin, with thicknesses reaching 15–18 km, corresponding to the location of the maximum sedimentary accumulation. These values are generally consistent with the stratigraphic data reported in [*Afanasenkov et al.*, 2016]. In both DGA-based models, the depocenter of the YKB shifts eastward relative to the position shown in the initial model and in the map of *Afanasenkov et al.* [2016], while remaining within the basin boundaries. The absence of deep boreholes in the area of increased sediment thickness highlights the need for further investigation to clarify the spatial distribution of the sedimentary cover and to enable a more detailed characterization of the basin. The Khatanga–Lena Basin (KLB) exhibits a broadly similar configuration across all three models. Nevertheless, the DGA-based models reveal minor lateral variations in basin geometry relative to the initial model, reflecting subtle differences in the inferred sedimentary thickness distribution.

Discussion

Comparison of the sedimentary cover models corrected using the DGA approach with the initial model reveals that the DGA-based models provide new insights into sedimentary thickness, often consistent with seismic survey data, particularly for the East Barents Basin (EBB), North Kara Basin (NKB), and South Kara Basin (SKB). The spatial distribution of sediments in the Laptev Sea Basin, as well as the South Kara and Yamal–Taz basins, has been refined. Additionally, the major fault bounding the Laptev Sea Basin to the northeast is more clearly delineated in the DGA-corrected models. These improvements are especially relevant for continental basins in North Eurasia, where existing geological data often lack sufficient spatial coverage for reliable lithospheric modeling.

Both DGA-derived models show a slight increase in sedimentary thickness in orogenic regions. For example, the Novaya Zemlya fold belt exhibits sediment thicknesses of approximately 2 km, which may partially reflect calculation uncertainties, while the Anabar Shield remains consistently thin. The models also provide enhanced resolution for the Taimyr orogen segments relative to the initial model.

In the Siberian Trap province (southeastern region), the DGA-based models reproduce the lateral distribution of sediments observed in the VSEGEI map [*Petrov et al.*, 2016], but display differences in thickness. This region has complex stratigraphy: the origin of the Late Permian–Triassic magmatism remains debated, with most studies attributing it to a large mantle plume, consistent with the lower-mantle geochemical signature of the basalts [*Dobretsov et al.*, 2008; *Sobolev et al.*, 2011]. The traps overlie Middle Carboniferous–Late Permian terrigenous coal-bearing deposits with thicknesses ranging from 100 to 1400 m. Uncertainties in the total sedimentary thickness are likely related to lateral density variations in both the traps and underlying strata.

Conclusions

The following conclusions could be formulated in this study:

- Improved structural resolution: DGA-based models provide a more accurate delineation of regions with complex geological structures, including denuded mountain-folded zones and areas characterized by thick sedimentary sequences. This enhanced resolution allows for better identification of depocenters and structural variations that are not apparent in the initial models.
- Enhanced offshore sediment characterization: In shelf regions, the models offer more reliable estimates of sedimentary cover thickness than global datasets such as GlobSed. For example, the models highlight spatial variations in the Laptev Sea Basin, South Kara Basin, and Yamal–Taz Basin, including clearer delineation of major faults and rift structures.
- Refinement of continental basins: The DGA-based models provide improved detail for continental basins, including the South Kara Basin and Yamal–Taz Basin. In particular,

the models reveal localized depocenters and subtle variations in sedimentary thickness, supporting more accurate structural and stratigraphic interpretations.

- Depth-related limitations and uncertainties:
  - Uncertainties increase with depth due to the small density contrast between deep sedimentary layers and the crystalline basement, which may lead to overestimation of thickness in deep basins.
  - Intermediate Late Paleozoic–Early Mesozoic units complicate the distinction between sedimentary cover and basement, potentially causing discrepancies with seismic interpretations, where high-velocity layers may be interpreted as basement.
  - Contributions from the upper part of the folded basement can artificially increase inferred sediment thickness, as seen in the Novaya Zemlya fold belt, where sediment thicknesses increase to 2–3 km in the models.
- Qualitative nature of deep-basin models: Due to these factors, the models for deep sedimentary basins should be considered primarily qualitative, providing insight into spatial patterns rather than precise quantitative thicknesses.
- Support for regions with sparse data: In northern Eurasia, where borehole data are limited and geophysical surveys are sparse or outdated, the DGA-based sedimentary cover models provide one of the few reliable sources of structural information. These models help fill gaps in data coverage and improve the overall understanding of basin geometry.
- Applications to lithospheric and basin modeling: The refined sedimentary cover models can serve as a robust framework for lithospheric modeling, including studies of shelf and continental basins. By integrating gravity-derived thicknesses with existing geological and seismic data, these models enable a more accurate reconstruction of basin architecture and tectonic evolution.

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