Abstract

The Taimyr fold and thrust belt (FTB) consists of several zones that show evidence for Precambrian, late Paleozoic (Hercynian), and Mesozoic tectonic events. Most scientists point to Precambrian and late Paleozoic compression as the most intense compression events, although Zonenshain et al. (1990) argued for a strong Mesozoic tectonic event. Our studies of the Central and Southern Taimyr done in 2005-2012 in the frame of projects supported by the State geological mapping program and by TGS-NOPEC Company also points to important role of the Mesozoic tectonics. The main results are summarized in the following points: 1. The only clear angular unconformity in the sedimentary succession of the Central and Southern Taimyr is between Vendian and underlying rocks. Vendian – Triassic succession does not contain unconformities, although some hiatuses may occur. 2. Pre-Rhaetian unconformity (previously interpreted as pre-Jurassic) may be related to extension event as well as to compression event. 3. Folds in Cambrian up to Upper Permian rock units have very similar geometry. 4. In the eastern part of Southern Taimyr (Tsvetkova Cape area) Permian to Jurassic rocks show similar structural style. 5. Stress axes orientation estimated from the fracture study in Riphean rocks in the Central Taimyr and Permian up to Upper Jurassic sediments in the eastern part of Southern Taimyr (Tsvetkova Cape area) is very similar. 6. Apatite fission track study of samples from the Tsvetkova Cape area point to ca. 150-125 Ma and 75-60 Ma uplift/erosion events. 7. In the eastern part of Southern Taimyr, all compression-related structures were affected by a younger extension. In summary, our observations do not show evidence for a strong late Paleozoic compression in the Central and Southern Taimyr. Granite intrusions, previously interpreted as Carboniferous, are ca. 250 Ma and may be presumably linked to the Norilsk trap LIP magmatic event. Also worth noting is that there are no Paleozoic ophiolite complexes within Taimyr FTB. Similarity in fold geometry and stress axes orientation shows that Vendian and younger rocks up to Permian in the Central Taimyr as well as Permian and Mesozoic rocks of the Southern Taimyr were mainly deformed during Mesozoic (Early and/or Late Cretaceous) compressional event, also recognized by brittle fractures in the Riphean rock units. These events are approximately synchronous to major collisional processes occurred in latest Jurassic – Cretaceous time in the northeast Asia and may reflect a connection between Southern Taimyr and Mesozoic fold belts of the northeast Asia. The final extension best documented in the Tsvetkova Cape area likely reflects tectonic relaxation processes right after the compressional event and opening of the Laptev Sea rifted sedimentary basin in Late Cretaceous-Cenozoic.
The Taimyr fold and thrust belt (FTB) consists of several zones that show evidence for Precambrian, Late Paleozoic (Hettangian), and Mesozoic tectonic events. Most scientists point to Precambrian and late Paleozoic compression as the most intense compression events with minor Late Mesozoic tectonic activity within southeastern part of Taimyr Peninsula (Verkhovansk, 1991; Pevgorskiy, 1986), although Zemenkain et al. (1990) argued for a strong Mesozoic tectonic event. Our structural studies of the Central and Southern Taimyr done in 2005-2012 also point to important role of the Mesozoic tectonics.

Regional-scale structural style of the study area is dominated by two major folds, anticline and syncline. Within the anticline fold almost whole coast of Laptev’s Sea, from Lena Delta to Khatanga Bay.

The Chernokhrebetnaya fold zone is located in the north-eastern part of Taimyr Khingan depression, near its contact with the Taimyr thrust belt. The study area belongs to the larger Ob’-Yenisei fold zone which strikes along the coast of Laptev’s Sea, from Lena Delta to Khatanga Bay.

Structure and Mesozoic tectonics of the southeastern Taimyr fold and thrust belt

1. Regional Setting

Fig. 1. Remote sensing image of Taimyr Peninsula and the locations of the study areas. 1 - The Zhdanova River, 2 - The Verkh-Khaylova River, 3 - The Chernokhrebetnaya River, 4 - The Chetskaya Mountain belt. The Earth’s surface relief is shown in grey scale. (image data: 05/26/1997, Landsat-7 ETM++)

Fig. 2. The Taimyr fold-thrust belt. Simplified tectonic zonation on the geologic map (zone boundaries after Verkhovansk, 1996)

2. The Chernokhrebetnaya fold zone

Fig. 3. The Verkh-Khaylova River area. Generalized map with orientation, and orientation showing structural elements and structural style of Cherskaya area

3. The Central and Southern Taimyr zone (eastern parts)

Fig. 6. The Chernokhrebetnaya fold zone. Deformational stages and related structures.

4. Conclusions

Fig. 7. Fission-track and Lu-Hf-Pb isotopic data on biotite and muscovite: The Verkh-Khaylova River, Central Taimyr

Fig. 8. Tertiary reactivation in Lower Riphean - Vendian-Paleozoic (substage) in the Central Taimyr Fold belt.

Fig. 9. Miocene (~16 Ma) extension in the Western Taimyr shear zone.

The orientation of the compressional deformations (Fig. 2) is typical for Taimyr tectonic zones, but marked by structural-stratigraphic characteristics of Khatanga and Cherskaya. Khatanga rocks refers to Late Jurassic to younger compressional deformation phases (stage) (Fig. 2).

This stage can be regarded as a of an Early Cretaceous collision among the Arctic palaeocontinent (Arktichnaya and the Siberian centre in the Yenisei-Arkhangel’skaya zone of Verkhokhrebetnaya-Chernokhrebetnaya fold system.

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