



Материалы  
Всероссийской  
конференции  
с международным  
участием

# Петрология магматических и метаморфических комплексов

Выпуск 9



МИНИСТЕРСТВО ОБРАЗОВАНИЯ И НАУКИ  
РОССИЙСКОЙ ФЕДЕРАЦИИ  
НАЦИОНАЛЬНЫЙ ИССЛЕДОВАТЕЛЬСКИЙ  
ТОМСКИЙ ГОСУДАРСТВЕННЫЙ УНИВЕРСИТЕТ  
ПРАВИТЕЛЬСТВО РОССИЙСКОЙ ФЕДЕРАЦИИ  
РОССИЙСКИЙ ФОНД ФУНДАМЕНТАЛЬНЫХ ИССЛЕДОВАНИЙ



Национальный  
исследовательский  
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государственный  
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# **Петрология магматических и метаморфических комплексов**

## **Выпуск 9**

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с международным участием

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В сборнике представлены материалы 9-й научной конференции по проблемам генезиса, моделирования условий формирования, структурной организации и минерагении магматических и метаморфических комплексов. Рассмотрены вопросы их геохронологической корреляции и формационной типизации.

Для специалистов в области петрографии, геологической съемки и прогноза месторождений полезных ископаемых.

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# PALEORECONSTRUCTIONS OF WYOMING AND SUPERIOR CRATONS FROM 2.70 TO 1.72 GA WITH IMPLICATIONS FOR ARCHEAN-PROTEROZOIC SUPERCONTINENTS AND THE CIRCA 2.45-2.35 GA GREAT OXIDATION EVENT

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The ages and orientations of mafic dykes can be effective tools for testing pre-Pangea continental reconstructions (Bleeker and Ernst, 2006), especially when combined with paleomagnetic data. This paper presents new U-Pb geochronologic data and paleomagnetic measurements relating to the Archean to Proterozoic sojourns of the Wyoming and Superior cratons. These cratons formed the core of a much larger supercratonic assembly that existed for nearly 500 Ma and may have included most of the cratonic blocks of the Earth at that time.

Direct U-Pb dating of deformation coupled to paleomagnetic data from Archean and Proterozoic dyke swarms has established that southern Wyoming and southern Superior cratons sutured ca. 2.65 Ga along the Oregon Trail structural belt (OTSB) in central Wyoming and remained connected until ca. 2.1 Ga rifting (Chamberlain et al., 2003; Grace et al., 2006; Frost et al., 2006; Kilian 2015; Kilian et al., 2016a). Wyoming was likely part of a much larger, high- $\mu$  ( $^{238}\text{U}/^{204}\text{Pb}$ ) craton, and this collision was a key step in formation of the supercraton Superia-Vaalbara, which included Kola-Karelia. Superia-Vaalbara migrated to the equator by 2.45 Ga, and was intruded by a series of Large Igneous Provinces, which contributed to several Paleoproterozoic glaciations (Snowballs Earth-style) and oscillations in the atmospheric redox state at the early stage of the Great Oxidation Event between 2.43 and 2.32 Ga (Gumsley et al., 2017).

In this reconstruction, the Huronian Supergroup, deposited along the southern margin of the Superior craton, and the lower part of the Snowy Pass Supergroup, deposited along the southeastern margin of the Wyoming craton, are coeval successions from the conjugate sides of the failed rift. Breakup of Superia-Vaalbara involved multiple rifting events from 2.3 to 2.0 Ga and possibly led to the first separation of the high- $\mu$  cratons: Pilbara, Kaapvaal, Wyoming, Hearne, and Kola-Karelia. Separation of Wyoming and Superior occurred ~100 km south of the OTSB suture, leaving the Archean Southern Accreted terrane (SAT) attached to the Wyoming craton. The SAT has geological, geophysical and isotopic affinity with the Superior craton. By 1.90 Ga, Wyoming and Superior cratons were ~60° apart in longitude at mid-latitudes on the basis of the simplest drift paths and data from the Sourdough dike swarm (Kilian et al., 2016b). The Wyoming craton joined Laurentia by reconnecting with the Superior craton along the Wyoming craton's eastern margin ca. 1.72 Ga based on tectonic evolution of the Hartville Uplift, in SE Wyoming (Krugh 1997) and Black Hills, in South Dakota (Allard and Portis, 2013).

While Kola-Karelia forms part of the Superia-Vaalbara reconstruction, it is unclear whether or not the Anabar and Aldan shields were connected to this early Proterozoic supercraton, although Paleoproterozoic successions recording the ca. 2.2 Ga Lomagundi carbon isotope excursions were deposited along open margins of both shields. There is good evidence that the Siberian craton was near the northern margin of Superior province from 1.75 to 0.75 Ga (Ernst et al., 2016), but any earlier paleoreconstructions of the Siberian craton are less certain.

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