Estimating the Variations in Paleointensity from the Siberian Traps of Maimecha-Kotui and Norilsk Region

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The large Siberian trap province (Russia) includes several regions - Norilsk, Maimecha-Kotui, Putorana and Tunguska. According to estimates of absolute age from different parts of the regions (Kamo et al., 2003), the formation of the traps occurred about 250 Ma, took about 1 Ma and was associated with rapid eruptions of huge amounts of volcanic material (2.5 million km^3). Trap sections are composed of numerous lava flows (up to 40 and more in some sections), so the study of their NRM provides a unique possibility to reconstruct a sufficiently detailed pattern of variations in the paleodirections and paleointensities over a period of one million Ma at the Permian-Triassic boundary. Such data are of vital importance for understanding the evolution of the geomagnetic field and developing the geodynamo theory.

Collections of rocks from two regions (Fig. 1): Norilsk (section Ergalah, Permian-Triassic boundary) and Maimecha-Kotui (Onkuchakskaya, Tyvankitskaya and Delkanskaya suites, early Triassic) were sampled and investigated for magnetostratigraphy and paleodirections. A part of these rocks was selected for the paleointensity determination, and the results are shortly reported below.

Extensive study of magnetic properties of rocks, their thermostability, estimating the domain structure of grains were carried out. The Thellier-Coe procedure with the pTRM-check heating to lower temperatures after every two temperature cycles was the basic method for determining the paleointensity. In addition, the Wilson express-method of H_{anc} estimations was applied also. Overall the Thellier procedure was carried out for almost 300 different hand samples. Satisfactory (in terms of quality and statistics) determinations of H_{anc} are obtained for 29 (from 70) hand samples of Ergalah section, 77 (from 146) ones of Onkuchakskaya suite, 28 (from 41) and 5 (from 22) ones from Tyvankitskaya and Delkanskaya suites, respectively. The VDMs were calculated using paleoinclination determined for a correspondent lava flow or for a pulse. The sequences of VDM values obtained for Ergalah, Tyvankitskaya, Delkanskaya and Onkuchakskaya suites are shown in Fig. 2. As is seen, the VDM values vary in the range of $(1–5)\times10^{22}$ Am^2 and make less than a half of the present day value VDM = 8×10^{22} Am^2. This result agrees well with the previous published data supporting the Mesozoic dipole low hypothesis. Note that the character of variations of VDM is almost identical in both sections, which suggests that the geodynamo regime did not change throughout the entire period of Siberian trap volcanism.

Keywords: paleointensity, Permian-Triassic, variations, Thellier-method, Siberian traps

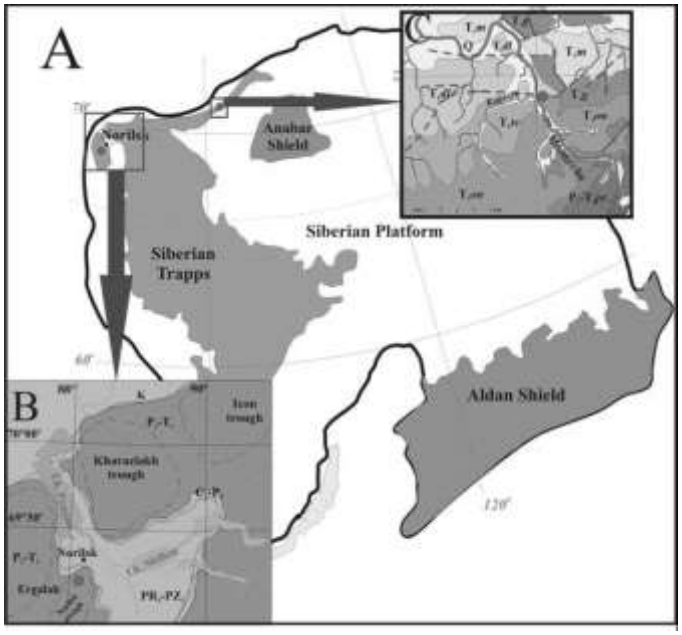

Figure 1: A – Location of studied sections in Siberian platform, B – geological scheme of Norilsk region, C - geological scheme of Maimecha river's region.

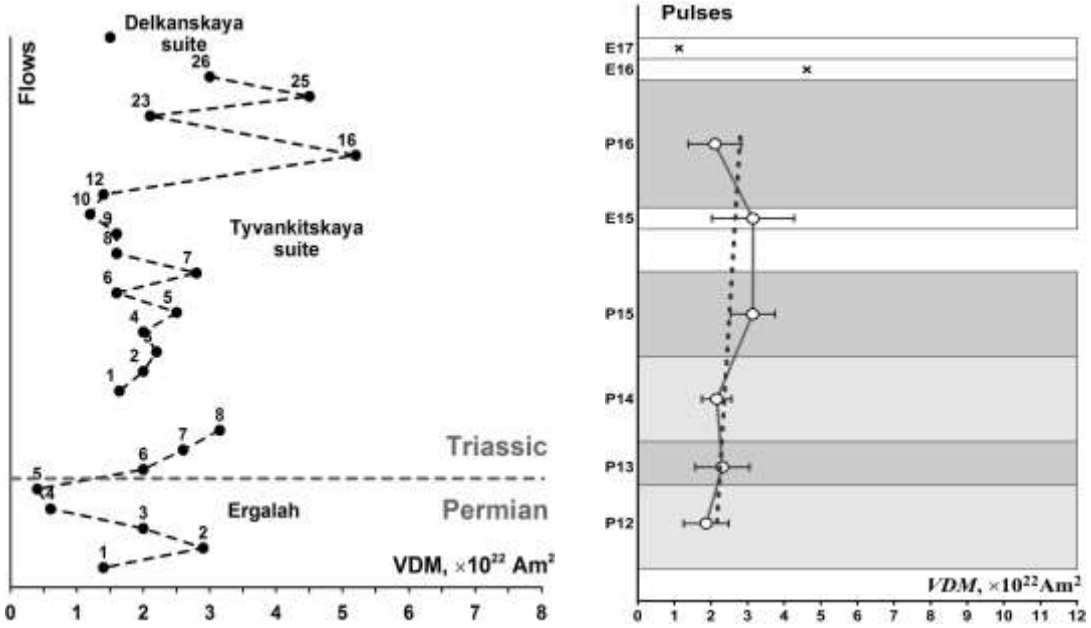

Figure 2. VDM values profile obtained through sections for Ergalah, Tyvankitskaya and Delkanskaya suites (left) and Onkuchakskaya suite (right).