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Late Triassic siliceous-volcano-terrigenous deposits of the Chukchi Peninsula: composition of igneous rocks, U–Pb age of zircons, and geodynamic interpretations

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Abstract

Study of Late Triassic volcanic, subvolcanic, and volcanosedimentary rocks of the Chukchi Peninsula (Vel'may terrane) has shown their different geochemical types. Basalts, dolerites, and tuffs of the lower–middle strata of the Upper Triassic section bear evidence for their formation in suprasubductional geodynamic setting. Basalts and dolerites of the upper strata of this section correspond in composition to within-plate rocks and are similar to Middle–Late Triassic oceanic-plateau basalts and dolerites. U–Pb dating of magmatic zircons from tuffs of the lower–middle strata and from dolerites of the upper strata shows the almost synchronous magmatic activity in the suprasubductional (206 ± 5 Ma) and within-plate (212 ± 4 Ma) geodynamic settings.

Keywords: geodynamic settings of magmatism; basaltic volcanism; U–Pb dating; Late Triassic; Vel'may terrane; Chukchi Peninsula

Introduction

The existing models for the tectonic and geodynamic evolution of the Arctic region are based on results of geophysical, lithological, stratigraphic, paleontological, structure-geological, petrological, geochemical, isotope-geochemical, and geochronological research into the Arctic Ocean and its continental margins (Laverov et al., 2013; Lawver et al., 2002; Nokleberg et al., 1998; Parfenov et al., 2010; Shephard et al., 2013). The internal consistency of these models is seriously governed by the different maturities of exploration of the particular regions. The Chukchi Peninsula is one of the vast continental margins of the Arctic Region, with an intricate geologic history. Research into its key objects for obtaining the information necessary for geodynamic and tectonic constructions is the topical problem.

This work is concerned with study of geochemistry and dating of lavas, sills, and dikes from the Upper Triassic strata of the Vel'may terrane on the Chukchi Peninsula (Nokleberg et al., 1998; Parfenov et al., 1993a). The terrane is considered as a link of the structure bounding the Arctic Alaska–Chukotka microplate in the south and stretching from Alaska to Cape Svyatoi Nos and the Novosibirskie Isles (Bol'shoi Lyakhovskii Island). Several remote terranes were united into this structure, based on (*a*) their present-day geologic location along the southern boundary of the Arctic Alaska–Chukotka microplate (Fig. 1*a*), (*b*) the presence of tectonic sheets and blocks of plutonic ultrabasites, basites, siliceous-volcano-terrigenous strata, and predicted and revealed ophiolite fragments in their structure (Ganelin, 2011; Kosygin et al., 1974; Loney and Himmelberg, 1989; Lychagin, 1985; Lychagin et al., 1991; Wirth et al., 1993), and (*c*) the similarity of the Late Triassic faunas in the deposits of the Chukchi Peninsula and the Brooks Range (Tynankergav and Bychkov, 1987).

Research into the geodynamic setting of formation of the Vel'may terrane rocks and their isotope-geochronological dating were not performed earlier. The published data on the contents of major rock-forming elements in lavas of the Upper Triassic strata (Tynankergav et al., 2011) are insufficient for the reliable determination of the rock series and reconstruction of the geodynamic setting of magmatism occurrence.

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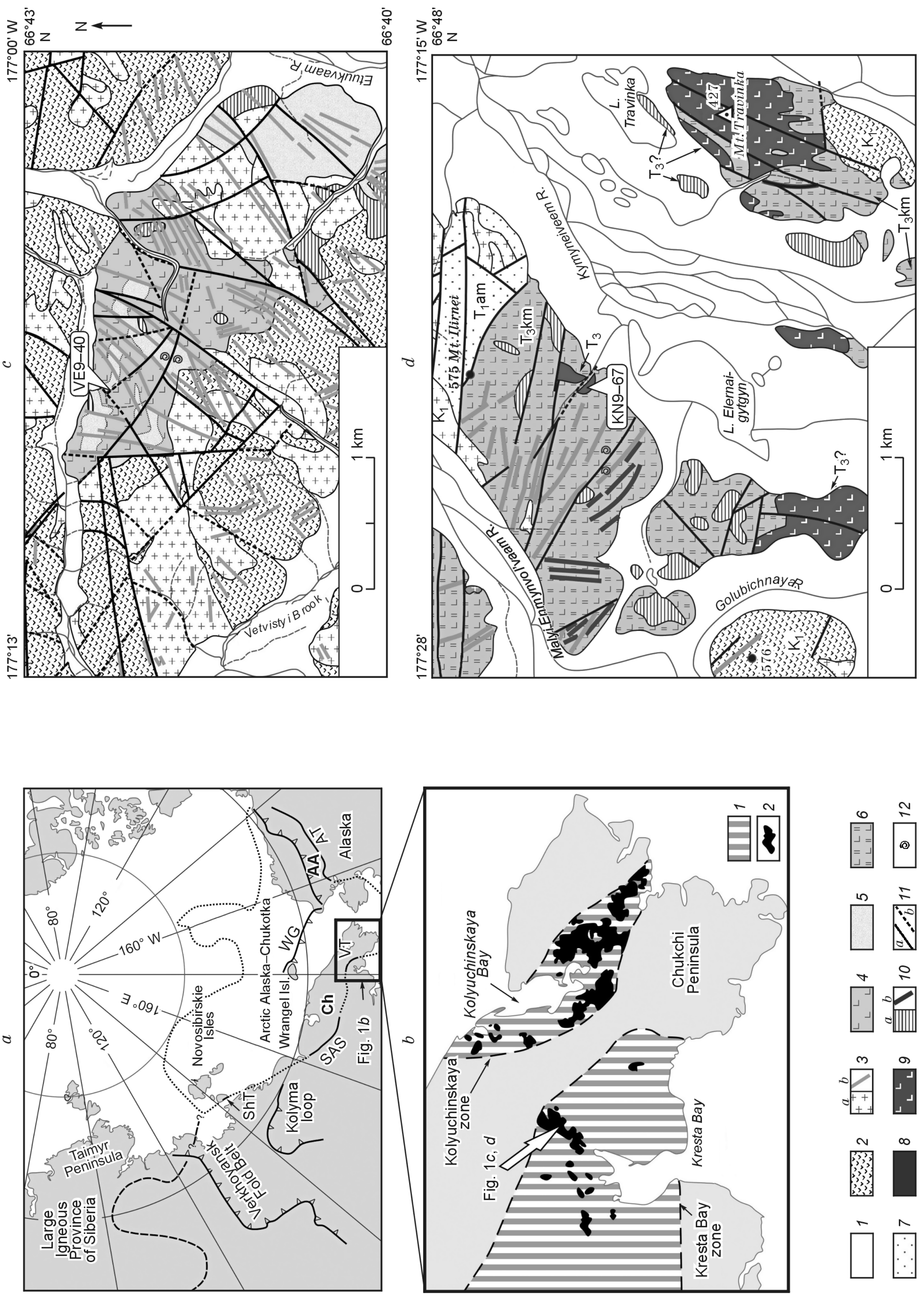
a
Large Igneous Province of Siberia
Taimyr Peninsula
Verkhoyansk Fold Belt
Kolyma loop
ShT
SAS
Ch
Novosibirskie Isles
Wrangel Isl.
Arctic Alaska–Chukotka
WG
VT
AA
AT
Alaska
Fig. 1b
0°
80°
120°
160° E
160° W
b
Kolyuchinskaya Bay
Kolyuchinskaya zone
Fig. 1c, d
Chukchi Peninsula
Kresta Bay
Kresta Bay zone
1
2
1 2 3 4 5 6
7 8 9 10 11 12
a b
c
177°00' W
66°43' N
66°40'
177°13'
N
Etlukvaam R.
VE9–40
Vetvistyi Brook
0 1 km
d
177°15' W
66°48' N
177°28'
L. Travinka
427
Mt. Travinka
T3?
K1
T3km
Kymyneiveem R.
T1am
575 Mt. Ilirnei
T3
KN9–67
L. Elernaigytgyn
Malyi Enmynvolvaam R.
Golubichnaya R.
576
0 1 km