New U-Pb, Sm-Nd, Rb-Sr, Ar-Ar and K-Ar isotopic data for the Altai-Sayan Fold Region, Central Asia: an overview and geological constrains

A. G. Vladimirov
V. A. Ponomarchuk
A. Travin
S. N. Rudnev
N. N. Kruk
S. A. Vystavnoy
M. Yu. Rumjantsev

United Institute of Geology, Geophysics and Mineralogy SB RAS, Ac. Koptyga av. 3, 630090 Novosibirsk, Russia

V. A. Khalilov

Geological institute, KAZ, Kalinina str. 69a, 480100, Alma-Aty, Kazakhstan

Altai-Sayan Fold Region (ASFR) is situated to the south-west of the Siberian Craton (Fig. 1).

This region is characterized by mosaic structure originated from multiple periods of tectonic reactivation (from Early Caledonian to Variscan orogeny). Gradual decrease in ages of geological complexes from east to west (with distance from Siberian Craton) is observed. These features of the ASFR tectonics are related to successive accretion of terrains to the Siberian Craton and anomalous development of shear movements during collisional and postcollisional stages (Berzin *et al.*, 1994; Berzin and Dobretsov, 1994). Some locations of the ASFR have especially complex structure, and their geological evolution last from Neoproterozoic to Early Mesozoic (Lebedev *et al.*, 1993; Vladimirov *et al.*, 1996; 1997; 1998). New geochronological results (1991-1997) received for these locations compose majority of the data discussed in this paper.

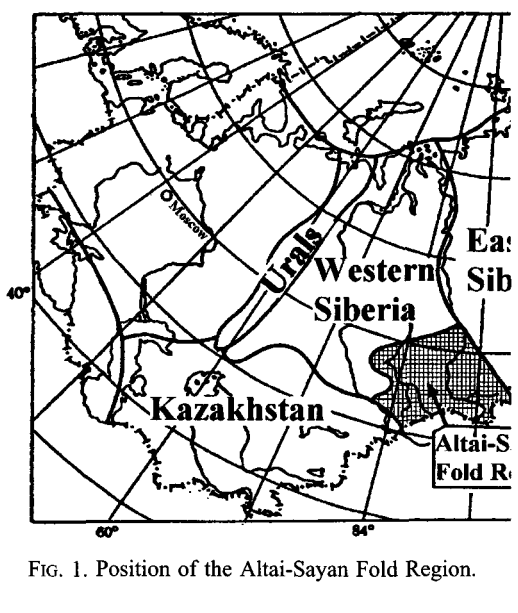

FIG. 1. Position of the Altai-Sayan Fold Region.

Methods

Analysis of geochronological data was performed separately for granitoides, gabbroides and metamorphic core complexes. For most objects U-Pb isotopic dates (n = 63) were used, and for objects having multistage genesis results of Rb-Sr (n = 16), Ar-Ar (n = 10) and K-Ar on biotite (n = 8) methods were also analysed. For gabbroides Sm-Nd isotopic dates (n = 4) were involved into analysis. For magmatic and metamorphic complexes of different age calculation of occupied surfaces was done. Moreover granitoid massifs of A-, S- and I-types were differentiated. It became possible due to the GIS techniques.

Construction of GIS isotope age database was performed. The main point was to make a powerful tool for analysis and visualization of heterogeneous data set. The generic data object is 'date' having a number of mandatory properties: altitude, longtitude, age and isotopic method of dating. Other properties are optional and include isotopic composition of samples used, description of dating technique, geological interpretation e t. c. The database is accessible from GIS-environment (e.g. ArcView™ by ©ESRI) so 'dates' can be visualized on any available

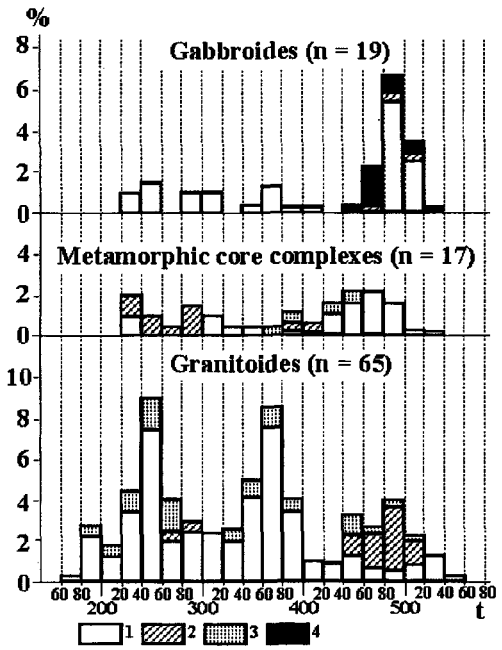

FIG. 2. Histograms of ages distribution. 1 - U-Pb, 2 - Ar-Ar and K-Ar, 3 - Rb-Sr, 4 - Sm-Nd dates.

set of digitized map layers and analysed (including spatial features) in any desired way.

Results and discussion

Histograms of ages distribution for granitoides, gabbroides and metamorphic core complexes are shown on Fig. 2.

For gabbroides four distinct peaks corresponding to main tectogenesis stages in the ASFR (Berzin *et al.*, 1994) are distinguished: Early Caledonian accretion of island arcs to the Siberian Craton (520–460 Ma), formation of Late Caledonian active continental margin of Siberian Continent (400–340 Ma), final closing of Palaeoasian Ocean and Variscan collision of Siberian Continent with Kazakhstan and Tarim plates (320–280 Ma), intracontinental (postcollisional) magmatism attributed to plume source (260–220 Ma).

Ages of metamorphic core complexes correlate with stages of gabbroid (mantle) magmatism.

Correlation of granitoid magmatism peaks with these of gabbroid magmatism is observed only for Early and Late Caledonian stages of tectogenesis. Granitoid magmatism of Variscan collision stage (320–280 Ma) is poorly represented compared with first intracontinental stage (260–220 Ma). This stages of intracontinental granitoid magmatism represented mainly by S-type granites which are attributed to main shear zones (Table 1). The youngest peak of granitoid magmatism (200–180 Ma) is correlated with dyke belts of alkaline gabbroides and lamprophyres (Vladimirov *et al.*, 1997).

TABLE 1. Relative distribution of magmatic rocks in ASFR

Age (Ma)	Gabb-roides	Granitoid types I	A	S	Total
520-460	4.1	3.3	2.5	–	9.9
400-340	0.1	10.7	3.2	4.1	18.1
320-280	2.4	9.8	–	1.2	13.4
260-220	<0.1	<0.1	–	55.3	55.3
220-180	<0.1	<0.1	–	3.3	3.3
Total	6.6	23.8	5.7	63.9	100.00

This research was supported by RFBR Grants 97-05-65961, 97-05-65219, 98-05-65295.

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