Age, sources and geodynamic setting of the Paleoproterozoic granitoids in the western Aldan shield (eastern Siberia)

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Precambrian image of the western Aldan shield was fashioned mainly during of the Paleoproterozoic time as a result of accretion of newly formed continental crust fragments to the Achaean Olekma and Aldan microcontinents. Based on the recently obtained U-Pb zircon data for the key Proterozoic granitoid complexes of different tectonic setting we suggest following geodynamic model.

The beginning of the Paleoproterozoic activization is marked by emplacement of abundant 2398±4 – 2522±2 Ma crustal-origin granitoids with A-type characteristics within the Border zone between the Olekma and Aldan terrains. The presence of the voluminous A-type granitoids located within the about 500 km long Border zone suggests their formation as a result of plume activity initiated a enormous melting of stacked blocks of continental crust. Formation of TTG Timpton gneisses at 2011±3 Ma and Ungra gabbro-diorite-tonalite massif of 2022±20 Ma at active continental margin of the Olekma-Aldan microcontinent occurred during of the next tectonic event. Collision of Paleoproterozoic Fedorovsky arc complexes with microcontinents and related high-grade metamorphism took placed at 1993±1 Ma as evident from the age of syncollisional subalkaline quartz diorite. Emplacement of post-collisional S-type granites and subalkaline granites occurred at 1966±4 Ma – 1950±19 Ma. Final Paleoproterozoic collisional event and related high-grade metamorphism was linked with collision of the Olekma-Aldan-Fedorovsky and Sunnagin microcontinents. Syncollisional quartz diorites have generated 1925±5 Ma and post-collisional granites emplaced at 1916±10 Ma, 1907±15 Ma and 1899±6 Ma crowning Precambrian magmatic activity in the region.

This work has been supported by grants 02-05-65086, 01-05-65266 and 00-05-72011 from the Russian Foundation for Basic Research (RFBR).

Subsurface sediments as a tool to estimate regional background: validation and application in the eastern Po plain

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Background values of chemical elements in soils are of fundamental importance for the evaluation of pollution levels and can serve efficiently to the definition of territorial administration policies. Background values depend on several factors, such as the composition of source rocks, the intensity of chemical weathering, and the occurrence of pedogenic and/or diagenetic phenomena, which can redistribute the elements within the soil profile.

Identification of background values for selected elements (Ni, Cr, Zn, Cu, Pb) was carried out in the eastern Po Plain through the analysis of approximately one hundred subsurface samples, collected by hand drilling at about 1 m depth, within unaltered sediments. Sampling sites were selected accurately on the basis of surficial geology, taking into account their attribution to different facies associations and sediment provenance, which can greatly influence trace metal distribution. Chemical analyses performed so far include the evaluation of total metal contents by X-ray fluorescence.

In order to verify the possibility of using data from subsurface samples as background values for the study area, a comparison was carried out with data from 30m-thick cores of the same area, spanning the entire Holocene (Amorosi et al, 2002).

The results of this comparison are fairly satisfactory. Particularly, the marked increase in Cr and Ni recorded in the deeper cores, and attributed to an ultramafic fraction supplied by the Po river (Amorosi et al., 2002), can be identified in the 1m-deep samples over a significant part of the study area. This enables the identification of an abandoned Po delta lobe and shows that major geochemical provinces correspond to depositional systems and are not a function of grain-size or facies associations.

The strong affinities between geochemical composition of subsurface samples and the data from core samples indicate that the formers can well represent the background values in soils, and can be used for the geochemical mapping of the study area.

References

Amorosi A., Centineo M.C., Dinelli E., Lucchini F., Tateo F. (2002). *Sedimentary Geology*, in press