Contrasting magma sources in ultramafic-mafic intrusions of the Noril'sk area (Russia): Hf-isotope evidence from zircon

K.N. MALITCH[1], E.A. BELOUSOVA[2], W.L. GRIFFIN[2], I.YU. BADANINA[1], O.V. PETROV[1] AND N.J. PEARSON[2]

[1]All-Russia Geological Research Institute, St. Petersburg, 199106, Russia (Kreshimir_Malich@vsegei.ru)

[2]GEMOC ARC National Key Centre, Macquarie University, Sydney, NSW 2109, Australia

World-class platinum-group-element (PGE)-Cu-Ni deposits closely linked to intracontinental paleorift-related ultramafic-mafic intrusions are located in the northwestern corner of the Siberian craton, Russia. Recent U-Pb SHRIMP studies [1, 2] identified distinct age groups of zircon from the main types of ultramafic-mafic intrusions of the Noril'sk area. Most of concordant U-Pb ages lie in the range 230-270 Ma. Minor zircon populations show older U-Pb ages, which cluster around 300 and 340 Ma.

In situ Hf-isotope data (~310 analyses) were collected on the dated spots within single zircon grains from the main lithological units of economic (Noril'sk-1, Talnakh and Kharaelakh) and non-economic (Nizhny Talnakh and Zelyonaya Griva) intrusions of the Noril'sk area. The analysis used a New Wave LUV213 laser-ablation microprobe attached to a Nu plasma MC-ICP-MS at GEMOC [3].

Zircons from economic intrusions with U-Pb ages between ca. 230-340 Ma yielded mean epsilon $_{Hf}$(T) (parts in 10^4 difference between the zircon sample and the chondritic reservoir) values of + 9.4 (n=45) at Kharaelakh, + 11.3 (n=96) at Talnakh and + 12.2 (n=83) at Noril'sk-1, close to the mean value of the depleted mantle reservoir at that time. In contrast, zircons from non-economic intrusions with U-Pb ages between ca. 215-305 Ma yielded eps $_{Hf}$(T) values +1.0 (n=80) at Nizhny Talnakh and +1.7 (n=11) at Zelyonaya Griva.

The Hf isotope data suggest that zircons from economic intrusions are characterized by the signature of a juvenile mantle-derived magma. The less radiogenic Hf isotope values of zircons from non-economic intrusions indicate mixing between mantle and crustal magma sources. Our new findings suggest the interaction of distinct magmas, indicating that ultramafic-mafic intrusions of the Noril'sk area have a more complex geological history than is commonly assumed.

[1] Petrov *et al.* (2006) *GCA* **70**, 18S, A486. [2] Malich *et al.* (2007) *GCA* **71**, 15S, A616. [3] Griffin *et al.* (2002) *Lithos* **61**, 237-269.

State-of-the-art geodynamic modeling of subduction zones: From slab edges to flat and steep slabs

V.C. MANEA[1,2]* AND M. MANEA[1]

[1]Computational Geodynamics Laboratory, Centro de Geociencias, UNAM, Mex (*correspondence: vlad@geociencias.unam.mx)

[2]Seismological Laboratory, 252-21, CalTech, Pasadena, California, USA

In the recent years, significant progress has been made in computational geodynamics with the main purpose to bring observations from different fields into numerical simulations of subduction zones. Here we present up to date numerical models for three different subduction systems: Kamchatka, Chile and Mexico.

The first system is located adjacent to the Kamchatka-Aleutian junction where the Pacific slab edge is subducting beneath Kamchatka. We show that thermal state of the mantle wedge is the key factor governing the composition of arc magmas. Integrating results from petrology and numeric modeling we demonstrate that northward decrease of the mantle wedge temperature beneath volcanoes correlates well with decreasing slab dip, length of mantle columns and magma flux.

Recent studies suggest that variations in the slab geometries along the Chilean margin are related with strong variations in the upper plate structure. 2D time dependent geodynamic models show that the presence of a highly viscous thick continental lithosphere near the mantle wedge produces flat slabs. Then, the long-term exposure of the base continental lithosphere to the fluid fluxes from the slab will drop the viscosity and the two plates start decoupling, the subduction regime switching back to steep slab. Our results show that the whole cycle, from step to flat and back to steep slab takes 8-10 Ma in good agreement with estimations from chemistry of magmatic rocks in Northern Chile.

The last study area is the Mexican subduction system, with a focus on its central part where the subducting Cocos slab is in flat regime for the last ~ 20 Ma. Our numerical simulations show that time-space variations in the mantle wedge viscosity and shape change the slab shape through time. The transformation of the low viscosity wedge into just a low viscosity channel located between the subducting and the overriding plates produces perfectly flat slabs. The geodynamic models explain reasonable the two opponent characteristics: flat slab and the lack of upper plate deformation.