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Pre-caldera collapse of the Tastau volcanoplutonic ring complex (Eastern Kazakhstan)

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Tastau volcanoplutonic ring complex belongs to the Zaisan Magmatic Province of Eastern Kazakhstan. ZMP consists of voluminous volcanic and plutonic rocks emplaced during regional extension affecting the Zaisan orogen. Extension affected crust previously thickened by the Late Carboniferous – Permian collision of the Kazakhstan with the Siberian craton (Buslov et al., 2004). Coeval mafic-felsic magmatism in the ZMP mostly consists of anatectic acidic magmas (Ermolov et al., 1983; Titov et al., 2001) with associated mantle-derived magmas having high-K calc-alkaline. Age of the Zaisan magmatism is Permian – Early Triassic (248 – 293 Ma) (Shcherba et al., 1998, Lyons et al., 2002). The hypabyssal Tastau volcanoplutonic ring complex 248 $\pm$ 34 Ma is the largest multiphase intrusive bodies which represent a volcanic root system. The complex intruded low-grade sedimentary rocks, which comprises sandstone and siltstone of a greywacke composition. The folded sedimentary complex was metamorphosed at a greenschist facies and up to hornblende hornfels facies during the intrusion of the complex. The volcanoplutonic complex has a form of an ellipse (13?18 km). Arc-shaped belts of composition dykes are intrude in the host rocks. A wide variety of magmatic rocks is represented within the Tastau volcanoplutonic complex: leucogranite, granite, granosyenite, gabbronorite and gabbro-diorite and calcium basite. Tastau magmatic rocks represent the continued calc-alkaline series and they are characterized by variations in chemical compositions (46 < SiO2 < 78 wt. %). Unhybrid gabbronorite have the most magnesia content (#Mg=0.50 – 0.55). Synplutonic mafic dikes and enclave are a subalcaline gabbro, a monzonite, a syenite and a quartz syenite (SiO2 = 46.2 – 62.8, Al2O3 = 15.8 – 19.6, TiO2 = 0.75 – 2.22, FeOtot = 4.7 – 11.5, MgO = 1.8 – 5.4, CaO = 2 - 7 wt.%) and high content of alkalines (Na2O+K2O = 5.2 – 9.3 wt.%). Mafic enclaves are depleted relatively the Maxut gabbro in Sr, Ca; and rich Rb, K. The felsic rocks are granite and felsite, which are depleted Ba, Sr, Tl, and rich U. All rocks have a similar positive chondrite-normalized REE patterns and negative europium anomaly (mafic enclaves (Ce/Yb)N=4.99 - 5.54, Eu/Eu*=0.68 - 0.78; granite (Ce/Yb)N=5.48 - 8.59, Eu/Eu*=0.24 - 0.64; felsite (Ce/Yb)N=2.50, Eu/Eu*=0.006), except the unhybrid gabbro (Ce/Yb)N=5.3380, Eu/Eu*=1.02). Compositions of the Tastau magmatic rocks hit the intraplate magmatism area and the active continental margins. Relative of succession of a main intrusive events in Tastau volcanoplutonic compex. First event: the calcium basite intrusion during high-speed shear deformation. Second event: the forming of a felsic radial dike swarm, which represents the caldera forming eruption of felsic melt. Third event: the forming of a first granosyenite intrusive ring and a first granosyenite stock, which represents first stage of the collapse caldera. Fourth event: the forming of a second granite intrusive ring and a second granite stock, which represents second stage of the collapse caldera. First of all the catastrophic deformation event in an enclosed space along with the calcium basite intrusion happened. The numerous small (1-70 cm) intrusive mafic bodies are situated mainly in the linear zone of a metasedimentary rock tectonic brecciation crossing the central part of Tastaut volcanoplutonic complex. Within this zone the lithified rock underwent a brittle-ductile deformation and cataclasis. The calcium basites form a dyke swarm and are a source of other bodies: globular, bag-like and irregular morphologies. The composition of the calcium basite is unusual and characterized by wide variations of all main chemical elements (SiO2 = 46.2 - 61.2 %, Al2O3 = 12.6 - 17.7 %, TiO2 = 0.55 - 0.85 %, FeOtot = 3.77 - 6.87 %, MnO = 0.35 - 0.68 %, MgO = 2.0 - 5.64), low alkali contents (Na2O + K2O = 0.78 - 2.9 %) and high contents of CaO (10.8 – 20.7 %). The mafic magma emplacement controlled by regional compressive shear deformation. The magma fragmentation was due to the significant decreasing of viscosity of disintegrated host matrix in environment of the high-speed shearing, which was ride the regional tectonic causes. The deformation rate was comparable with the rate of a mafic melt cooling. This catastrophic short-time tectonic-magmatic event (or pre-caldera collapse) presedes all other developmental stages

of volcanoplutonic complex.