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IAVCEI (Volcanology, Geochemistry)

VS28p-487

30-Jun-2015, 15:00 - 16:30



Abstract content:

Geology, petrology and geochemistry of the Tolbachik volcanic massif, Kamchatka, Russia

Data on the geology, petrography, and geochemistry of previously geochemically unstudied Middle-Late-Pleistocene rocks from Tolbachik volcanic massif (Central Kamchatka Depression, CKD) are presented. Two volcanic series – middle-K and high-K were erupted. The geochemical history of the massif was started earlier 86 ka (K-Ar dating) with the formation of the Tolbachik pedestal presented by middle-K series. During stratovolcanoes formation both series occur and the role of high-K melts was increasing with time. In Holocene high-K rocks are dominated but some cinder cone lavas are presented by middle-K high-Mg melts which suggest that both volcanic series are still exists. The computer modeling show that both series can be explained by the process of crystal fractionation at different water content from nearly or the same mantle source similar to high-Mg basalts of 1975 Northern Breakthrough. Middle-K rocks could crystallize at water-rich conditions (more than 2% of H₂O) while the high-K rock could crystallize at dry conditions at the same pressure. However the existence of different mantle sources and possible magma mixing cannot be excluded. Our data show that fractional crystallization at different P-T-H₂O-fO₂ conditions can be one of the main processes responsible for rock variations at CKD. Sr-Nd-Pb isotopes suggest 2-4% of crustal assimilation to the magma chamber during pedestal and stratovolcanoes formation while lava-cinder cones are not show evidences of crustal assimilation. Major and trace element data coupled with K-Ar dating provide strong evidence that Povorotnaya mount located in 8 km NE of Plosky Tolbachik is the old block of the Tolbachik massif pedestal and for the moment the oldest known object (306 ka by K-Ar dating) in Klyuchevskaya group.

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Keywords:

Tolbachik Klyuchevskaya Group of Volcanoes subduction geochemistry fractional crystallization