

*Dear Friends,*



*From the very beginning, humankind has been leaving its marks on the environment. In the past century, this influence has increased to such an extent that its results are comparable with major natural disasters. However, dangerous manifestations of the active internal life of our planet – catastrophic disasters, especially volcanic eruptions, earthquakes and tsunamis – are still way beyond human control.*

*Earth is not that vast a space for the rapidly growing human civilization; despite the sad lessons of the past, cities with multi-million populations are growing in areas of seismic unrest and around volcanoes. The densely populated Pacific coast is exposed to the raging destruction of tsunamis, which originate from underwater earthquakes. Every year, more and more people fall under the risk of a strike of disastrous and often deadly natural forces. The so-called Ring of Fire, a chain of over three hundred active volcanoes spanning along the ocean perimeter, includes the Kamchatka peninsula in Russia – one of the major centers of volcanism on Earth.*

*This issue of Science First Hand focuses on the studies of the recent powerful eruption of Tolbachik, a Kamchatkan volcano belonging to the Klyuchevskaya volcanic group. The great diversity of volcanoes and their eruption modes gave this area the name of “volcanic sanctuary”; its sparse population and the virtual absence of any risk to humans make it a perfect “test ground” for the study of volcanism, in the same way as Baikal is a natural “laboratory” for ecological and evolutionary research.*

*The last eruption of Tolbachik (2012–2013) had many surprises for the researchers up its sleeve. Despite the fact that Tolbachik has formed above a subduction zone, where one tectonic plate submerges under another, the contents of its erupted lavas has been found to be, in some ways, similar to the lava contents of volcanoes forming above plumes – stationary streams rising from the mantle to the planet surface. Another peculiarity is the geochemical heterogeneity of its lavas. Scientists hypothesized that there are several constantly interacting magmatic chambers beneath the volcano. Eventually, the hypothesis was confirmed using the method of seismotomographic probing. Professor Ivan Koulakov describes this process in his article.*

*The reader will feel a spirit of real discovery in the article by Vyacheslav Gussyakov on the origin and forecasting of megatsunamis – giant waves that originate from extremely powerful earthquakes, i.e. with magnitudes of 9.0–9.5; rare as they may be, megatsunamis cause the most devastating damage and massive casualties. The majority of “regular” earthquakes, for example, in the Pacific Ring of Fire, can cause dangerous tsunamis 15-20 meters high, but as a rule, their impact area is limited to the size of the seismic focus.*

*Tsunamis born during mega-earthquakes can travel great distances across the ocean and rock the waters of peripheral seas. Even at a distance of 5 thousand kilometers, the height of a megatsunami wave can reach twenty meters, just like it happened in the Aleutian islands in April, 1946.*

*The most catastrophic natural disaster in modern Russia in the past century was the earthquake and the following megatsunami in the Kuril islands on November 4, 1952. The giant oceanic wave completely destroyed several settlements, including the town of Severo-Kurilsk; unpublished sources report over 10 000 casualties.*

*Sadly, preventing and effectively counteracting natural disasters of this magnitude is an impossible task for humankind. Hence, the study of processes preceding these catastrophic events is a major challenge for scientists. One of the main aims of modeling the development of these events is generating maximally accurate forecasts, which can buy time and save hundreds or even thousands of lives.*

*Apart from its important applications in everyday life, the study of the internal structure of Earth and the processes governing its depths provides us a with deeper insight into the planetary cycles of matter transformation, including the formation of ores, and ultimately expands our fundamental knowledge of the evolution of Earth and other astronomical bodies.*

Academician Nikolay L. Dobretsov,  
Editor-in-Chief

A handwritten signature in black ink, appearing to read 'N. Dobretsov'.