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В настоящем издании представлены доклады морских геологов, геофизиков, геохимиков и других специалистов на XXII Международной научной конференции (Школе) по морской геологии, опубликованные в пяти томах.

В томе I рассмотрены проблемы палеоокеанологии, палеоэкологии, биостратиграфии, перекрестной корреляции отложений.

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**A 7.2 Ma tephra sequence at the Detroit Seamount, NW Pacific:
A key reference for regional correlations and record of major
explosive eruptions from North Pacific volcanic arcs**

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**Сводный разрез горизонтов тефры, захороненных в осадках
подводной горы Детройт за последние 7.2 миллиона лет,
как основа для региональных корреляций и летопись
крупнейших эксплозивных извержений вулканических дуг
Северной Пацифики**

Key words: tephra, marine sediments, NW Pacific Ocean, Detroit Seamount

Large explosive eruptions are one of the most extreme natural events. Products of such eruptions are presented mostly by volcanic ash (tephra), which can be dispersed over tens of millions square kilometers. During the eruption, eruptive cloud is transported by the wind, and tephra particles settle mantling the landscape. In this way tephra forms an isochron that directly links various sedimentary successions and permits synchronization and dating of disparate paleoenvironmental archives. Geochemical fingerprinting of tephra layers buried in terrestrial and marine sediments ensures their correlations among the sites and permits the identification of the widely dispersed horizons, which can serve as major markers in paleoceanological and paleoclimate research. In addition, tephra sequences in sedimentary cores represent records of large explosive eruptions and permit assessment of regional ashfall hazards.

Tephrochronological studies of the marine sediments are on the rise in many

regions all over the world with major efforts in North Atlantic where tephra layers in the marine sediments can be correlated to those buried in the Greenland ice, which permits the refinement of their ages [1, 2]. In NW Pacific, tephra from sedimentary cores got far less attention with only few papers on marine tephrochronology published in 1990-2000s [3, 4]. At the same time, North Pacific volcanic arcs, especially Kurile-Kamchatka and Alaska-Aleutians, are highly explosive and hosted many large eruptions, the magnitudes of which are still not known. Ash clouds from major North Pacific eruptions repeatedly affected the whole Northern Hemisphere, dispersing ash as far as Greenland, Svalbard, and Eastern Canada [5–8]. On-going work by Alexander Derkachev and Maxim Portnyagin has revealed numerous tephra layers in many NW Pacific cores but all these cores exhibit sediments younger than 250 ka [9, 10].

Our current research, funded by the Russian Science Foundation, is aimed at the reconstruction of the continuous record of tephra layers for the last 7.2 Ma based on the three Ocean Drilling Program cores taken in 1993 in NW Pacific, ~700 km downwind from Kamchatka and Northern Kurile Islands (Fig. 1). The research includes the following activities:

- description and sampling of all the visible tephra layers from the drill cores ODP145-881, 882, and 884 (NW Pacific);
- single-shard electron microprobe (EMP) analysis of volcanic glasses from all the detected tephra layers;
- correlations of tephra layers among the cores and construction of the summary tephra sequence;
- single-shard laser ablation-inductively coupled plasma-mass spectrometry (LA-ICP-MS) analysis of all unique tephras;
- construction of an age model for the summary tephra sequence based on the integration of the available age-depth models for the individual cores and additional isotopic dates for tephras and their proximal counterparts;
- additional microprobe analysis of tephras from long sedimentary cores MD-2416 (NW Pacific) and MD-2415 (Okhotsk Sea).

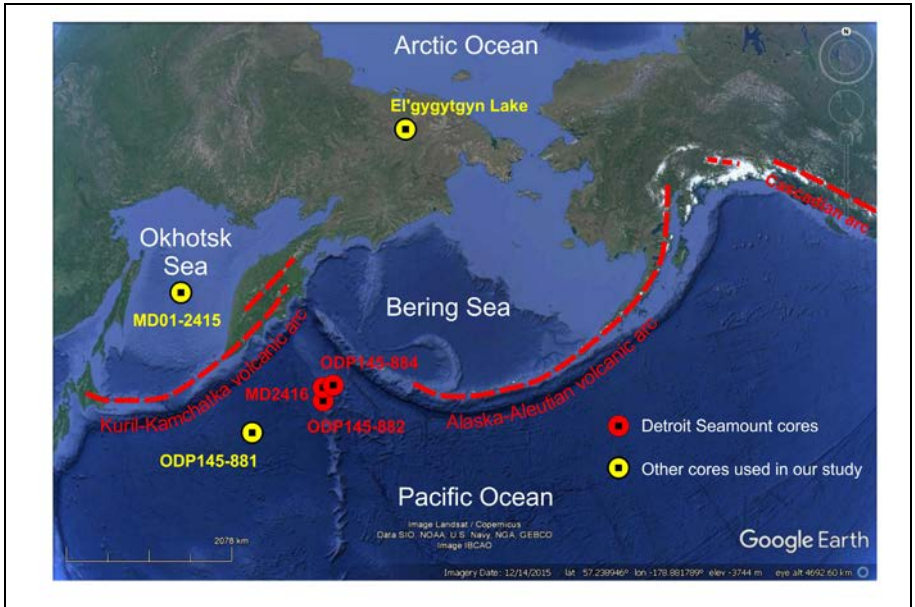


Figure 1. Location of the cores used in this study

This work runs in parallel with our investigations of the terrestrial tephra sequences, welded tuffs, and pumiceous ignimbrites in Kamchatka and Kurile Islands (e.g., [11]), which ensures the identification of source volcanoes for major tephras and mapping of their areal distribution. As a result we are planning to create a single database for all detected tephra layers, which will include age and geochemical data for each layer. This database will serve as a reference for regional correlations of tephra layers and will provide a record of major explosive eruptions from North Pacific volcanic arcs. Correlation of the obtained paleovolcanic record with climate fluctuations recorded in the same cores will allow us to consider the relationships of the volcanic peaks with abrupt climate shifts including glaciations.

As a first step of our research, we are presenting a summary sequence of 107 unique tephra layers buried in the Detroit Seamount sediments (NW Pacific) during the last 7.2 Ma. The summary is based on tephra correlations among the three sediment cores: ODP145-882 (~7.2 Ma) and 884 (~6 Ma), and MD-2416 (~1 Ma) (Fig. 1). All tephras were geochemically fingerprinted with the help of single-shard EMP analysis (a total of 4288 individual points). In addition, all tephras from ODP145-882 and selected tephras from ODP145-884 were analyzed with the help of single-shard LA-ICP-MS analysis (a total of 597 points). Twelve tephra layers from those deposited within the last 1 Ma were

found in all the three cores. Additionally, twenty one tephra layers were found in two cores. Other layers were well expressed only in one of the cores.

At this stage, we were able to identify sources for 20 tephra layers, including eight layers associated with Gorely eruptive center in South Kamchatka. Seventeen tephra layers were correlated to their proximal or distal counterparts, which had been dated elsewhere. For example, two of the tephra layers in the Detroit Seamount sediments are also present in the El'gygytgyn Lake core taken in 2009 within the frames of the International Continental Scientific Drilling Program (Fig. 1). Tephra correlations have allowed us to refine ages for some of the tephra layers and identify dispersal areas for the largest eruptions. The obtained 7.2 Ma record of geochemically characterized tephra layers can serve as a reference for regional and even hemispheric correlations among disparate paleoenvironmental archives.

Research on tephtras buried in marine deposits is an effective method of identification of the largest eruptions and reconstruction of their parameters. Our studies will serve as a prerequisite of the understanding of sizes and recurrence times of past large eruptions, which in turn will permit the identification of space-time patterns in the volcanic activity and long-term forecast of the future large events.

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Мы представляем сводный разрез вулканических пеплов, захороненных в осадках подводной горы Детройт (СЗ Тихий океан) в течение последних 7.2 миллионов лет. Разрез, включающий 107 горизонтов пеплов, основан на трех осадочных колонках, корреляции между которыми осуществлялись с помощью геохимической характеристики вулканического стекла с применением электронного микрозонда и масс-спектрометрии индуцировано-связанной плазмы с лазерной абляцией. Возраст пеплов определялся с помощью возрастных моделей индивидуальных колонок и корреляции с датированными проксимальными отложениями. Полученная нами база данных послужит основой для региональной корреляции осадочных колонок и составления летописи крупнейших эксплозивных извержений вулканов северной Пацифики.