APPEAREACES OF SEEPAGE STRUCTURES ON THE NE SAKHALIN SLOPE: DIFFERENCES AND SIMILARITIES IN GAS DISCHARGE

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Data considered were obtained in several cruises during side-scan sonar surveys carried on NE Sakhalin slope in the framework of Korean-Japanese-Russian projects CHAOS (Hydro **C**arbone **H**ydrate **A**ccumulation in the **O**khotsk **S**ea, 2003-2005) (*Matveeva et al., 2005*) and SSGH (**S**akhalin **S**lope **G**as **H**ydrate, 2004-2009) (*Jin et al., 2007, 2008; Shoji et al., 2008*). The towed hydroacoustic system "SONIC-3M" designed in VNIIOkeangeologia (Saint-Petersburg) was used for side-scan sonar mapping (*Gladysh et al., 2008*). Gas discharge places appear on the side-scan sonar images as a spots of high backscatter intensity, which are considered as seepage structures (S-structures). Total square of the area mapped by side-scan sonar on the slope amounts to 2600 km^2. 739 S-structures were observed in depth interval 350-1200 m.

Data obtained show that S-structures are spread everywhere on the north-eastern Sakhalin slope, but their appearances strongly vary from one place to another one that are connected to changes of slope structure. The main change was observed at crossing of Lavrentiev Fault that separates slope on northern and southern segments (Fig. 1). Differences in relief morphology and sedimentary cover structure suggest that slope failure occurred in the northern segment, whereas the southern segment remained stabile.

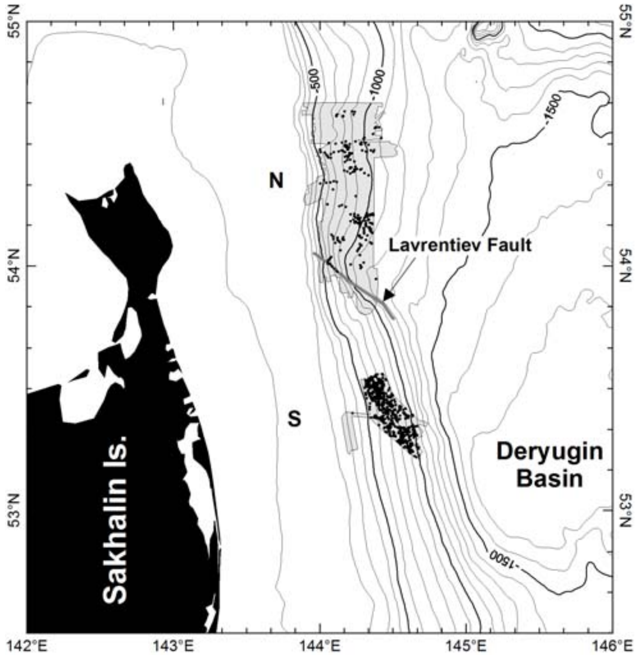

Fig. 1. Location of the S-structures (black dots) on the NE Sakahlin slope. Areas covered by side-scan sonar mapping are shaded. Segments: N=northern, S=southern. Except Lavrentiev Fault other features were not shown due to small map scale. Contour interval is 100 m.

Northern and southern segments differ from each other both by density of S-structures and by character of their distribution. Within the northern mapped area S- structures are grouped in more or less isolated fields. Several fields including 202 S-structures can be distinguished; only single structures are located outside their boundaries. Their average density throughout whole mapped area is one structure per 10 km^2. The majority of S-structures within the southern segment are confined to submarine landslide, erosion canyon or faults that is visible on map for Lavrentiev fault.

In the southern segment S-structures are uniformly located filling nearly the whole studied area without any significant gaps. 537 S-structures were detected in southern study area; their average density was equal one S-structure per 1 km^2, i.e. by an order more compare with northern segment. Their density contours have tendency to be oriented in main NW and minor NE direction having the same strike as the faults within the northern segment. In the southern segments the faults are not clearly observed, but we suppose that a system of fissures exists here. These fissures are invisible on the seismic cross-sections because gas chimneys serving as conduits for seepages mask them. As far as strike of supposed fissures and faults inside northern segment coincide they apparently originated in a same stress system.

Hydroacouctic anomalies (gas flares) were detected on each S-structures crossed by ship's tracks. Height of gas flares in the southern segment in general is less as compared with height of flares confined to the northern one. This fact may indirectly justify that amount of gas discharging in each S-structure here is also less. From the other hand suggested difference may be compensated by amount of S-structures located within the southern area. Thus it may be qualitatively inferred that in spite of difference in seepage appearance total volumes of gas escaping onto the surface in frames of northern and southern areas are approximately the same. The difference is determined by slope structure and consists in the fact that in the northern segment gas discharge occurs within localized areas and in the southern one – throughout the whole segment.

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