Structure of the uppermost sedimentary layers in Kamchatka - Aleutian island arc junction area from high resolution echosound data (SO-201 Leg 1a, Leg 2 KALMAR).

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Geological and geophysical investigations have been carried out from board of RV "Sonne", cruises SO-201leg1a, leg 2 (Cruise Report 2009, SO-201, Leg 1a, Leg 2) from summer to autumn 2009. Study areas were located in Kamchatka and Aleutian island arcs junction area, Komandor Basin of the Bering Sea and northern Emperor Seamounts (ESM) and Emperor Trough (ET). The work was performed in the frame of the Russian-German Project KALMAR and included acoustic profiling by on-board profilograph PARASOUND P70. This report presents obtained data on structure of the upper part (up to 100 m) of the sedimentary cover in different structures of the Kamchatka continental margin, northwestern Pacific Plate and the Bering Sea. The data were recorded in PS3 and SEGY formats and were processed by R. Lutz (BGR) in REFLEXW for consequent interpretation (Cruise Report 2009, SO-201, Leg 1a).

(1) The areas away from the influence of the continental slope and seamounts is generally dominated by an acoustic faces characterized by numerous distinct, closely spaced and continuous parallel reflectors, about 2-3 m in thickness. As usual, these reflectors are conformable with the surface topography and can be traceable over tenth of kilometers. The acoustic penetration is often around 50-75 m and some times about 100 m. The draping character and the layered internal reflection pattern suggest undisturbed pelagic or hemipelagic depositional conditions. This style of acoustic reflection is dominated in the top of Shirshov Ridge and Mejia Swell, north-west Pacific plate. (2) Similar acoustic faces generally dominate in the deepest areas of Komandorsky basin of Bering Sea but thickness of internal layers is bigger (about 5-7 m). The acoustic transparencies of the observed layers showed internal homogenization and very high acoustic reflection. It is probably the result of disintegration of slope-failed masses and their transport by turbiditic or debris flow. These layers are separated from each other by continuous parallel reflectors which are about 2-3 m thick. In some places near the slope and other topographic highs the uppermost sedimentary sequence is about 7 - 10 m thick and has irregular structure and a hummocky surface. It is traceable over tens of kilometers and is characterized by lens-shaped forms of layers that are separated by layers with good stratification from others lenses. Possibly, there are shear slides. (3) The uppermost sedimentary sequence along the Shirshov Ridge is different at the West and East flank. Acoustic facies at the East flank is characterized by numerous continuous or lens-parallel reflectors, closely spaced with diffuse acoustic reflections. The thickness of these layers is 7-10 m. The visible thickness is about 50-75 m. The sediment cover is disturbed by normal folds with a vertical offset of about 5-10 m. Erosional canyons crossing this area. In this case sediment layers are lens-shaped and feather out to the side of these canyons. The Western flank of Shirshov Ridge is characterized by steeper relief with many erosional canyons and topographic highs. Diffuse reflections obtained from these areas provide little information about the uppermost sedimentary sequence. The normal faults separate Shirshov Ridge from the Komandorsky Basin. The upper part of sediment cover is about 25 - 35 m thick and contains lens-strata and, as usual, feather out in thickness (15 -25 m) to topographic highs and faults. Very often the acoustic layers are folded. (4) Massif of Volcanologist is characterized by step fault and volcanic cones relief. The sediments are less then 25-35 m in thickness and cover plain. In general, acoustic facies is characterized by numerous distinct, closely spaced lenses form layers, about several meters in thickness. They are separated by layers about 5-7 m in thickness with homogeneous internal structure. Reflectors are conformable with the basement surface topography. (5) Another type of section is typical for ESM and ET having dissected bottom relief. Maximum visible thickness of the sedimentary cover reaches 80 m. Two types of records are

distinguished; they alternate in the section and characterize different sedimentary complexes with different internal structure. The first complex is formed by lens-like sedimentary bodies with length varying from several kilometers up to several tens of kilometers. They are formed by acoustically transparent unstratified complexes. Usually, these sedimentary bodies are developed in bottom relief depressions. Their visible thickness varies from 10 m to 40 m and internal structure is conditioned by disintegration and mixing of sedimentary masses during their transportation by underwater currents and flows. The second complex is formed by well-stratified sedimentary horizons similar to those described above. Their thickness reaches 40-60 m becoming thinner in relief lows, where they are interstratified with deposits of the first complex. They are observed on ESM, on the plain between ESM and ET, on ESM flanks. Geometry and internal structure of these bodies and analysis of bottom relief justify that they were formed by debris flows. Besides, they are stratified by thin-bedded sedimentary complexes characterizing pelagic background sedimentation. (6) In the studied parts of Kamchatka continental slope (the Bering Sea, Kronotsky Bay) sediments on the echograms have a homogeneous coarsely-stratified structure. The internal structure on the echograms is characterized by chaotic structure. Considerably long frequently lens-like interlayers subdivided by thin layers with intensive reflective characteristics are distinguished. Visible thickness of the sedimentary cover is from 10-15 m to 60 m. Sedimentary unit developed in the central part of the profile and composing the scarp on the slope has different structure. Thickness of sedimentary body increases up to 40 m. The records are characterized by thin-bedded, lens-like internal structure with intensive reflectors. The sedimentary cover in depressions within Kronotsky Bay have similar structures. Characteristic features of its upper part are: absence of thin-bedded structure, presence of numerous interlayers with intensive reflection connected with their coarse composition and presence of numerous lens-like layers. These features are typical for sediments formed in conditions of active sedimentary material removal by turbiditic flows and underwater currents, which nearly completely smooth over background pelagic sedimentation.

Fulfilled study of sedimentary cover upper part structure in the investigated area shows that in general structure and composition of sedimentary cover is mainly conditioned by local bottom relief features and are formed by depositional, redistribution and/or erosional processes. Along with background sedimentation the important role belong to complexes formed by different underwater flows and currents. Authors express gratitude to scientific staff that obtained and processed the PARASOUND P70 data and crew of RV “Sonne”. The investigations were funded by BMBF, Project No. 03G0201B and Minobrnauka.

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