O8-4	DEPTH DISTRIBUTION OF STRESSES IN THE HOKKAIDO WADATI-BENIOFF ZONE AS DEDUCED BY INVERSION OF EARTHQUAKE FOCAL MECHANISMS

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The paper focuses on the depth distribution of stresses in the Hokkaido Wadati-Benioff zone. The considered area is limited by the parallels 40°-48°N and meridians 140°-150°E. ýt comprises the southernmost part of the Kurile Island and Hokkaido where the active subduction of the Pacific plate beneath the Eurasian continent results in an well-defined Wadati-Benioff zone.

The morphology of the Hokkaido Wadati-Benioff zone (**HWBZ**) was studied in details by Hanus and Vanek (1984). According to theýr study the **HWBZ** dips to NW at 40°, it's prevailing thickness is of about 50 km, maximum depth of penetration is of 270 km. An intermadiate depth seismic gap in the **HWBZ** in the depth range 90-215 km and its close relation to active andesitic volcanism was confirmed. The geometry of an activated paleosubduction zone (**HPSZ**) of variable dip and thickness in the depth range 220-560 km was also outlined.

Based on knowledge of the geometry of the deep seismogenic structures in the studied region, we were able to distinct 217 earhquakes (with available CMT Harvard solutions) which belong to the **HWBZ** and 13 for the **HPSZ**. An epicentral map of the earthquakes used in our study is shown in Figure 1. In the further procedure, we used the inverse technique of Gephart and Forsyth (1984) for determining the best fit principle stress directions σ_1 ,σ_2, $\sigma_3$and the ratito R=σ_2-σ_1 / σ_3-σ_1 for 20 km depth intervals in the **HWBZ** and for the **HPSZ** considered as a whole body. The results obtained as well as the misfit of the best stress models are listed in Table 1.

In almost all considered depth layers the maximum compressive stresses σ_1 are normal to the strike of the slab and dip less than 25°, indicating the NW-SE convergence between the pacific and Eurasian lithospheric plates. Exclusions are: the depth layer 81-120 km with almost along strike σ_1 ;161-220 km where σ_1 towards E and is almost horizontal; and **HPSZ**. With down dipping σ_1. The minimum compressive stresses σ_3 are down dipping only at depth 21-60 km. In all reminder depth intervals σ_3 are along the strike of the slab and of different dips.

These results indicate that the slab pull and the mantle resistance acting on the slab edge are not the only forces which control the contemporary plate tectonics in the Hokkaido region. Along strike compression at depths 81-120 km and along strike extension at 0-20 and 61-220 km are involved in the slab dynamics. These can be related to horizontal bending of the subducting Pacific plate.

Referances

Gephart, J. and Forsyth, D., 1984. An improved method for determining the regional stress tensor using earthquake focal mechanism data: application to the San Fernando earthquake sequence. J. Geophys. Res., 89: 9305-9320.

Hanus, V. and Vanek, J.,1984. Earthquake distribution and volcanism in Kamchatka, Kurile islands, and Hokkaido. Part 3: Southern Kuriles and Hokkaido, Studia geoph. Et geod., 28: 248-271.

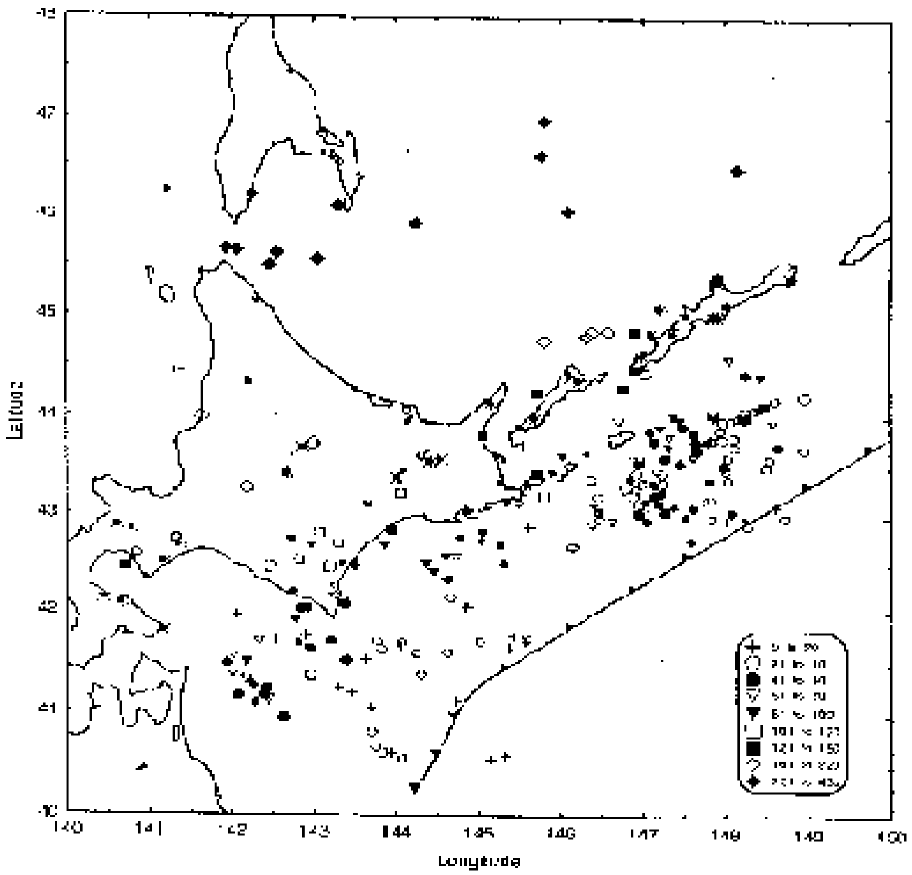

Figure 1. Epicentral map of earthquakes which focal mechanisms were used for determining the stress field parameters in the Hokkaido Wadati-Benioff zone. The symbols used for the considered depth ranges are listed in the legend. The trench is marked by a serrate line, the active andesitic volcanoes by stars.

Table 1. Best fit stress models for the Hokkaido Wadati-Benioff zone. N is the number of earthquake focal mechanisms used; the following three columns show the directions (dip/azimuth) of the principle stresses σ_1, σ_2, σ_3; the next columns include the value of R and the average misfit θ for the best model.

Depth [km]	N	σ_1 dip/azimuth	σ_2 dip/azimuth	σ_3 dip/azimuth	R	θ misfit [°]
0 - 20	25	17/112	58/230	27/13	0.70	9.89
21 - 40	57	22/125	9/32	67/282	0.60	4.95
41 - 60	60	0/135	0/216	90/45	0.50	5.25
61 - 80	25	17/126	23/224	61/3	0.70	5.28
81 - 100	22	67/169	9/281	21/15	0.70	5.54
101 - 120	10	39/[illegible]	6/105	50/7	0.30	4.22
121 - 160	8	20/130	68/281	9/37	0.90	4.0[illegible]
161 - 220	10	5/64	62/180	27/332	0.40	4.16
[illegible]	13	3/25[illegible]	[illegible]/142	30/30	0.40	5.39