

NEOTECTONIC MOVEMENTS RECORD IN THE SPIT DEPOSITS OF THE WESTERN AND CENTRAL POLISH COAST IN THE LIGHT OF GEOLOGICAL AND SEISMIC INVESTIGATIONS

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1. Introduction

Seismic investigations were executed on the western and central Polish coast on the area of Dziwnów, Liwia Łuża Lake, Kopań Lake and Wicko Lake. Seismic reflective research with use of the apparatus CS-5G-1(6 channels) as high-resolution seismic investigations were carried out along the designed profiles, that are situated near to the present-day shore of the Baltic Sea. During the field investigations, seismic reflective waves were recorded in measuring range $R = 100$ ms. This range was useful for the seismic waves, which have penetrated the deeper geological layers even to the top of Pleistocene substrate. In this way the seismic waves rich 80 – 100 m below the terrain level. It should be stated, that the distances between geophones were 10 m, and between profiles 40 m.

During the geophysical research, there was used constant intensification of seismic impulses amounting from 66 – 72 dB. It should be added, that measuring range $R = 100$ ms causes, that seismic waves rich the frequency of 5 kHz. In many places for the verification of the seismic investigations were executed the geological drillings located on the beach and on the area of the spit. The cross-section lines have different length, that are situated perpendicular to the present-day shore line of the Baltic. It should be stated, that the seismic investigations with using this apparatus were carried out many times to study upper part of the Neogene deposits (Kaszubowski, 1989, 1994a,b; Dobracki and Kaszubowski, 2001, 2002; Kaszubowski and Dobracki, 2002, 2004a,b, 2006).

3. Results of the seismic investigations

Surface of the Neogene substrate in the area of the Dziwnów Spit is represented by the lower Jurassic deposits. It should be stated, that according to the geological research (Ruszała, 1978) and geological drill no.1L the surface of Mesozoic deposits is represented in the upper part by fine sands and silts. Deeper layers are build from sandstones and siltstones. Here existing very characteristic seismic records, that have very small amplitudes of seismic waves and no big periods of seismic impulses. In the area of spit of the Liwia Łuża Lake Pleistocene and Holocene deposits lie on the upper Cretaceous sediments as the Neogene substrate. This substrate is represented by limestones and silty marls. According to research of Dobracki (1997) study area is located on the edge of the Trzebiatów syncline and bordering with south-western part of the Kołobrzeg Anticline. As the result of the seismic investigations a surface of the Neogene substrate lie on the topographic levels from 20 – 80 m b.s.l. It is very important, that in this study area was very strictly observed by this method of the Neogene substrate, witch is represented by the Cretaceous deposits. Here, one can observe very large amplitudes of seismic waves and very small periods of seismic impulses. It should be noticed, that the seismic range $R = 100$ ms was not available to rich the Pleistocene substrate, because there is bigger thickness of Pleistocene deposits than the previous areas. But in the area of spit of the Wicko Lake the Pleistocene substrate is represented by Miocene silts and clays.

Pleistocene on the areas of spits of the Dziwnów and Liwia Łuża Lake is represented by glacial tills, interglacial sand and gravels as a fluvial sedimentation or sands and gravels as a fluvio-glacial deposits. On the seismic cross-sections, there were separated glacial tills of the Odranian Glaciations (area of the Liwia Łuża Lake), Vartanian Glaciation, sands and gravels of the Eemian Interglacial, glacial tills of the Vistulian Glaciation, fluvio-glacial sands and gravels of the Vistulian Glaciation. Seismic record of the glacial tills is very characteristic. This record is bi-partite and existing no big amplitudes of seismic waves. In the area of spit of the Kopań Lake, Pleistocene is represented by glacial tills and interglacial sand and gravels or biogenic deposits as a fluvial sedimentation; there are glacial tills of the Vistulian Glaciation (southern part of this seismic cross-section) , sands and gravels of the Eemian Interglacial, glacial tills of the Vartanian Glaciation – upper and lower stadial, sands and gravels of the Lubavian Inerglacial, glacial tills of the Odranian Glaciation – upper and lower stadial, glacial tills of the Sanian Glaciation II. As results of seismic investigations, the geological structure of the Pleistocene is very similar in the area of spit of the Wicko Lake. There are the same glacial levels and interglacial deposits. Generally, in the area of the central Polish coast, as showing of the seismic investigations the Pleistocene deposits are reaching a very big thickness.

On the seismic cross-sections in the analyzed areas, in many cases the Holocene is represented

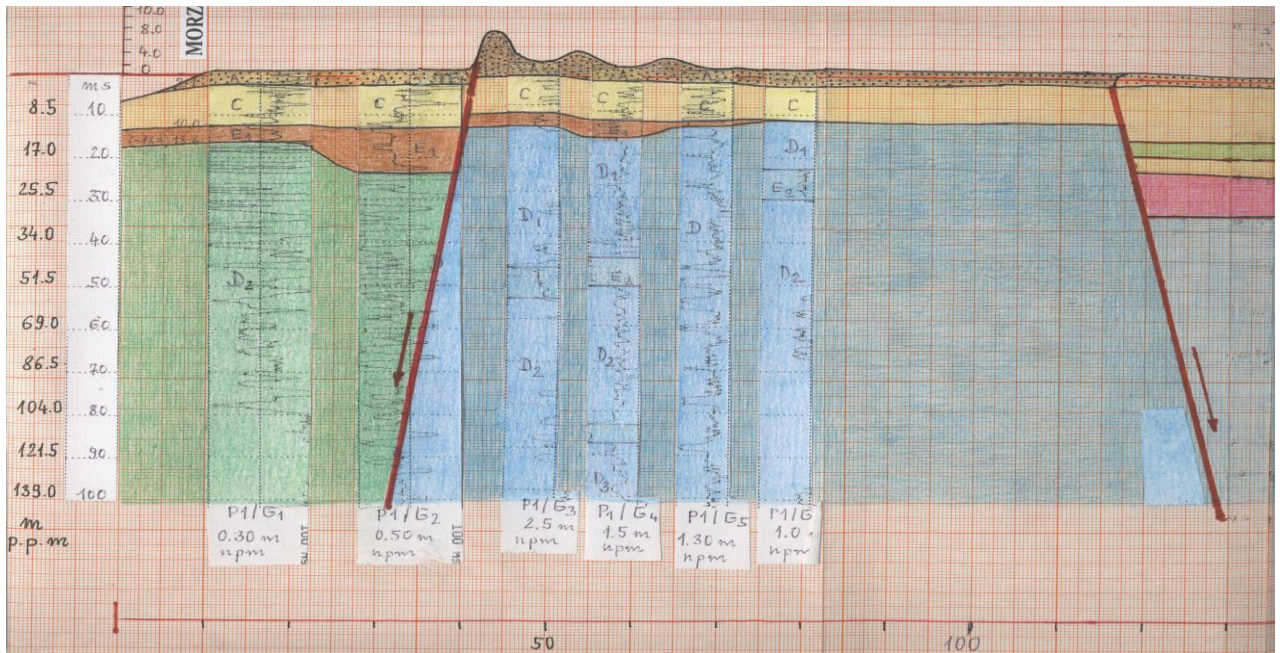


Figure 1. Seismic cross-section across of the Dziwnów Spit near Międzywodzie (part A; Kaszubowski and Dobracki 2006).

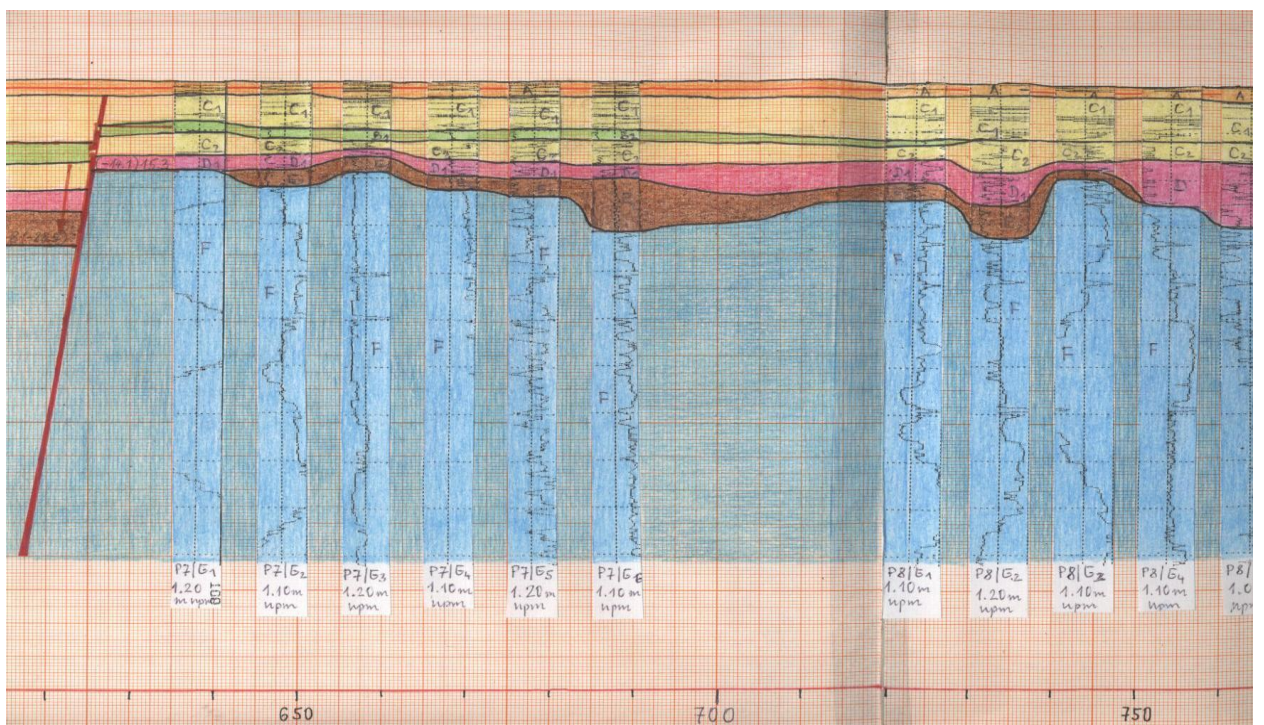


Figure 2. Seismic cross-section across of the Dziwnów Spit near Międzywodzie (part F; Kaszubowski and Dobracki 2006).

by sands and gravels of several transgressions and regressions of the Baltic Sea. There are also existing biogenic deposits. Generally, the Holocene deposits have distinctly smaller amplitudes of seismic waves than the Pleistocene sediments. There are deposits of the Littorina Sea transgressions, Limnaea Sea transgressions and Mya Sea transgressions. In the analyzed spit areas are occurring several dune generations (for example: yellow dunes, light-yellow-gray dunes and gray dunes).

It should be stated, that in the analyzed spit areas of the western and central Polish coast the neotectonic movements were occurring. There are very distinctly evidences for these processes marked in the vertical displacements of young and very young deposits. Very good evidence is existing in the area of the Dziwnów Spit (fig. 1, 2). On this area, there were found 3 neotectonic movements zones (30 m, 130 m and 620 m from the present-day shore of the Baltic; fig. 1,2). But in the area of spit of the Liwia Łuża Lake were found 2 neotectonic faults (150 m, and 1200 m southwards from the present-day shore of the Baltic). In the area of spit of the Kopań Lake the neotectonic faults are existing in the northern part of this spit (30 m and 170 m southwards from the shore-line of the Baltic). Similar situation is occurring on the area of spit of the Wicko Lake, where 2 neotectonic faults were identified also in the northern part of this spit area (20 m and 160 m southwards from the shore-line of the Baltic). Generally, the neotectonic movements in the analyzed areas were occurring periodically (to the end of the Vistulian Glaciation, to the end of the Atlantic Period and to the end of the Sub-Boreal Period). It is very important, that in the area of the beach, there are existing of the contemporary tectonic movements (fig.1) that have influence on the present-day processes of the Baltic coastal zone.

3. References

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