

# NEOTECTONIC STRUCTURES AND THEIR AGE IN THE AREA OF THE WESTERN POLISH COAST

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## 1. Introduction

Seismic and geological investigations were carried out in the area of the western Polish coast in the region of Dziwnów Spit and in the region of Liwia Łuża Lake Spit. 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, which are situated near to the present-day shore of the Baltic Sea. During the field research, 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 bedrock. In this way the seismic waves rich a 80 – 100 m below the terrain level. It should be noticed, that the distances between geophones were 10 m, and between profiles 40 m.

During the field research, there was used constant intensification of seismic impulses amounting from 66 – 72 dB. It should be stated, 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, the geological drillings were executed located on the beach and on the area of the spit. The cross-section lines have different length, which are situated perpendicular to the present-day shore line of the Baltic. It should be noticed, 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; Kaszubowski, 2002; Kaszubowski and Dobracki, 2004).

## 3. Results of the seismic investigations

Surface of the Neogene bedrock 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) fine sands and silts. Deeper layers are build from sandstones and siltstones. Here existing very characteristic seismic records, which have very small amplitudes of seismic waves and no big

periods of seismic impulses (fig.1). In the area of spit of the Liwia Łuża Lake Pleistocene and Holocene deposits lie on the upper Cretaceous sediments as the Neogene bedrock. These deposits are represented by limestones and silty marls. However, the seismic research shows a very characteristic records, which have very large amplitudes of seismic waves and very small periods of seismic impulses. Probably, there are sandstones, which belong to the Jurassic. 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 bedrock lie on the topographic levels from 20 – 80 m b.s.l.

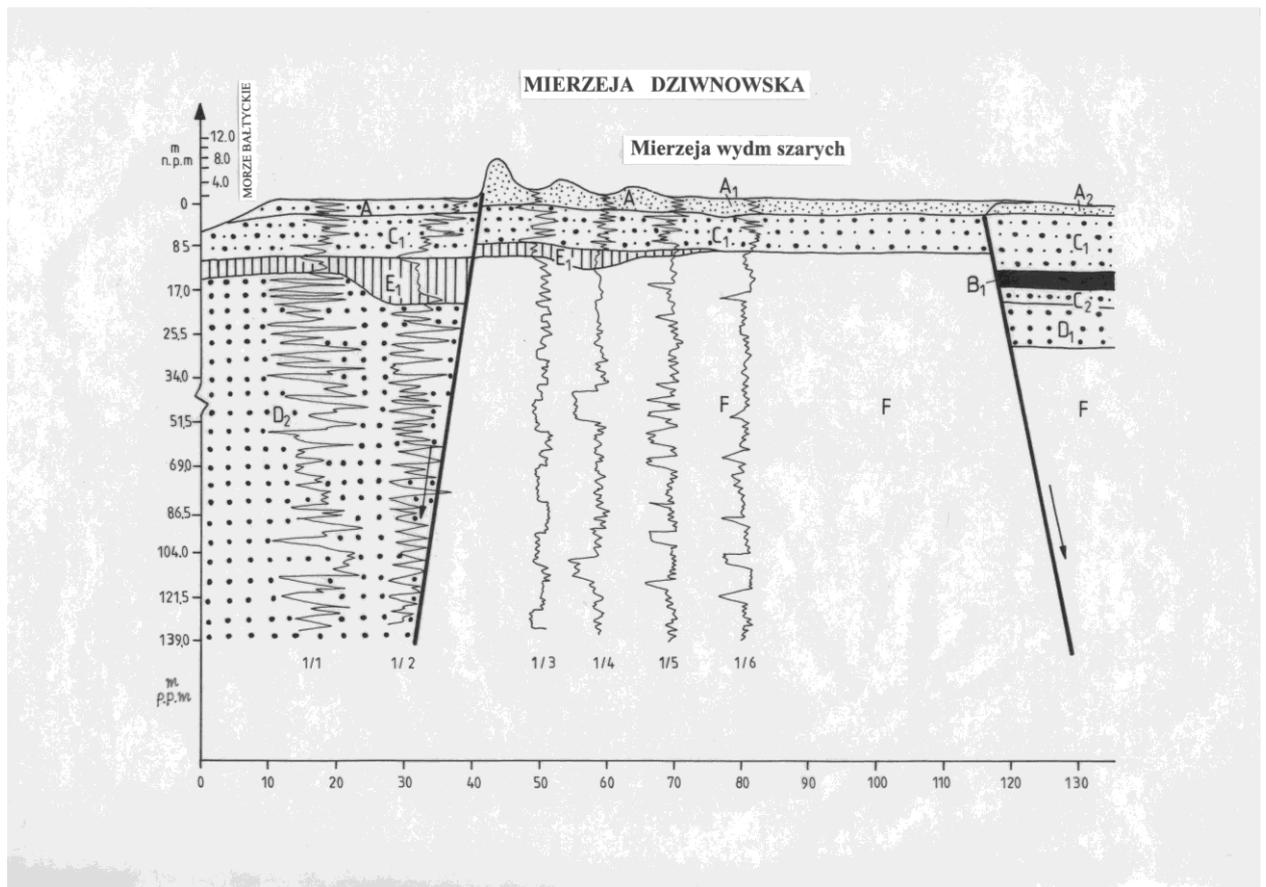


Figure 1. Seismic-geological cross-section through the Dziwnów Spit.

A- beach deposits; A1- spit of gray dunes; A2- spit of light- yellow- gray dunes; B1- middle Holocene organic deposits; C1- gravel and sands of the late Littorina Sea, Limnaea Sea and Mya sea; C2- gravels and sands of the early Littorina Sea; D1- glaci-fluvial gravels and sands of the Vistula Glaciation; E1- glacial tills of the Vistula Glaciation; D2- fluvial gravels and sands of the Eemian Interglacial; F- siltstones of the lower Jurassic ↘ -neo-tectonic faults.

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, fluvioglacial 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. On the seismic cross-sections in the analyzed areas, in many cases the Holocene is represented 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 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. 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. 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). 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 Subatlantic 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.

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