TTZ-South seismic experiment

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The wide-angle reflection and refraction (WARR) TTZ-South transect carried out in 2018 crosses the SW region of Ukraine and the SE region of Poland. The TTZ-South profile targeted the structure of the Earth's crust and upper mantle of the Trans-European Suture Zone, as well as the southwestern segment of the East European Craton (slope of the Ukrainian Shield). The ~550 km long profile (~230 km in Poland and ~320 km in western Ukraine) is an extension of previously realized projects in Poland, TTZ (1993) and CEL03 (2000). The deep seismic sounding study along the TTZ-South profile using TEXAN and DATA-CUBE seismic stations (320 units) made it possible to obtain high-quality seismic records from eleven shot points (six in Ukraine and five in Poland). This paper presents a smooth P-wave velocity model based on first-arrival travel-time inversion using the FAST (First Arrival Seismic Tomography) code.

The obtained image represents a preliminary velocity model which, according to the *P*-wave velocities, consists of a sedimentary layer and the crystalline crust that could comprise upper, middle and lower crustal layers. The Moho interface, approximated by the 7.5 km/s isoline, is located at 45—47 km depth in the central part of the profile, shallowing to 40 and 37 km depth in the northern (Radom-Łysogóry Unit, Poland) and southern (Volyno-Podolian Monocline, Ukraine) segments of the profile, respectively. A peculiar feature of the velocity cross-section is a number of high-velocity bodies distinguished in the depth range of 10—35 km. Such high-velocity bodies were detected previously in the crust of the Radom-Łysogóry Unit. These bodies, inferred at depths of 10—35 km, could be allochthonous fragments of what was originally a single mafic body or separate mafic bodies intruded into the crust during the break-up of Rodinia in the Neoproterozoic, which was accompanied by considerable rifting. The manifestations of such magmatism are known in the NE part of the Volyno-Podolian Monocline, where the Vendian trap formation occurs at the surface.

Key words: WARR studies, seismic modeling, tomography inversion, velocity model.

Introduction. The TTZ-South experiment is the latest in a series of three wide-angle reflection/refraction (WARR) seismic studies situated along a NW-SE oriented line in Central Europe. This paper presents the results of a WARR study on the ~550 km long TTZ-South profile that runs along the southwestern edge of the East European Craton in southeastern Poland and western Ukraine. The previous two WARR profiles along the TTZ were conducted in Poland. The first one (the TTZ profile) was carried out in 1993 [Grad

et al., 1999] and the second (the CEL03 profile) in 2000 [Janik et al., 2005]. The combined profiles TTZ, CEL03 and TTZ-South form a 1025 km-long lithospheric transect between the Baltic Sea and Moldova. It runs parallel to the southwestern edge of the East European Craton (EEC). Due to the nature of the wide-angle reflection/refraction method, the density of rays and, as a consequence, the amount of information beneath the peripheral parts of the profile (approximately 100 km at each end) is significantly reduced. Thus, the structure of the lithosphere near the ends of the profile is relatively poorly determined. To improve the ray coverage in SW Poland, an overlap of the two profiles, CEL03 and TTZ-South, of approximately 200 km was arranged. The main purpose of these WARR studies was to determine the Earth's crustal and upper mantle structure along the Teisseyre-Tornquist (TTZ) zone in southeastern Poland and western Ukraine (Fig. 1).

Studies of the tectonic structure in the area of the junction of the EEC with the accreted terranes of the West European Platform of mainly Palaeozoic age are extremely important for understanding the geodynamic processes that have formed the structure of the lithosphere in this region. At this stage, the seismic records were pre-processed, and the travel times of the first arrivals were picked and inverted for a smooth velocity model with the FAST (First Arrival Seismic Tomography) code [Zelt, Barton, 1998] using a tomographic solution of the seismic inverse problem.

Tectonic setting of the study area. The TTZ is the fundamental tectonic boundary in Europe, and was first traced by the Polish geologist Wawrzyniec Teisseyre and the German geologist and palaeontologist Alexander Tornquist at the beginning of the 20-th century, based on the differences in the sedimentary cover and in the magnetic anomalies of the East European Platform (EEP) and the West European Platform [Teisseyre, 1893, 1903; Tornquist, 1908, 1910]. In their honor, this line was named the Teisseyre-Tornquist Line (TTL) (see review of [Grad, 2019]). A tectonic background map of the area of the TTL is shown in Fig. 2.

The crystalline crust of the EEP is composed of highly deformed and metamorphosed Precambrian rocks cut by numerous igneous intrusions. In contrast, the consolidated crust, characteristic of the so called Palaeozoic platforms, is built of rocks that have been involved in orogenic tectonics but not necessarily metamorphosed and bearing just occasional igneous intrusions [Berthelsen, 1993, Pharaoph, 1996; Dadlez et al., 2005].

The Trans-European Suture Zone (TESZ) is considered to be a broad swath of deformation (100—200 km wide) that extends across Europe from the British Isles to the Black Sea [Pharaoh, 1996; Pharaoh et al., 2006; Narkiewicz et al., 2015; Grad, 2019; Narkiewicz, Petecki, 2019] (see Fig. 2). The TESZ includes a strip of crustal domains, which separate the ancient cratonic area with Precambrian basement from the Variscan, Cimmerian and Alpine fold zones [Berthelsen, 1993, Pharaoph, 1996; Winchester et al., 2002; Dadlez et al., 2005].

The SW margin of the EEC crust was affected by tectonic and magmatic (re-)activation as a result of extension and rifting during the Neoproterozoic break-up of the Rodinia supercontinent (e. g. [Powell et al., 1993; Sliaupa et al., 2006; Pease et al., 2008]). This event formed the oceanic domain between Baltica and Amazonia, which subsequently closed during Palaeozoic accretionary and orogenic events. The formation of the Baltica margin was accompanied by notable magmatism of the Volyn Series. In the late Riphean—Early Vendian, during the break-up of the Rodinia supercontinent, the rifted margin of the EEC and an extensive system of aulacogens was formed, including the Volhynia-Orsha aulacogen. It forms a zone of structural heterogeneity at the border of Sarmatia and Fennoscandia. This suture between the Palaeoproterozoic crust of Fennoscandia and mainly Archaean crust of Sarmatia is considered by [Gorbatschev, Bogdanova 1993; Bogdanova et al., 2001] as a key boundary within the EEC.

The TTZ-South profile targeted the structure and evolution of the collage of major tectonic units in the TESZ, as well as the southwestern segment of the EEC (see Fig. 2).

The transect follows a complex crustal transition zone that separates the Archaean-Palaeoproterozoic lithosphere of the EEC from lithospheric domains accreted to it prior to late Carboniferous times (Caledonian and Variscan orogenies), and overprinted by the Alpine-Carpathian orogeny.

The TTZ-South profile trends NW-SE on the territory of Poland and Ukraine. In Poland it crosses the Radom-Kraśnik Zone and the Narol Unit, both adjacent to the Łysogóry and Małopolska blocks, whose inverted portions, uplifted in the southeastern part of the Mid-Polish Swell, compose the Holy Cross Mountains. In Ukraine the TTZ-South profile passes through the Lviv Trough and Volyno-Podolian Monocline of the SW margin of the EEC. The thick (up to 15 km) sedimentary cover of the Radom-Kraśnik Zone is composed of sediments from Ediacaran to Carboniferous that, together with the southwestern part of the Lublin Trough, form a Variscan, late Carboniferous NE-vergent fold-and-thrust belt.

Data acquisition. The TTZ-South field experiment was carried out in September 2018, and included programming and deployment of seismic recording stations along the profile and drilling and shooting operations. The total length of the TTZ-South profile is approximately 550 km. The north-western part (~230 km) was located in the territory of Poland, and the southeastern part was laid out in
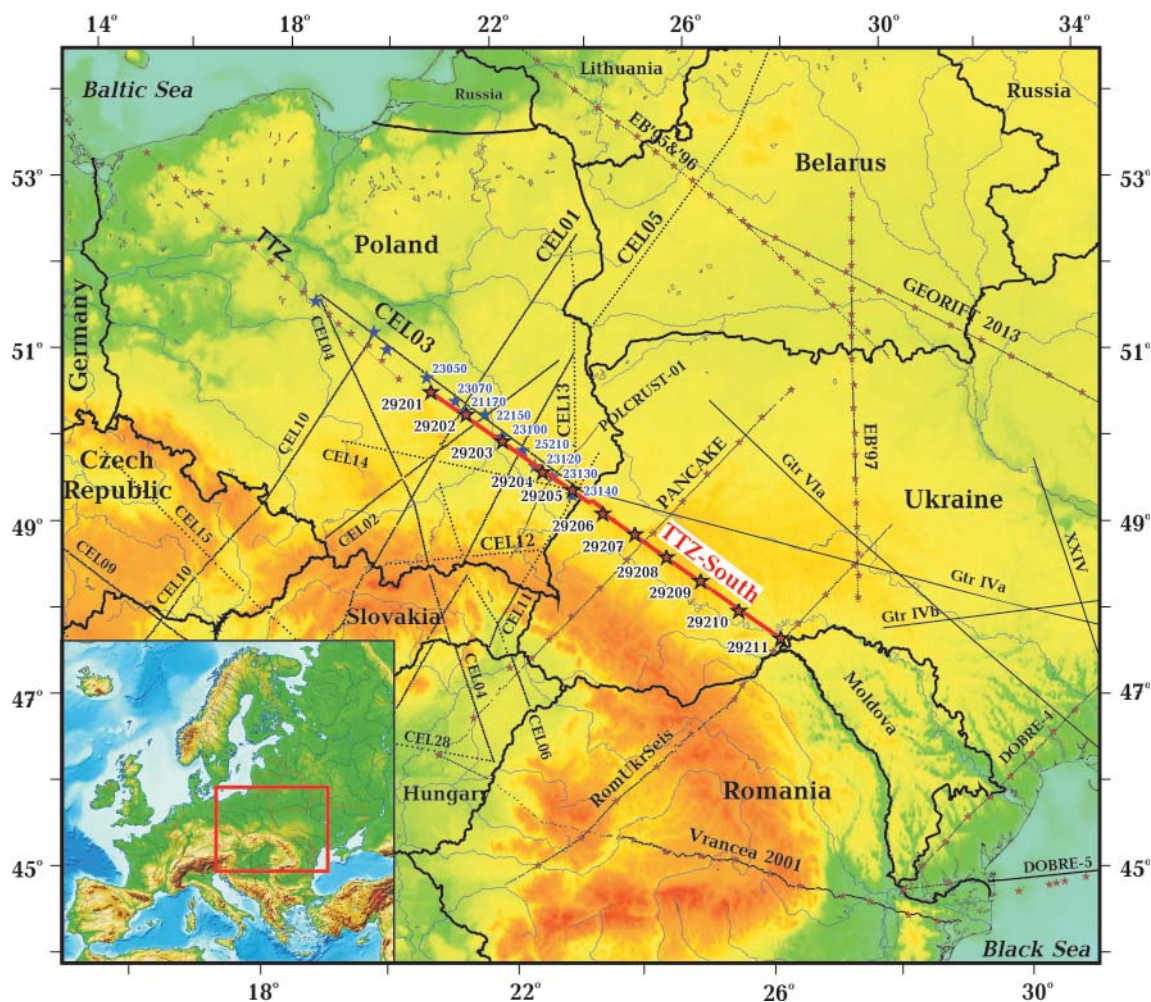

Fig. 1. Location of the TTZ-South profile (stars represent shot points and closely spaced red dots represent recording stations), CEL03 profile (blue stars represent shot points, black dots represent recording stations) and other previous WARR (dotted lines) and deep reflection (solid black lines) seismic profiles in the study area.
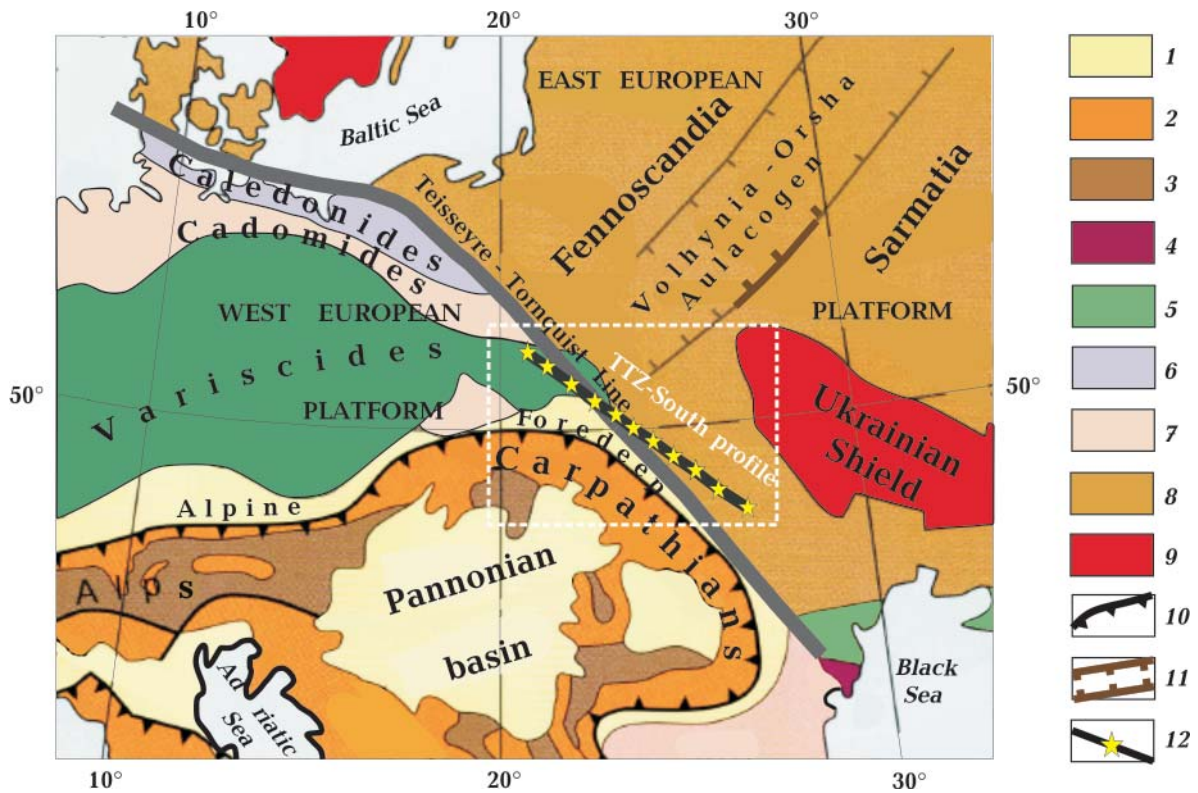
Fig. 2. TTZ-South profile location on tectonic map, simplified after Geological Atlas of Poland (2017): *1* — Alpine foredeep and intramontane basins, *2* — Alpine fold belt, *3* — Variscan and older massifs within Alpine belt, *4* — Cimmerian fold belt, *5* — Variscan fold belt, mostly under Permian to Cenozoic cover, *6* — Caledonian fold belt, under Devonian to Cenozoic cover, *7* — Cadomian basement, under Palaeozoic to Cenozoic cover, *8* — Archaean and Proterozoic crystalline basement under Vendian/Ediacaran to Cenozoic cover, *9* — exposed Archaean and Proterozoic basement, *10* — Alpine thrust front, *11* — Neoproterozoic continental rift (aulacogen), *12* — TTZ-South profile with shot points.

T a b l e . Locations and parameters of explosive sources used along the TTZ-South profile

Shot Point number	Distance, km	Latitude, °N	Longitude, °E	Altitude, m	Time UTC, yr:day:hr:m:s	Charge size, kg	Borehole depth, m	Number of boreholes
SP29201	0.0	51.42682	20.76500	180	2018:253:21:31:54.35	1000	30	20
SP29202	53.086	51.16452	21.40077	208	2018:253:22:28:22.50	800	30	16
SP29203	110.269	50.85157	22.04810	229	2018:255:22:27:55.07	700	30	14
SP29204	174.186	50.48555	22.74625	199	2018:254:22:31:10.79	600	30	12
SP29205	218.508	50.26772	23.27013	266	2018:255:23:01:08.45	600	30	12
SP29206	266.532	49.99233	23.78797	338	2018:253:21:00:35.55	400	30	8
SP29207	315.134	49.73712	24.33733	263	2018:254:21:00:17.89	500	30	10
SP29208	364.615	49.45562	24.86747	349	2018:253:21:59:55.58	500	30	10
SP29209	417.522	49.15783	25.43483	300	2018:254:21:59:51.67	500	30	10
SP29210	478.827	48.78647	26.05512	251	2018:253:23:00:34.37	600	30	12
SP29211	542.448	48.43600	26.73787	172	2018:253:23:29:59.71	700	30	14

Ukraine (~320 km). The project was designed to extend the line of former seismic profiles, carried out in northern Poland in 1993 (TTZ profile [Grad et al., 1999]) and 2000 (CEL03 profile [Janik et al., 2005]), to study the EEC boundary within the TTZ. Eleven shot points

were executed with five in Poland and six in Ukraine. The largest explosions with a charge of up to 1000 kg were made near the ends of the profile. Charges of less capacity (up to 400 kg) were used in the central part of the profile. Each shot point consisted of a group of wells drilled up to ~30 m depth, each with a charge of 50 kg. Seismic recorders with GPS receivers were used to record the time of the explosions; also additional seismic recording stations were placed close to the shot points as backup timing devices. Detailed information on the locations and origin times of all the shots and other necessary parameters are given in Table.

The observation system on the TTZ-South profile consisted of 320 mobile single-component seismic stations (110 Reftek-125 TEXAN and 210 DATA-CUBE) with 4.5 Hz geophones. Seismic signals were recorded at a sampling rate of 100 Hz. The stations were located along the profile at a distance of ~1.65 km from each other in Poland and ~1.9 km in Ukraine. Unfortunately, not all recorders in the Ukrainian part of the profile operated properly, which led to several gaps in the common shot gathers.

Seismic wave field. As a result of the performed seismic field experiment, seismograms of good quality were obtained. The observed wave field shows all the useful seismic phases that are necessary for the construction of a velocity model of the crust and uppermost mantle and its interpretation. Some examples of seismic record sections are shown in Fig. 3. They are constructed for the near-marginal shot points (SP29202 and SP29210) and contain useful phases throughout the entire length of the profile. The wave field contains the arrivals of the P-wave refracted phases, namely P_{sed} in the sedimentary cover, P_g and P_{ov} in the basement and deeper layers of the crust and P_n, the refraction at the Moho. The first P-wave arrivals are formed by refracted waves from the upper sedimentary layer (P_{sed}) at offsets of 0—10 km in both directions from the shot points, followed by P_g phases from the upper/middle crust up to 200—220 km distance and refractions from the upper mantle (P_n) recorded at distances up to 300—450 km. All these seismic phases were picked and used in the seismic inversion procedure. Reflected P-wave phases in the
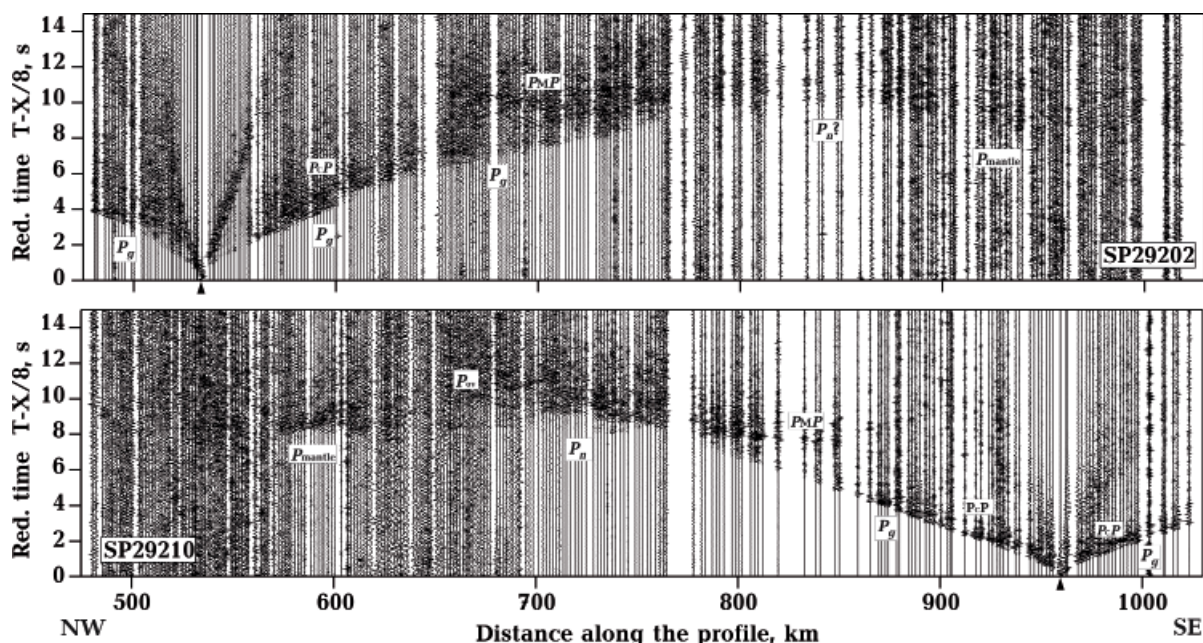

Fig. 3. Trace-normalized, vertical-component P-wave seismic record sections for shot points SP29202 and SP29210. The reduction velocity is 8.0 km/s: P_g — refractions from the upper and middle crystalline crust; P_{ov} — overcritical crustal phases; P_cP — reflections from mid-crustal discontinuities, P_mP — P-waves reflected from the Moho boundary; P_n — refractions from the uppermost mantle, immediately below the Moho; P_{mantle} — P-wave phases from the upper mantle. For location see Fig. 1.

crust are also present and easily identified, but the tomographic code used is based on first-arrival data only. Therefore, at this stage of the interpretation the reflected phases were not used. These reflected phases include P_cP from boundaries in the crust, P_MP from the Moho and P_{mantle} from boundaries within the mantle.

The travel-time curves of the refracted phases mentioned above provide the basis for determining the smoothed velocity distribution (model) of the crust and upper mantle.

Seismic modeling. At this stage, the program FAST [Zelt, Barton 1998] was used for the tomographic inversion of the first arrivals to obtain the velocity distribution in the crust and uppermost mantle. The objective of the tomographic inversion is to reconstruct the velocity properties of the medium which was penetrated by the seismic waves. Such studies are based on the travel times of the first arrivals for a set of source-receiver pairs. Any geometry of sources and receivers can be considered.

The system of observed travel-time curves from the refracted waves in the upper and middle crust (P_g) and upper mantle immediately under the Moho boundary (P_n) is presented in the middle panel of Fig. 4. In addition to the eleven shot points of the TTZ-South experiment, the P_g and P_n travel times recorded from nine of the shot points of the CEL03 experiment were used. The positions of the shot points for both experiments are shown in Fig. 1 and they are marked with violet triangles for CEL03 and black triangles for the TTZ-South profile in Figs. 4 and 5. Velocity parameterization along the cross-section was made on a continuous rectangular grid of 401×41 points with a cell size of 1.5×1.5 km. The size of the resulting model was 600×60 km. Such a model parameterization does not allow for the existence of velocity discontinuities representing geological boundaries or fault zones. The FAST code, limited to the analysis of the first arrivals of refracted waves only, represents velocity boundaries in the resulting model by zones of increased velocity gradients. Consequently, the resulting velocity model is limited only to

solutions with low wave number. Nevertheless, the model found by the seismic tomography method shows good convergence of the residuals to a minimum (Fig. 4, upper panel). The statistical parameters for the resulting velocity model include a total number of 2560 rays, a root mean square travel-time residual of 88 ms and a normalized chi-squared (χ^2) value of 1.1914.

The tomographic inversion algorithm uses a uniform velocity grid and smoothing, without velocity discontinuities at layer boundaries. The boundaries in the model with the largest velocity contrasts are the sediment-basement and Moho interfaces. The *P*-wave velocity changes from approximately 5 to 6 km/s at the bottom of the sedimentary layer. Therefore, the velocity isoline of 5.5 km/s may be considered as representing the behavior and geometry of the top of the basement. Similarly, the P-wave velocity often increases from approximately 7 to 8 km/s at the crust-mantle transition. In this case, the approximate depth of the Moho boundary can be represented by the 7.5 km/s isoline. In the lower panel of Fig. 4, the contours 5.5 km/s and 7.5 km/s, which correspond to the assumed positions of the top of the basement and the base of the crust, are shown as black solid lines.

Velocity model. The boundary between the two segments — Polish and Ukrainian — is located at ~700 km distance along the profile (SP 29205) and coincides approximately with the national border between Poland and Ukraine (see Figs. 1, 5). The crustal structure of the Polish part of the profile is well studied by six WARR profiles acquired during the CELEBRATION 2000 project, which cross the TTZ-South profile at several places — CEL01, CEL02, CEL05, and three profiles — CEL11, CEL13 and CEL14 just along the border between Poland and Ukraine [Grad et al., 2006; Guterch, Grad, 2006; Janik et al., 2011]. The TTZ-South profile lies on the SW continuation of the CEL03 profile which, in turn, lies on the prolongation of the TTZ profile [Janik et al., 2005; Janik et al., 2009]. The Ukrainian segment of the TTZ-South profile is crossed by the PANCAKE profile in the Lviv Trough near SP29207 [Starostenko et al., 2013] and by
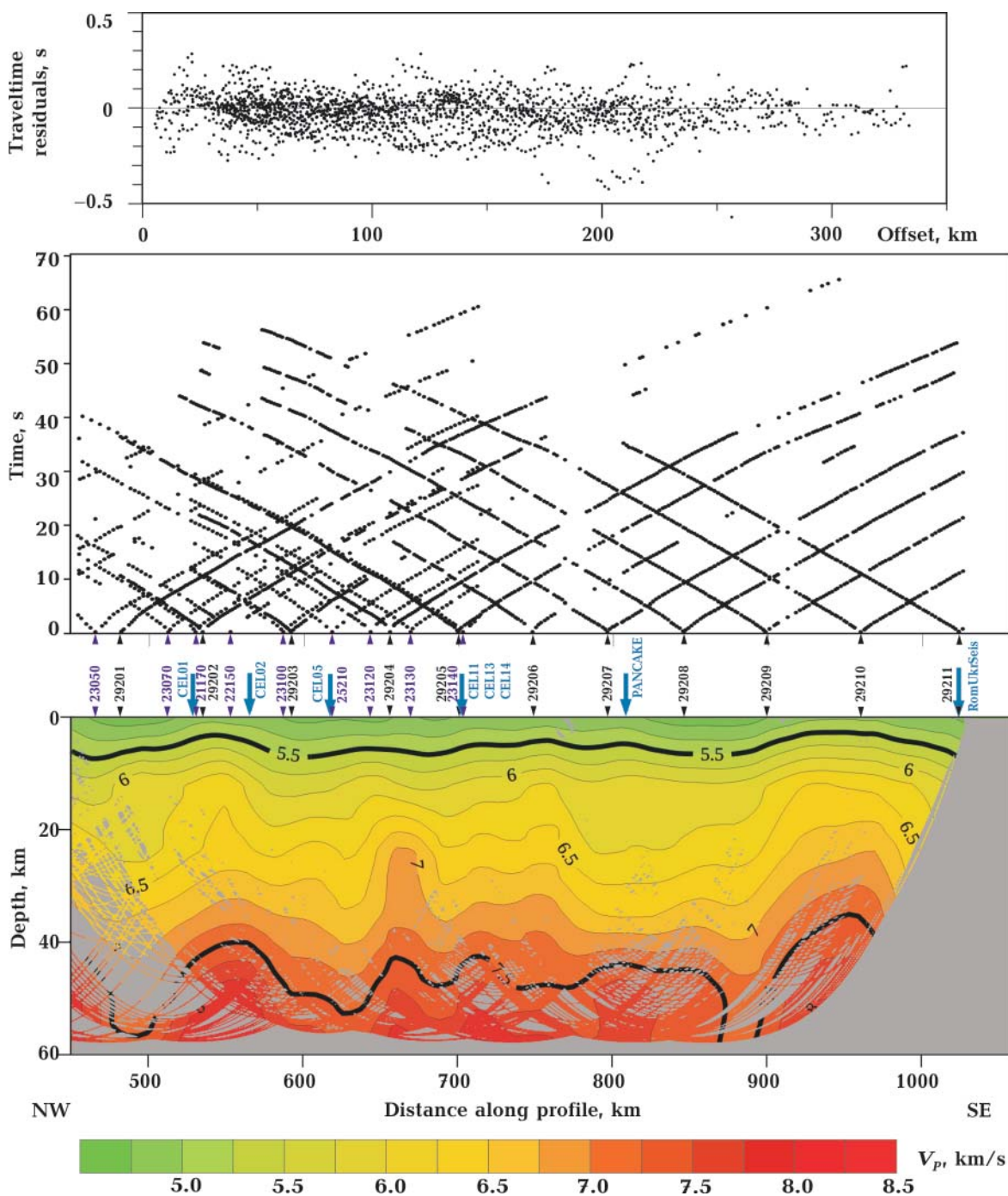
Fig. 4. Residuals between observed and calculated travel times (upper panel), observed travel times (middle panel) and *P*-wave velocity model, masked by calculated raypaths, obtained from tomographic inversion of the first arrivals (P_g and P_n phases) using the FAST package (lower panel). The 5.5 km/s and 7.5 km/s velocity isolines are considered to approximately represent the location of the sediment-basement boundary and Moho discontinuity in a model with smooth velocity distribution, respectively. Black triangles mark the shot points on the TTZ-South profile, violet triangles mark the shot points on the CEL03 profile, and blue arrows mark the intersection points between seismic profiles.

the RomUkrSeis profile at the southernmost end of the TTZ-South profile on the Volyno-Podolian Monocline.

Fig. 5 shows a first representation of the crustal structure along the TTZ-South profile as derived from the seismic tomography im-
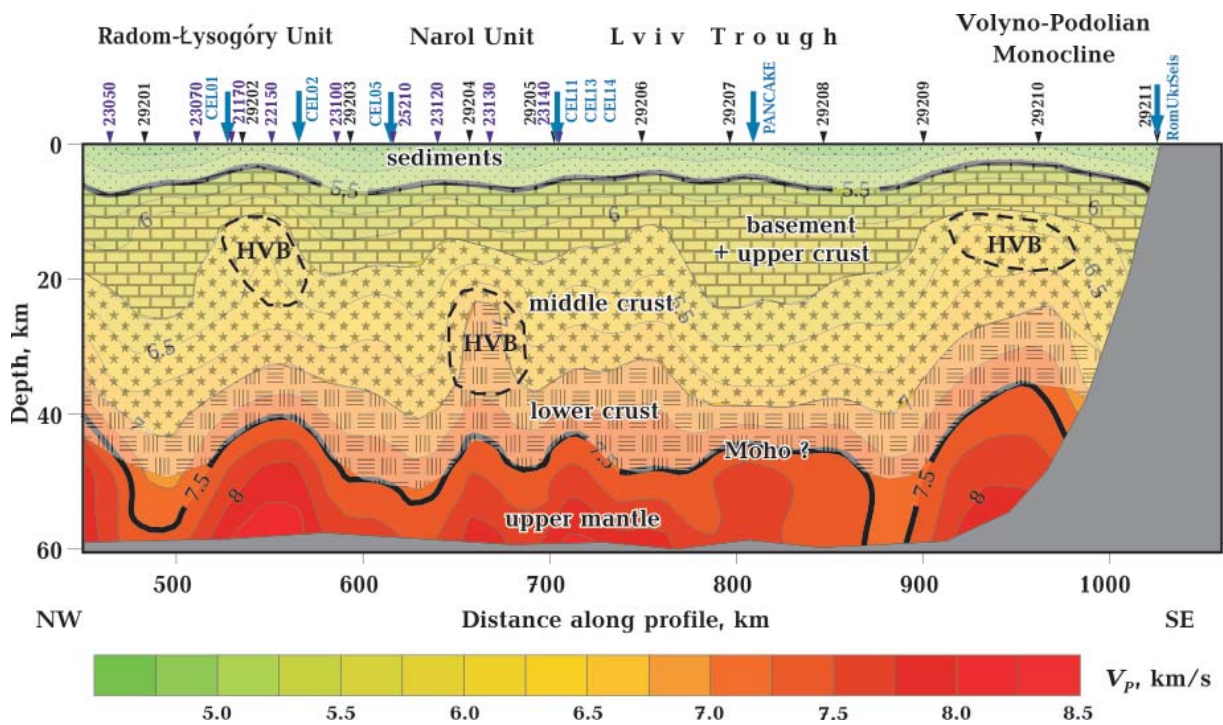
Fig. 5. Preliminary interpretation model of the crustal structure along the TTZ-South profile based on the tomographic image in Fig. 4. HVB — high-velocity body in the crust. Other symbols as in Fig. 4.

age. Along the profile, the thickness of the sediments with V_P up to 5.5 km/s varies from ~2—3 km on the Volyno-Podolian Monocline (Domain) to 6—8 km in the Lviv Trough and Narol Unit of the Polish Swell. The topography of the Moho interface, interpreted as the 7.5 km/s velocity isoline, shows short- and long-wavelength undulations along most of the profile. The Moho depth is estimated to be 45—47 km in the central part of the profile, shallowing to 40 and 37 km depth in the northern (Radom-Łysogóry Unit) and southern (Volyno-Podolian Monocline) segments of the profile, respectively.

Though the modeling approach (tomographic inversion) gives no seismic boundaries between layers, we assume that it is possible to distinguish the layers in the crystalline crust preliminarily, according to the modelled velocity values (see Fig. 5). The upper part of the velocity model, between isolines V_P=5.5 km/s and 6.2 km/s, belongs, most probably, to the basement (Ediacaran and Early Palaeozoic) and upper crust rising to ~10 km beneath the southern Radom-Łysogóry Unit and Volyno-

Podolian Monocline and deepening to 18 km depth under the Narol Unit. Its greatest depths (22—23 km) are inferred beneath the Lviv Trough and below the Radom-Łysogóry Unit at the northern end of the profile.

The velocity interval between V_P=6.25 km/s and 7.0 km/s (or 6.75 km/s) is assumed to represent the middle crust of ~20 km thickness, and which occurs at shallow depths below the Narol Unit and Volyno-Podolian Domain. It is underlain by the lower crust, defined by the velocity isolines 7.0 km/s and 7.5 km/s, of ~10—15 km thickness. Its shallowest position (~24 km depth) is found beneath the Volyno-Podolian Domain, where it mimics the uplift of the Moho (see Fig. 5).

A characteristic feature of the seismic tomography velocity image is the three local uprisings of velocity isolines, shown in Fig. 5 as high-velocity bodies (HVB). The first occurs at the top of the middle crust below the Radom-Łysogóry Unit, at 530—550 km distance and 10—15 km depth. The second is the local shallowing of the lower crust below the Narol Unit to 23 km depth at 660—680 km

distance. Finally, the third is the shallowing of the middle crust to 12—20 km depth below the Volyno-Podolian Monocline, at 900—970 km distance. These could be indicative of high-velocity bodies (HVB) in the crust, inferred in the depth range of 10—35 km. Such HVBs were detected with certainty in the crust of the Radom-Łysogóry Unit on profiles CEL01 and CEL02 [Malinowski et al., 2005; Środa et al., 2006]. HVBs inferred at depths of 10—35 km could be allochthonous fragments of what was originally a single mafic body or separate mafic bodies intruded into the crust during the break-up of Rodinia in the Neoproterozoic, which was accompanied by considerable rifting. The manifestations of such magmatism are known in the NE part of the Volyno-Podolian Monocline, where the Vendian trap formation occurs at the surface [Usenko, 2010; Gordienko et al., 2011].

Conclusions. During the wide-angle reflection and refraction study of the lithospheric structure along the TTZ-South profile, high-quality seismic records from eleven shot points (six in Ukraine and five in Poland) have been obtained. These data were processed by analyzing the seismic waves and the first arrivals were used in a tomographic interpretation by applying the FAST code inversion procedure.

The resulting tomographic image represents a smoothed preliminary model for the lithospheric structure of the transition zone between the East European Craton and Palaeozoic Western Europe in the territory of Ukraine and Poland. According to the velocity distribution, this model is inferred to consist of a sedimentary layer and the crystalline crust comprising upper, middle and lower crustal layers. The Moho depth is inferred at 45—47 km in the central part of the profile, shallowing to 40 and 37 km depth in the northern (Radom-Łysogóry Unit) and southern (Volyno-Podolian Monocline) segments of the profile, respectively. A peculiar feature of the velocity cross-section is a number of high-velocity bodies distinguished in the depth range of 10—35 km.

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Сейсмічний експеримент TTZ-South

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Сейсмічний профіль TTZ-South з використанням заломлених і відбитих у закритичній зоні заломлених хвиль, відпрацьований у 2018 р., перетинає південно-західний район України і південно-східний регіон Польщі. Профіль TTZ-South був спрямований на вивчення структури земної кори і верхньої мантії Транс'європейської шовної зони (ТЄШЗ) і південно-західного сегмента Східно-Європейського кратона (схила Українського щита). Профіль довжиною ~550 км (~230 км в Польщі і ~320 км на заході України) є продовженням раніше реалізованих проєктів у Польщі — профілю TTZ (1993 р.) і CEL03 (2000 р). Глибинне сейсмічне зондування за профілем TTZ-South, виконане з використанням 320 сейсмічних станцій TEXAN і DATA-CUBE, дало змогу отримати сейсмічні записи високої якості з одинадцяти пунктів вибуху (шість в Україні і п'ять у Польщі). У даній статті представлена спрощена *P*-швидкісна модель, що базується на інверсії часів пробігу перших вступів *P*-хвиль, побудована з використанням програми сейсмічної томографії перших вступів FAST.

Отримане зображення являє собою попередню швидкісну модель, яка складається з осадового шару і кристалічної кори, що включає верхній, середній і нижній її шари. Поверхня Мохо, що апроксимується ізолінією 7,5 км/с, розташована на глибині 45—47 км у центральній частині профілю, здіймається до 40 і 37 км у північній (Радом-Лисогорський блок у Польщі) і південній (Волино-Подільська монокліналь в Україні) частинах профілю відповідно. Особливістю швидкісного розрізу є ряд високошвидкісних тіл, виявлених у діапазоні глибин 10—35 км. Подібні високошвидкісні тіла раніше були виявлені в корі Радом-Лисогірського блоку. Тіла, виявлені на глибині 10—35 км, можуть бути алохтонними фрагментами спочатку єдиного масиву основних порід або окремими тілами основного складу, що впровадилися в кору в неопротерозої під час розколу суперконтінета Родінія, який супроводжувався потужним рифтогенезом. Прояви рифтогенного магматизму відомі в північно-східній частині Волино-Подільської монокліналі, де на поверхню виходять вендські трапи.

Ключові слова: ГСЗ, сейсмічне моделювання, томографічна інверсія, швидкісна модель.

Сейсмический эксперимент TTZ-South

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Сейсмический профиль TTZ-South с использованием преломленных и отраженных в закритической области преломленных волн, отработанный в 2018 г., пересекает юго-западный район Украины и юго-восточный регион Польши. Профиль TTZ-South был направлен на изучение структуры земной коры и верхней мантии Трансъевропейской шовной зоны (ТЕШЗ) и юго-западного сегмента Восточно-Европейского кратона (склона Украинского щита). Профиль длиной ~550 км (~230 км в Польше и ~320 км на западе Украины) является продолжением ранее реализованных проектов в Польше — профиля TTZ (1993 г.) и CEL03 (2000 г.). Глубинное сейсмическое зондирование по профилю TTZ-South, выполненное с использованием 320 сейсмических станций TEXAN и DATA-CUBE, позволило получить сейсмические записи высокого качества из одиннадцати пунктов взрыва (шесть в Украине и пять в Польше). В данной статье представлена упрощенная P-скоростная модель, основанная на инверсии времен пробега первых вступлений P-волн, построенная с использованием программы сейсмической томографии первых вступлений FAST.

Полученное изображение представляет собой предварительную скоростную модель, которая состоит из осадочного слоя и кристаллической коры, включающей верхний, средний и нижний ее слои. Поверхность Мохо, аппроксимируемая изолинией 7,5 км/с, расположена на глубине 45—47 км в центральной части профиля, воздымаясь до 40 и 37 км в северной (Радом-Лысогорский блок в Польше) и южной (Волыно-Подольская моноклиналь в Украине) частях профиля соответственно. Особенностью скоростного разреза является ряд высокоскоростных тел, выявленных в диапазоне глубин 10—35 км. Аналогичные высокоскоростные тела ранее были обнаружены в коре Радом-Лысогорского блока. Тела, обнаруженные на глубине 10—35 км, могут быть аллохтонными фрагментами изначально единого массива основных пород или отдельными телами основного состава, внедрившимися в кору в неопротерозое во время раскола суперконтинета Родиния, который сопровождался мощным рифтогенезом. Проявления рифтогенного магматизма известны в северо-восточной части Волыно-Подольской моноклинали, где на поверхность выходят вендские трапы.

Ключевые слова: ГСЗ, сейсмическое моделирование, томографическая инверсия, скоростная модель.