

Data from the TTZ-South seismic experiment

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Abstract

Raw, SEGY and other supplementary data are presented from the seismic refraction / wide-angle reflection profile, TTZ-South, in Poland and Ukraine. The purpose of this 550 km long seismic profile was to reveal the lithospheric structure along the Teisseyre-Tornquist Zone (TTZ), a major geophysical boundary in Europe.

Coordinates: 20°45'E/51°25'N and 26°44'E/48°26'N

Keywords: Seismic refraction/ wide-angle reflection, lithospheric structure, Teisseyre-Tornquist Zone

1. Introduction

The Teisseyre-Tornquist Zone (TTZ) is a major geophysical boundary in Europe separating the East European Craton and the Palaeozoic Platform of western Europe. The 550 km long seismic refraction / wide-angle reflection experiment, TTZ-South, was carried out in southeastern Poland and western Ukraine with the purpose of illuminating the lithospheric structure along the TTZ. To date, the results from the seismic experiment have been presented in Janik et al. (2020, 2022).

2. Data Acquisition – Experiment, schedule, acquisition parameters

The field experiment for the TTZ-South seismic profile lasted from 8th to 15th September 2018. The 11 shots were fired in the late evening of the 10th, 11th and 12th of September 2018. Data were recorded continuously at 100 samples/s by a total of 320 seismic instruments with 4.5 Hz geophones. Of the 320 seismic instruments, 150 were DSS CUBE recorders from the Geophysical Instrument Pool of the GFZ German Research Centre for Geosciences in Potsdam (GIPP). One of these 150 instruments was stolen and thus there are data for 149 instruments in the raw directory of this distribution. Unfortunately, about 60 of the 150 instruments provided no useful data, mainly due to GPS problems. Thus, only 90 of the instruments provided useful data. For these 90 instruments, station coordinates were determined and segy shot gathers were produced. A map showing the location of the TTZ-South seismic profile is presented (Fig. 1).

3. Data Processing

The GIPPtools programs `cube2meed` and `mseed2seggy` were used to convert the data from the raw cube format to segy format (Lendl, 2021). Program calls are given in the README file in the info directory of this distribution. Segy files begin 30 s before the shot time and end 210 s after the shot time. Coordinate units are in degrees, minutes, seconds. DC removal and the sign of the offset (positive or negative) was carried out in Promax. Station longitudes and latitudes were obtained using the GIPPtools program `cubeinfo` and a self-written program `prog1_new.f` (included in the info directory). Station heights were obtained from the srtm (Shuttle Radar Topography Mission) database using a self-written program `prog2.f` (included in the info directory).

4. Data Description

The contents of this data archive are given in Table 1. The raw directory contains the raw data in DSS CUBE format. The info directory contains various files including the meta data for the experiment. The segy directory contains the 11 final segy shot gathers. The header values which have been set in the segy files are listed in Table 2.

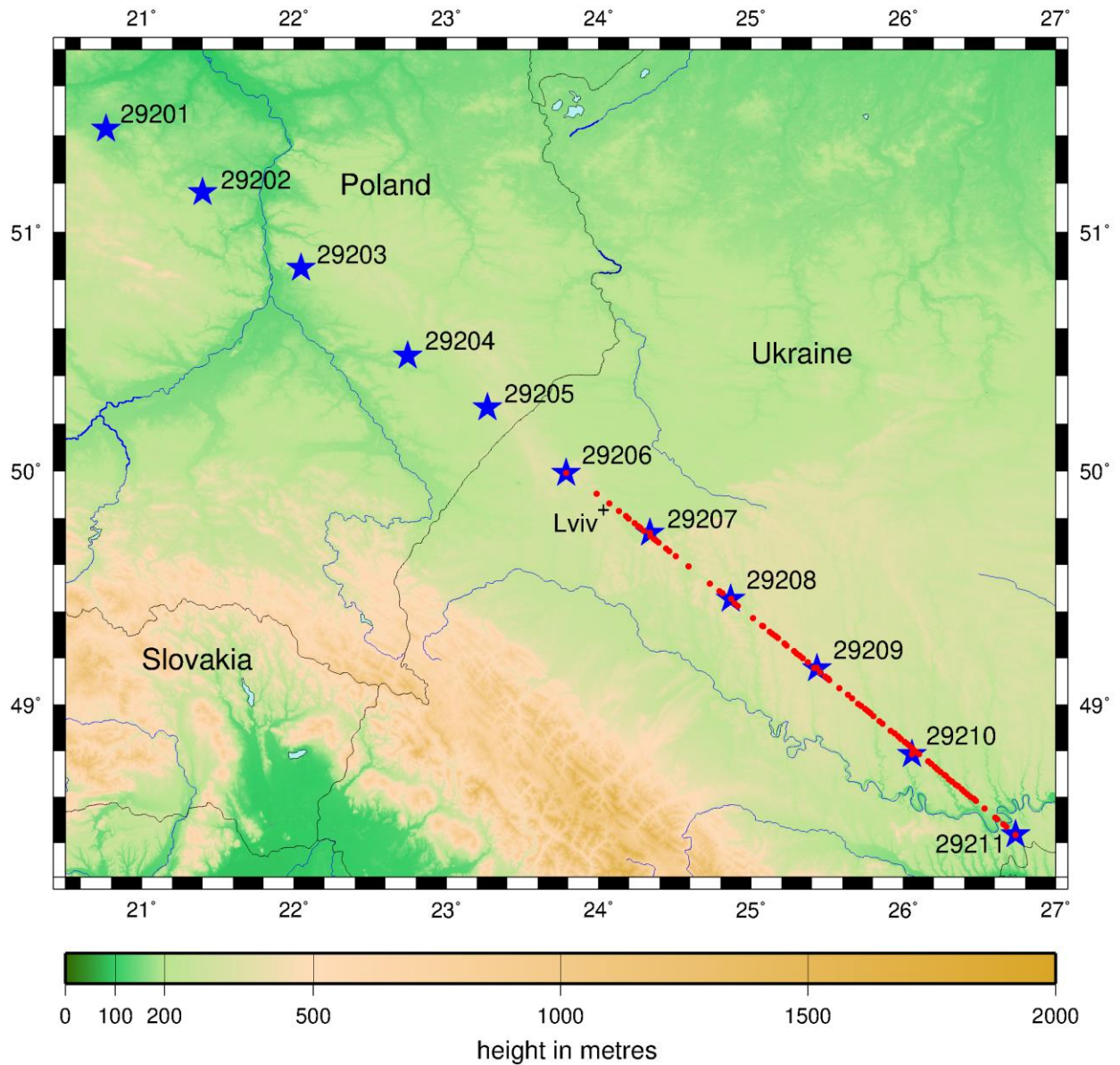


Figure 1. Location map for the TTZ-South seismic profile, showing the 11 shot points (blue stars) and the approximately 90 GIPP DSS CUBE stations which provided useful data (red dots).

5. Data Quality/Accuracy

The data quality is generally good (see Fig. 3 in Janik et al. 2020 and Figs. 5 and 8 in Janik et al. 2022). To ensure good timing accuracy, only those shot window recordings were used which had a time tag both before and after them. For interpolation purposes between time tags, a linear drift rate was assumed.

Table 1: Directory and file structure

Directory	File	Contents of directory or file
/raw		This directory contains the raw data in DSS CUBE format. It is 35 Gb large. There is a sub-directory for each cube.
/info	README	
/info	shots.dat	this file contains the coordinates and origin times of the shots
/info	stat_coords_xyz.dat	this file contains the coordinates of the stations which produced any useful data. The station number is the same as the cube number. Thus, when the cube was moved as in the case of 21 and 37, there is more than one set of coordinates for a station.
/info	prog1_new.f	this file contains the fortran program used to interpret the cube GPS information and produce the latitude and longitude of each station.
/info	prog1.dat	this file contains input information for prog1_new.f
/info	prog2.f	this file contains the fortran program used to determine the station heights from the srtm database of heights.
/info	ttz-south_srtm1.dat	this file contains the database of heights.
/info	ttz-south1801.ps	this file contains a location map of the shots and the stations which provided useful data.
/info	ttz-south_[1-11]_mseed2segy.inp	these are the project files needed by mseed2segy - one for each shot.
/info	janik_et_al_gzh20.pdf	this file contains the first publication resulting from the experiment.
/segy	csp_[1-11]_rmdc.sgy	segy files – one for each shot. 1-11 is the FFID number and rmdc means 'DC removed'. The shot number is equal to 29200 + FFID number.

Table 2: SEGY-header words set

ProMAX header word	SEGY header byte	Length (byte)	Description	Value, if constant
tracno	0	4	trace number within line	
seq_disk	4	4	trace number within reel (on disk)	
ffid	8	4	field record number = shot point number	
chan	12	4	receiver channel number = instrument number	
seqno	24	4	trace number within CDP ensemble	
trc_type	28	2	trace identification code	1
offset	36	4	distance from source to receiver (signed)	
rec_elev	40	4	receiver elevation (m) x 1000	
sou_elev	44	4	source elevation (m) x 1000	
	68	2	scale factor for bytes 40-67	-10000
	70	2	scale factor for bytes 72-87	-10
sou_x	72	4	source coordinate – X x 10	
sou_y	76	4	source coordinate – Y x 10	
rec_x	80	4	receiver coordinate – X x 10	
rec_y	84	4	receiver coordinate – Y x 10	
tlive_s	110	2	start time of live samples	0
tfull_s	112	2	start time of full samples	0
numsmpl	114	2	number of samples in trace	24000
samprat	116	2	sample interval; in micro-seconds	10000
idatrec	156	2	year data recorded (shot time)	2018

6. Data Availability/Access

Data is archived at the *GIPP Experiment and Data Archive* where it is freely available for further use after the end of the embargo period on 30th September, 2022. When using the data, please give reference to this data publication. Recommended citation is:

Mechie, J., (2022). Data of the TTZ-South seismic experiment. GFZ Data Services.
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The complete data set is archived at the Institute of Geophysics, Polish Academy of Sciences under doi:10.25171/InstGeoph_PAS_IGData_TTZ-South_2021_003 (page externally inaccessible). The best person to contact is Dr. Tomasz Janik.

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