

# TRAVEL TIME DATA FROM DEEP SEISMIC SOUNDING PROFILES IN NORTHERN EURASIA

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In September 2002, Dr. Igor Morozov at the University of Wyoming (UWy), provided us with phase picks from the DSS (Deep Seismic Sounding) profiles in northern Eurasia (Figure 1). There are seven DSS profiles carried out by using 19 PNEs (Peaceful Nuclear Explosion) conducted between July 26, 1977 through September 6, 1988. The best known ground truth data for these PNEs are from Sultanov et al. (1999) who reported 117 PNEs as listed in Table 1. There are 8,411 phase picks in the data set, of which 4,761 are *P* phases and 3,141 picks are *S* arrivals. *P*, *Pn* and *Pg* phases are picked at 3,141 stations, whereas *S*, *Sn* and *Lg* arrivals are picked at 2,570 stations (Figure 1).

There were some uncertainty regarding origin times and locations of the PNEs used to derive this travel time data. In this note, we made preliminary analysis of the phase data to ensure that the travel time data from the DSS profiles are consistent with phase data from permanent seismographic stations in northern Eurasia already used in our IMS station location calibration work (Lamont Consortium) and that the phase data are useful for further analysis. It is understood that: GEON Center in Moscow, Russia provided seismic waveform data to the University of Wyoming, and that each seismic record starts at a reference time relative to the PNE shots. Offset in meters from the shot point and station coordinates (usually up to four significant decimal digits) are given in each trace header.

We found out that for about half of the PNEs, arrival times appears to be fairly well constrained with respect to the GT1 or GT2 quality event location given in Sultanov et al. (1999). These PNEs are marked as "A" in the Table 1. There are arrival time data from certain PNEs which suggest some constant time offsets of few seconds. These are marked as "B" and are believed to be due to poor reference time given by GEON Center. There are few PNEs whose event parameters are not well constrained. These are GT10 or worse quality by Sultanov et al. (1999) and are marked by "C" in Table 1.

It is noted that several PNEs can be used as "reverse" profiles because several segments of the DSS profiles are recorded twice by shots at forward and reverse ends of the profiles. These profiles can be useful to constrained the poor reference times given by GEON.

Table 1: Origin time and location of the PNEs from Sultanov et al. (1999)\*

Date mo/dy/year	Origin time (hh:mn:sec)	Lat (°N)	Long (°E)	$m_b$	GT	Qual	PNE name
07/26/1977	17:00:00.22	69.575	90.375	5.0	1	A	Meteorite-2
08/10/1977	22:00:00.10	50.955	110.983	5.0	1	B	Meteorite-5
08/20/1977	22:00:00.78	64.108	99.558	5.0	1	A	Meteorite-3
09/10/1977	16:00:00.18	57.251	106.551	4.8	1	A	Meteorite-4
08/09/1978	18:00:00.79	63.678	125.522	5.6	1	B	Craton-4
08/24/1978	18:00:00.35	65.925	112.338	5.1	1	A	Craton-3
09/21/1978	15:00:00.19	66.598	86.210	5.2	1	A	Craton-2
10/17/1978	14:00:00.16	63.185	63.432	5.5	1	B	Craton-1
08/12/1979	18:00:00.21	61.803	122.430	4.9	1	A	Kimberlite-4
09/06/1979	18:00:00.31	64.110	99.562	4.9	1	A	Kimberlite-3
10/04/1979	16:00:00.03	60.675	71.455	5.4	1	B	Kimberlite-1
07/30/1982	21:00:00.00	53.80	104.15	5.0	10	C	Rift-3
09/04/1982	18:00:00.06	69.20	81.65	5.3	10	C	Rift-1
09/25/1982	18:00:00.18	64.35	91.80	5.2	10	C	Rift-4
08/11/1984	19:00:00.20	65.05	55.10	5.3	10	C	Quartz-2
08/25/1984	19:00:00.33	61.90	72.10	5.3	10	C	Quartz-3
09/17/1984	21:00:00.03	55.834	87.526	5.0	1	A	Quartz-4
08/22/1988	16:20:00.07	66.280	78.491	5.3	1	B	Ruby-2
09/06/1988	16:19:59.94	61.361	48.092	4.8	1	A	Ruby-1

Sultanov, D. D., J.R. Murphy and Kh.D. Rubinstein, A seismic source summary for Soviet peaceful nuclear explosions, *Bulletin of the Seismological Society of America*, Vol. **89**, pp. 640-647, 1999.

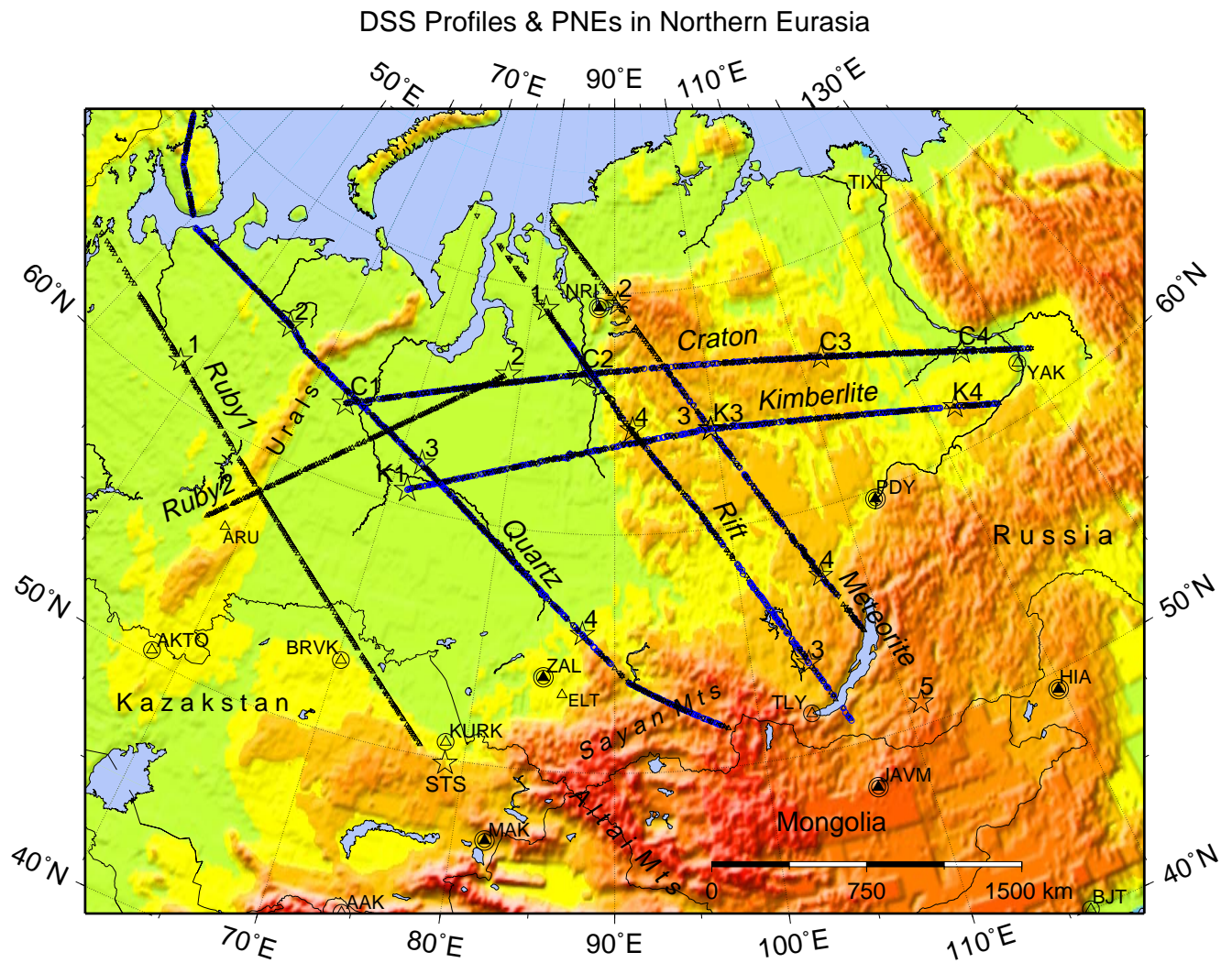


Figure 1: Seven deep seismic sounding (DSS) profiles in northern Eurasia. 19 PNEs (stars) are used to acquire DSS profile data. Small dots are temporary seismographic stations for the DSS experiments carried out in the Former Soviet Union during 1977–1988.