COMPARATIVE DESCRIPTION OF SEISMIC WAVES TRAVEL-TIMES FOR THE KAZAKHSTAN TERRITORY AS DERIVED FROM U.S.-KAZAKHSTAN OMEGA-SERIES EXPERIMENTS (1997-2000)

[1]R.-S. Jih, N.N. [2] N.N. Mikhailova, [2]N.N. Belyashova

[1]U.S. Department of State
[2]Institute of Geophysical Research NNC RK, Kurchatov, Kazakhstan

The Defense Threat Reduction Agency [DTRA], U.S.A., and the National Nuclear Center [NNC], Republic of Kazakhstan, jointly conducted a series of large chemical explosions between 1997 and 2000 at the former Semipalatinsk Test Site in the Eastern Kazakhstan. The U.S. Department of State also sponsored, via DTRA, a deployment of temporary seismographs along a profile between Semipalatinsk and Makanchi during the Omega-3 experiment.

These joint experiments provide an invaluable suite of Ground-Truth "Zero" (GT0) data for calibration of regional seismographs in Central Asia with a variety of possible applications: improved mapping of seismicity for earthquake hazards reduction, fundamental research in seismology, and monitoring and verification of nuclear tests. Region-specific, piecewise linear travel-time (TT) curves have been published by the U.S./DTRA-DOS and Kazakhstan/NNC/IGR teams:

$TT (Pn) = \Delta / 7.97 + 7.94$ (for 200km $\leq \Delta \leq$ 600km, NNC/IGR)

$TT (Pn) = \Delta / 7.94 + 7.56$ (for 300km $\leq \Delta \leq$ 500km, DTRA-DOS)

$TT (Pn) = \Delta / 8.19 + 8.92$ (for 600km $\leq \Delta \leq$ 1500km, NNC/IGR)

$TT (Pn) = \Delta / 8.13 + 8.79$ (for 500km $\leq \Delta \leq$ 1000km, DTRA-DOS)

$TT (Pn) = \Delta / 8.24 + 9.55$ (for 200km $\leq \Delta \leq$ 1500km, NNC/IGR)

$TT (Pg) = \Delta / 5.55 + 0.12$ (for 0km $\leq \Delta \leq$ 30km, NNC/IGR)

$TT (Pg) = \Delta / 6.13 + 0.57$ (for 30km $\leq \Delta \leq$ 1050km, NNC/IGR)

$TT (Pg) = \Delta / 6.02 + 0.20$ (for 0km $\leq \Delta \leq$ 900km, DTRA-DOS)

$TT (Sn) = \Delta / 4.59 + 14.13$ (for 200km $\leq \Delta \leq$ 1500km, NNC/IGR)

$TT (Sn) = \Delta / 4.69 + 14.98$ (for 0km $\leq \Delta \leq$ 900km, DTRA-DOS)

$TT (Lg) = \Delta / 3.20 + 0.09$ (for 0km $\leq \Delta \leq$ 30km, NNC/IGR)

$TT (Lg) = \Delta / 3.55 + 0.31$ (for 30km $\leq \Delta \leq$ 1500km, NNC/IGR)

$TT (Lg) = \Delta / 3.51 + 0.03$ (for 0km $\leq \Delta \leq$ 1000km, DTRA-DOS)

Though independently derived, these two sets of TT curves are remarkably consistent; which is very significant and encouraging. More importantly, deriving region-specific piecewise linear TT curves (for later operational use) with a handful, well-designed, well-recorded GT0 events, is shown to be a cost-efficient, quick pay-off approach for seismic calibration. The region-specific TT curves – or the equivalent 1-dimensional velocity models they represent – can then be used as the base