RELOCATION TESTS WITH ILOC USING GT CRITERIA EVENTS IN MONGOLIA

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Method

iLoc location algorithm

Data

RSTT – 3D velocity model
Hangay 1D velocity model
89 Mine explosions
21 GT criteria events occurred in Mongolia
30 Hangay GT events

Results for:

Mining explosions
GT criteria events in Mongolia
Hangay GT events

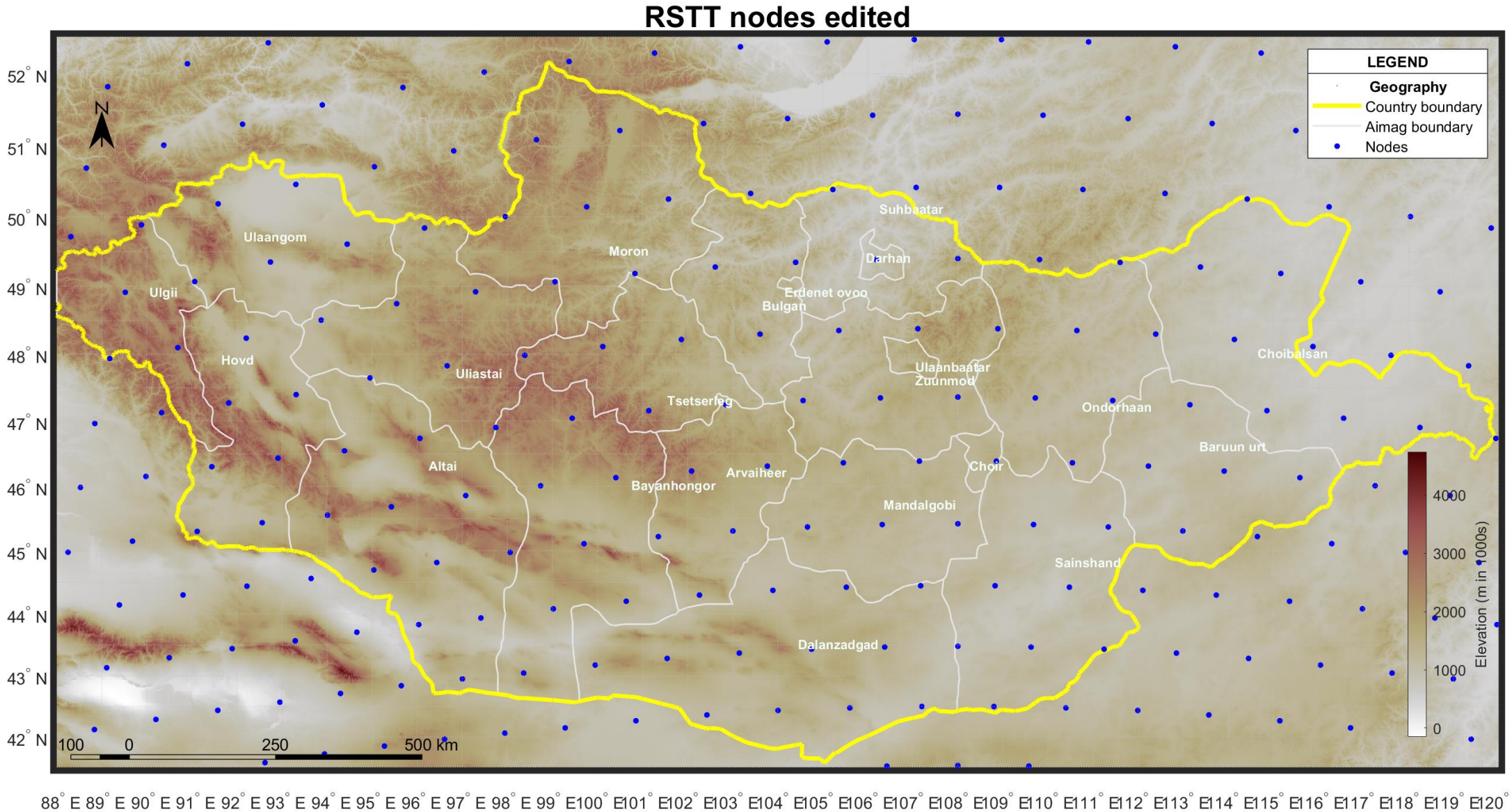
Conclusion

Method: iLoc relocation algorithm

- **iLoc location algorithm**
  - Relocated with neighborhood algorithm which search from the median of reported hypocenter parameters through the 0.5x0.5 grid to get an initial hypocenter.
  - Try to find the global minimum
  - If the global minimum is found, the linearized inversion algorithm works to find the final solution
  - It enables to use local, regional 3D velocity model-RSTT, and ak135 Earth's 1D model for the same events depending on the distance for each of them.

Bondár, I., & McLaughlin, K. (2009a).

Data: RSTT model



Data: RSTT model

RSTTmon_nodes — 2010-23bulllmo

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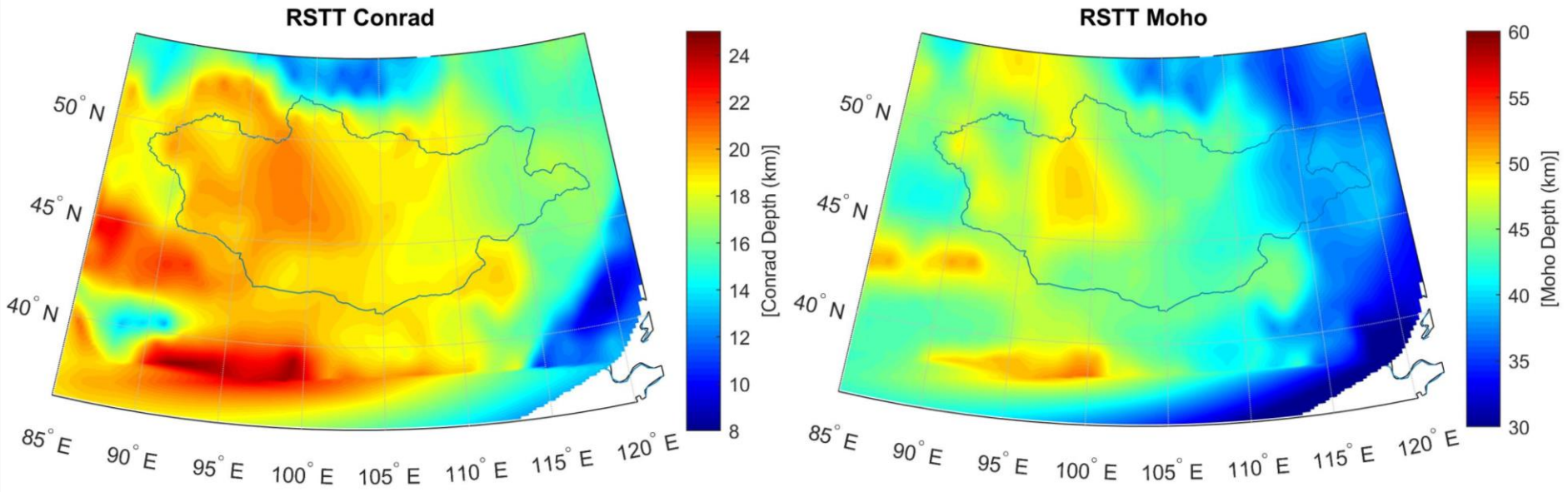
node     53      0  46.545  94.386
         0   -1.66   1.50   0.00
         1   -1.66   2.50   1.07
         2   -1.44   4.00   2.13
         3   -0.80   5.90   3.36
         4   -0.80   5.96   3.39
         5   16.00   6.30   3.65
         6   16.00   6.00   3.52
         7   38.51   7.00   3.99
         8   56.09   8.05   4.48   0.00066   0.00174
node    192      1  47.360 108.000
         0   -1.48   1.50   0.00
         1   -1.48   2.50   1.07
         2   -1.40   5.62   3.41
         3   -1.40   5.67   3.44
         4   -1.40   5.73   3.47
         5   12.00   6.30   3.65
         6   12.00   5.75   3.64
         7   36.66   7.00   3.99
         8   44.15   8.04   4.45   0.00047   0.00128
node    195      2  39.420 114.095
         0   -1.19   1.50   0.00
         1   -1.19   2.50   1.08
         2   -1.04   4.21   2.30
         3   -1.04   6.04   3.53
         4   -1.04   6.10   3.57
         5   16.47   6.30   3.67
         6   16.47   6.32   3.57
         7   32.19   6.99   4.01
         8   39.01   7.99   4.41   0.00090   0.00089
node    196      3  39.420 101.905
         0   -1.49   1.50   0.00
         1   -1.49   2.50   1.07
         2   -1.17   4.50   2.51
         3   -1.15   6.04   3.44
```

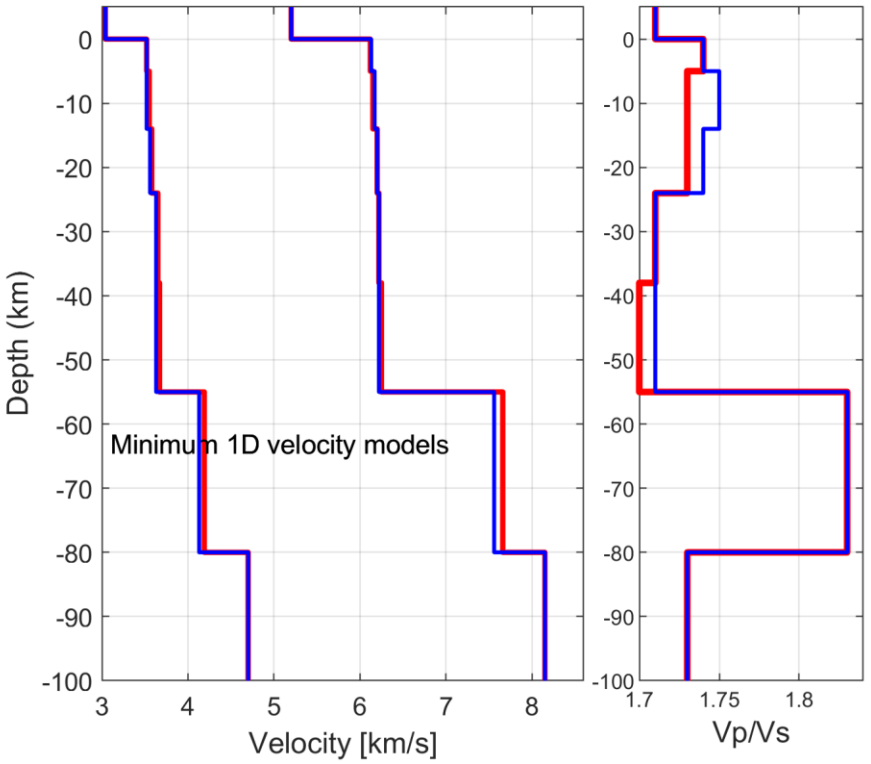
Ln 1, Col 1

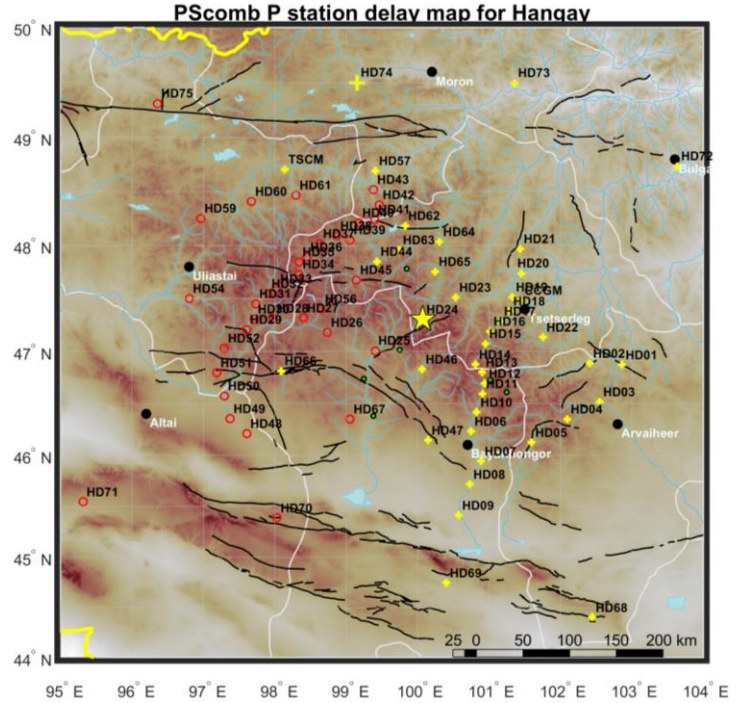


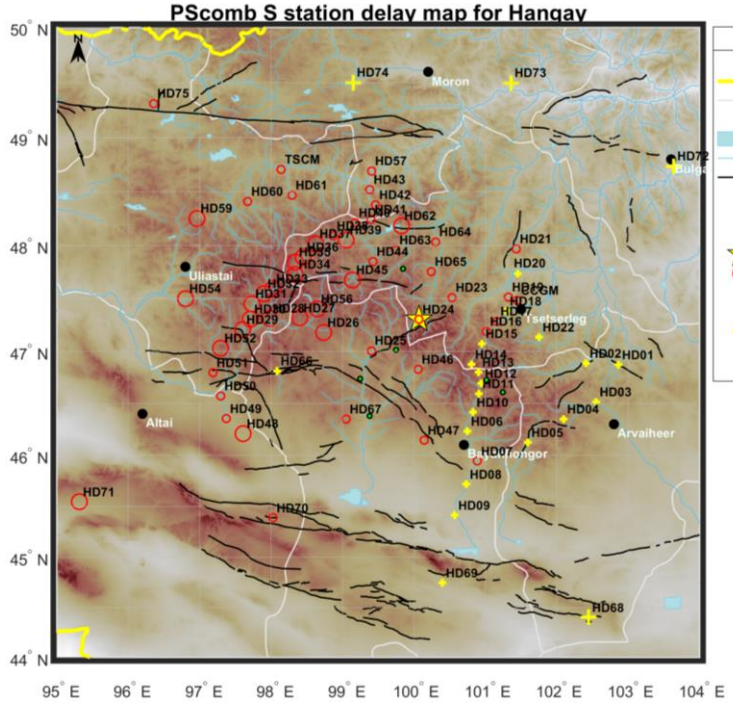
RSTT –Regional Seismic Travel Time

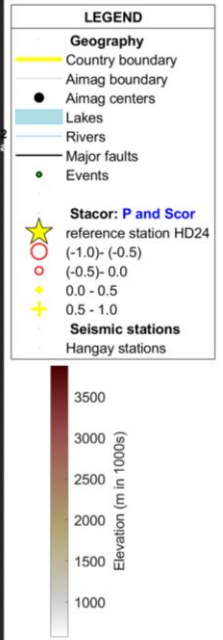
Myers, S. etal, 2010

Data: 1D velocity model for the Hangay region, Mongolia









The crust is characterised by an approximately 24 km thick upper crust that shows a small but constant velocity gradient both in P and in S with an average Vp/Vs ratio of about 1.73 for PScombined and 1.75 for Ponly and Sonly runs overlaying a lower crust of nearly constant P and S wave velocities with a Vp/Vs ratio of about 1.70.

The station delays for P and for S whole Hangay minimum 1D velocity models generally show a high regional consistency and they are very similar with the exception of a few peripheral stations and a specific region in northern Hangay dome where 3 stations show late arrivals for P and S phases.

(based on **Sarantsetseg L, etal. 2019)**

Data: Mine explosions and GT events from whole Mongolia and Hangay region

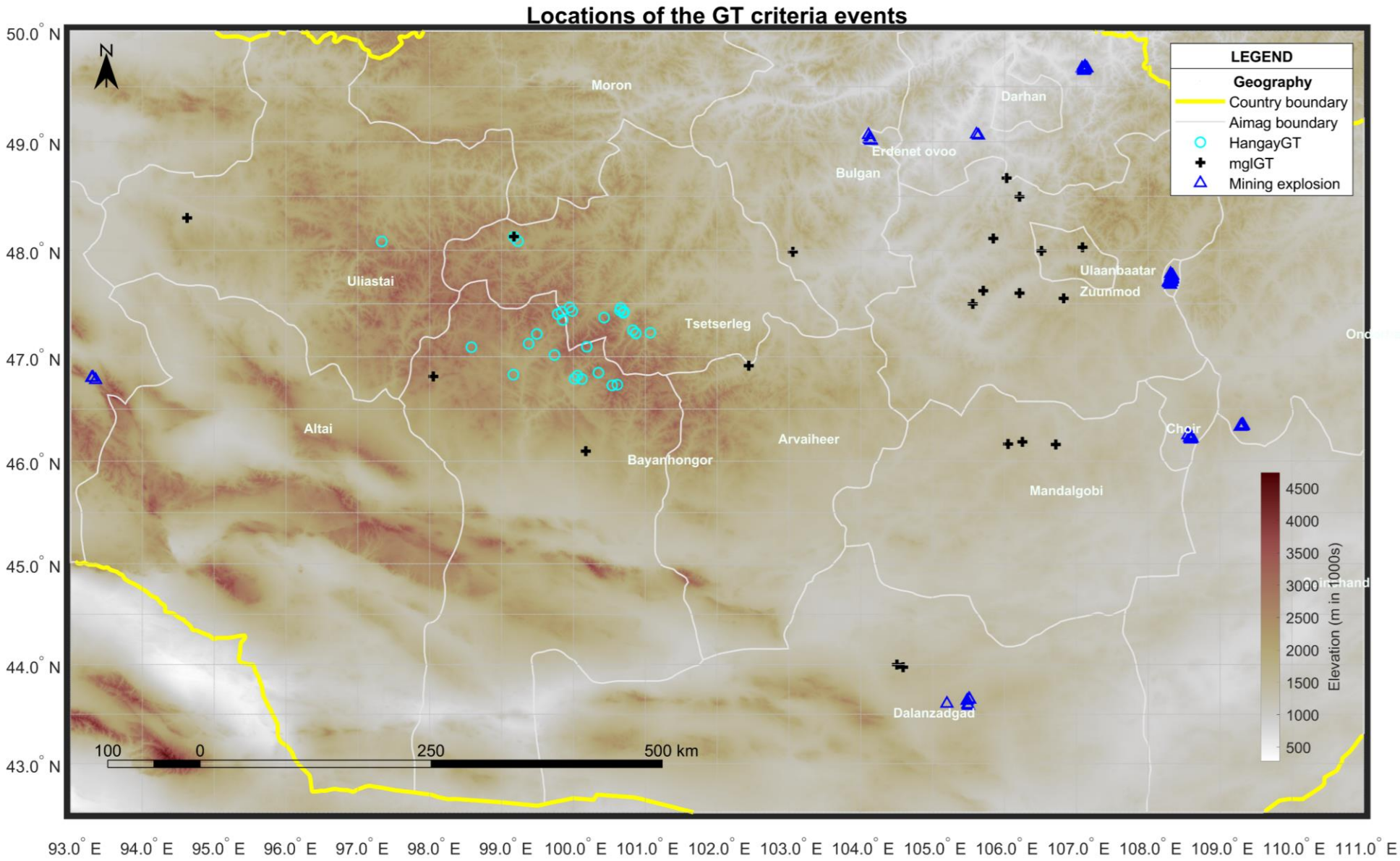
- GT criteria:
  - 10 or more stations within 2.5 degrees
  - 1 or more stations within 30 km
  - GAP<110 degrees
  - Secondary GAP<160 degrees

- **Mining explosions -89**

- **GT criteria 21 events occurred in Mongolia**

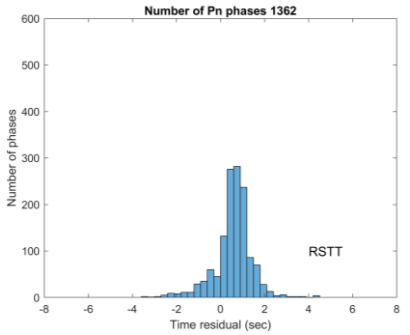
- **Hangay GT events-30**

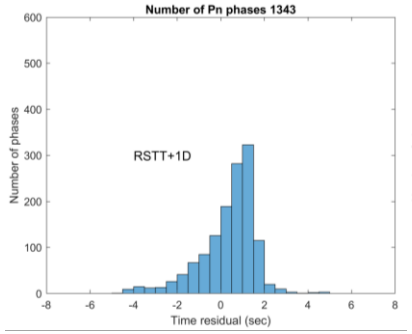
Bondár et al., 2011 –GT events
Meltzer et al., 2019 – Hangay experiment

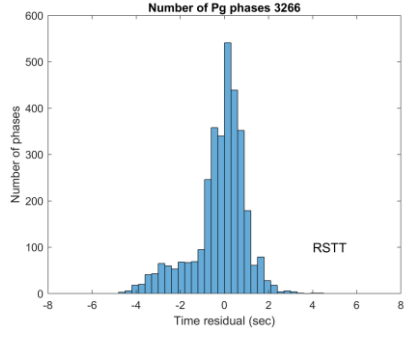


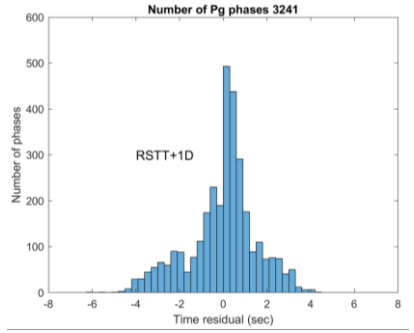
Results:

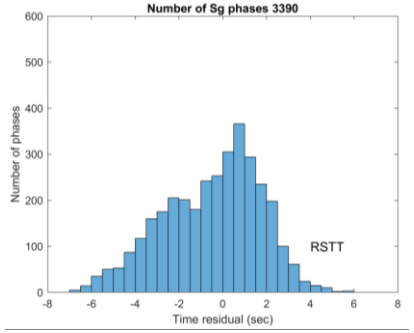
Mining explosions (2020-2023)

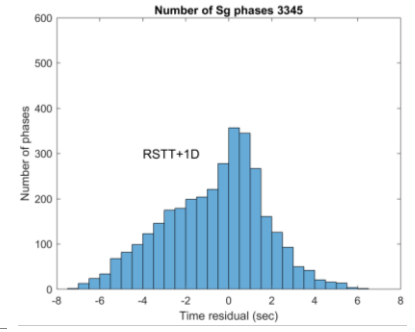




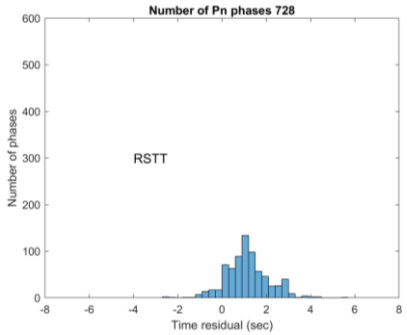


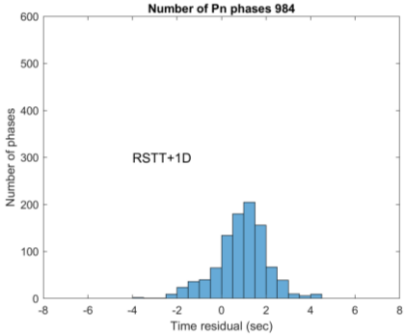


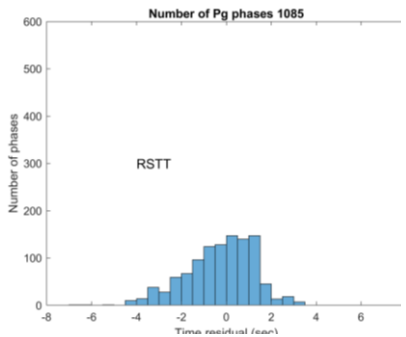


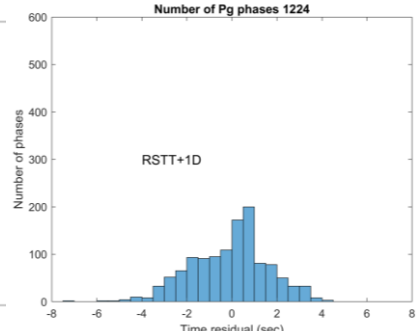


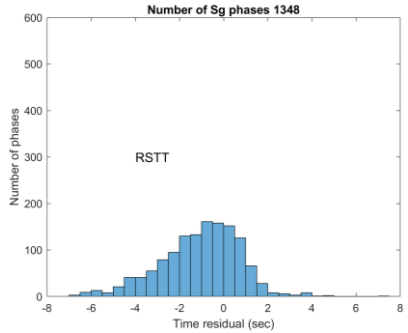
Mongolian GT (2011-2024)

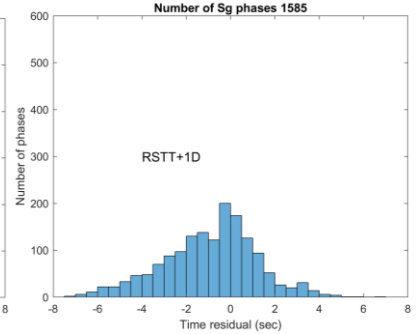




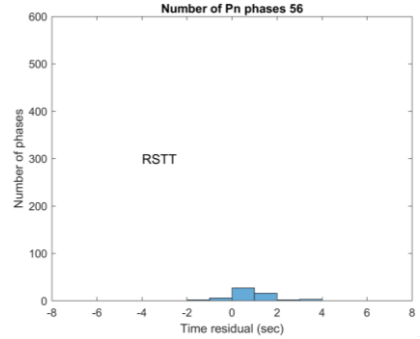


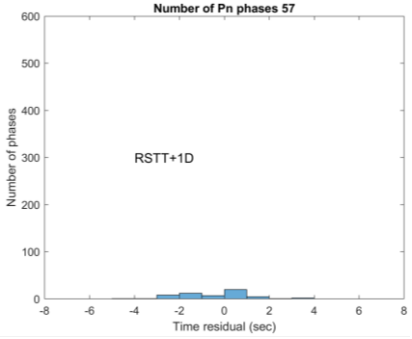


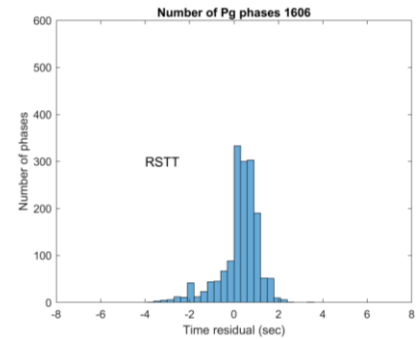


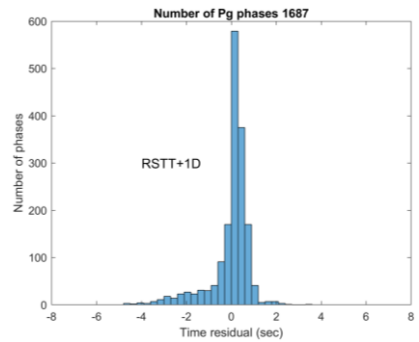


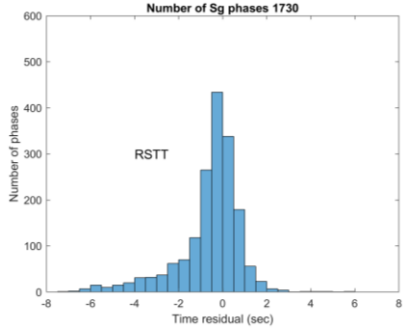
Hangay GT (2012-2024)

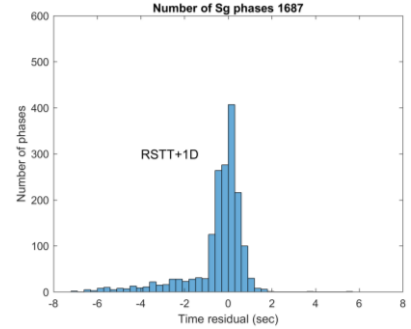




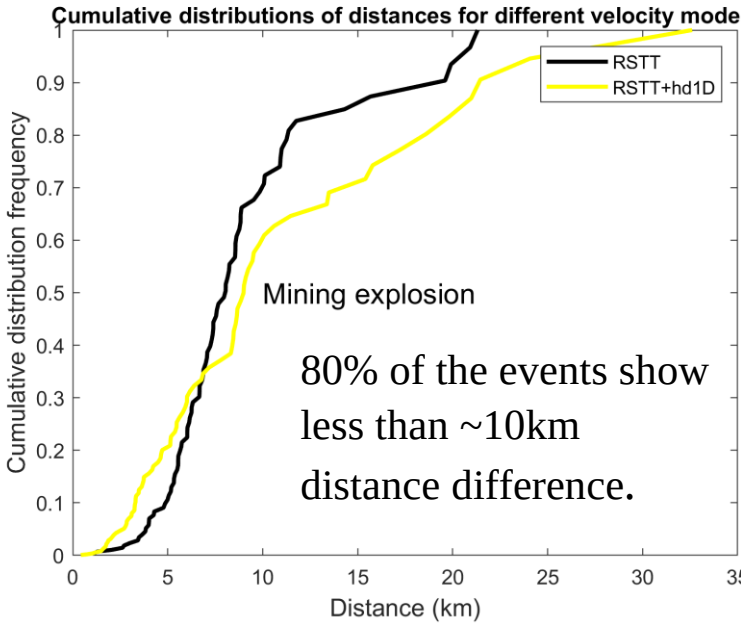


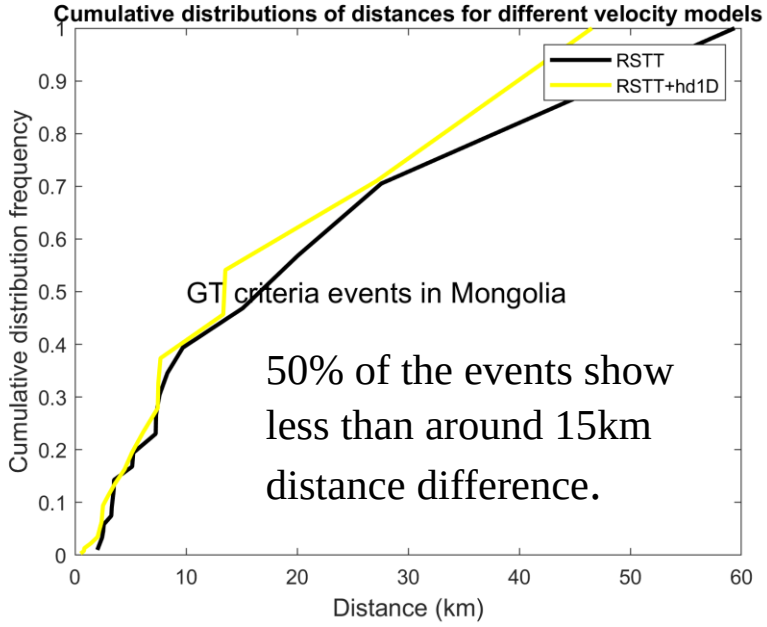


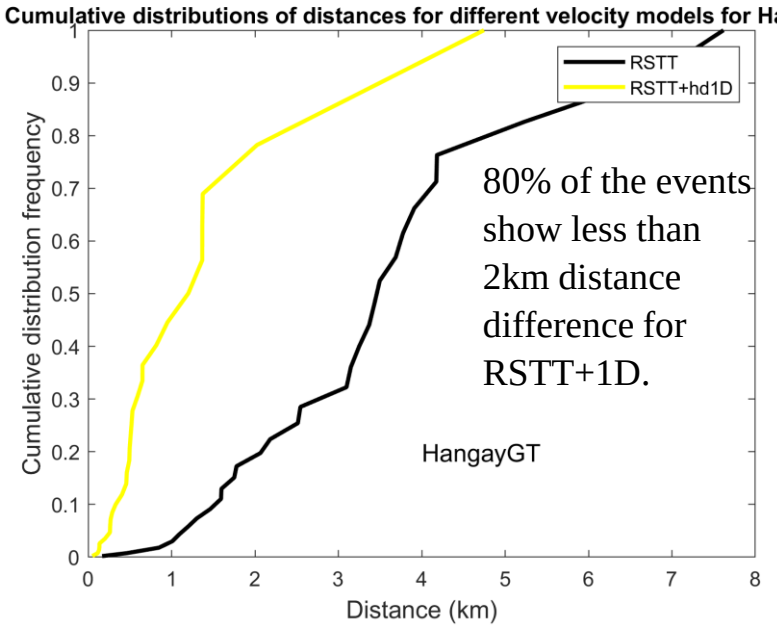


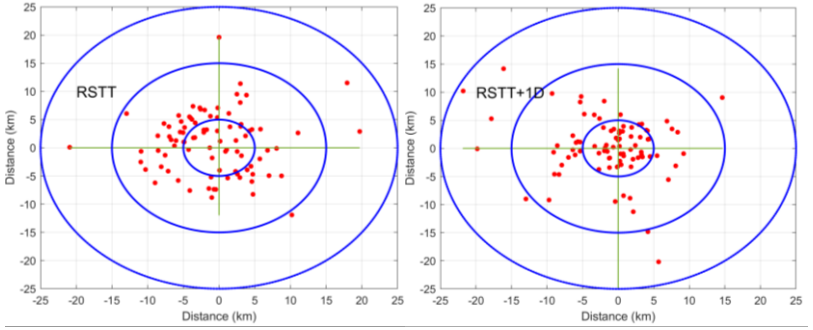


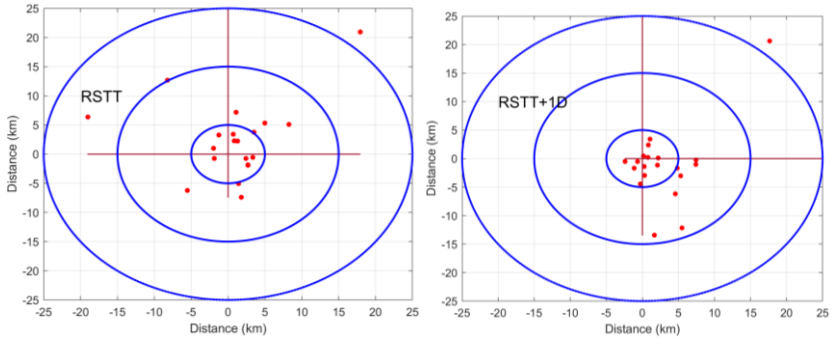
Results:

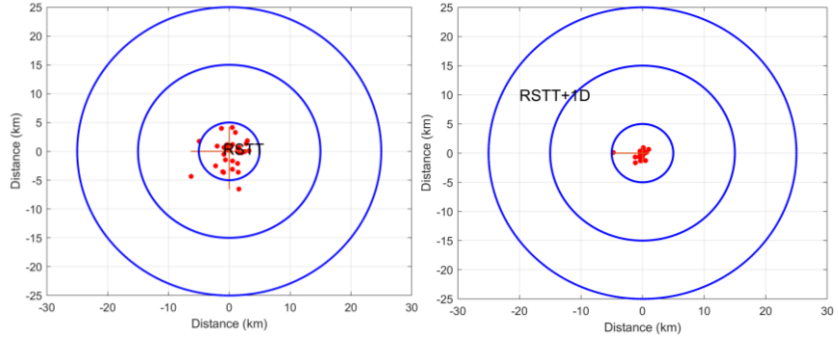






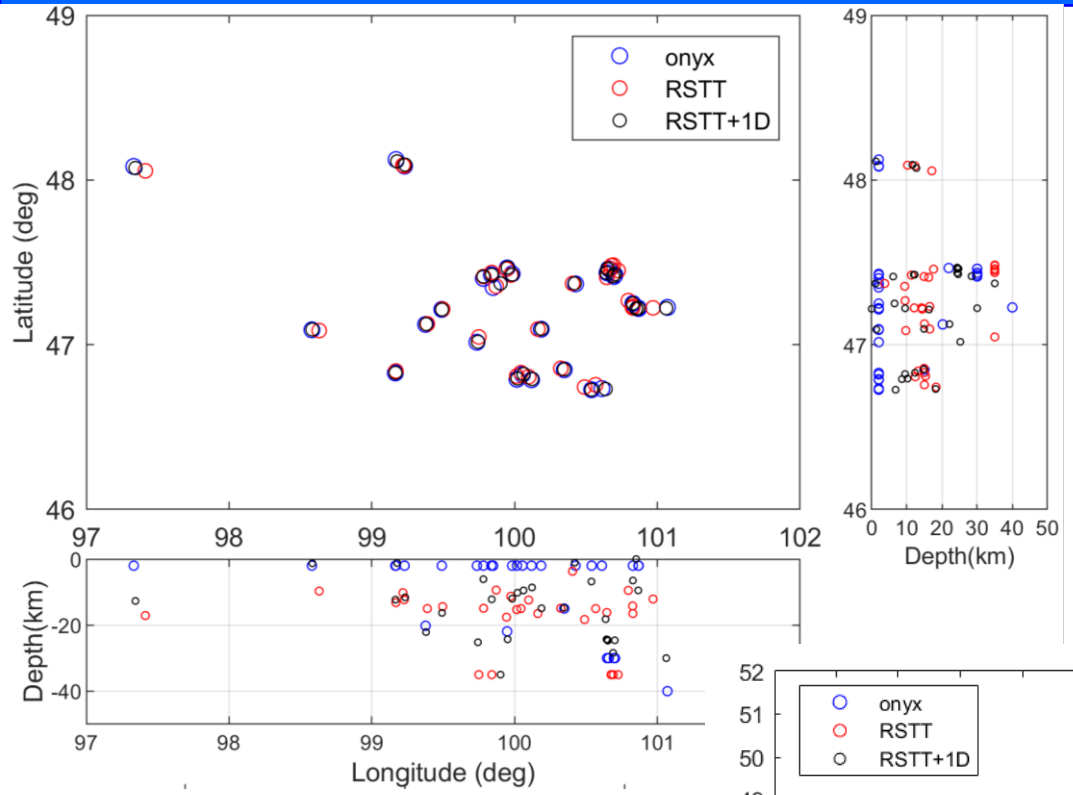


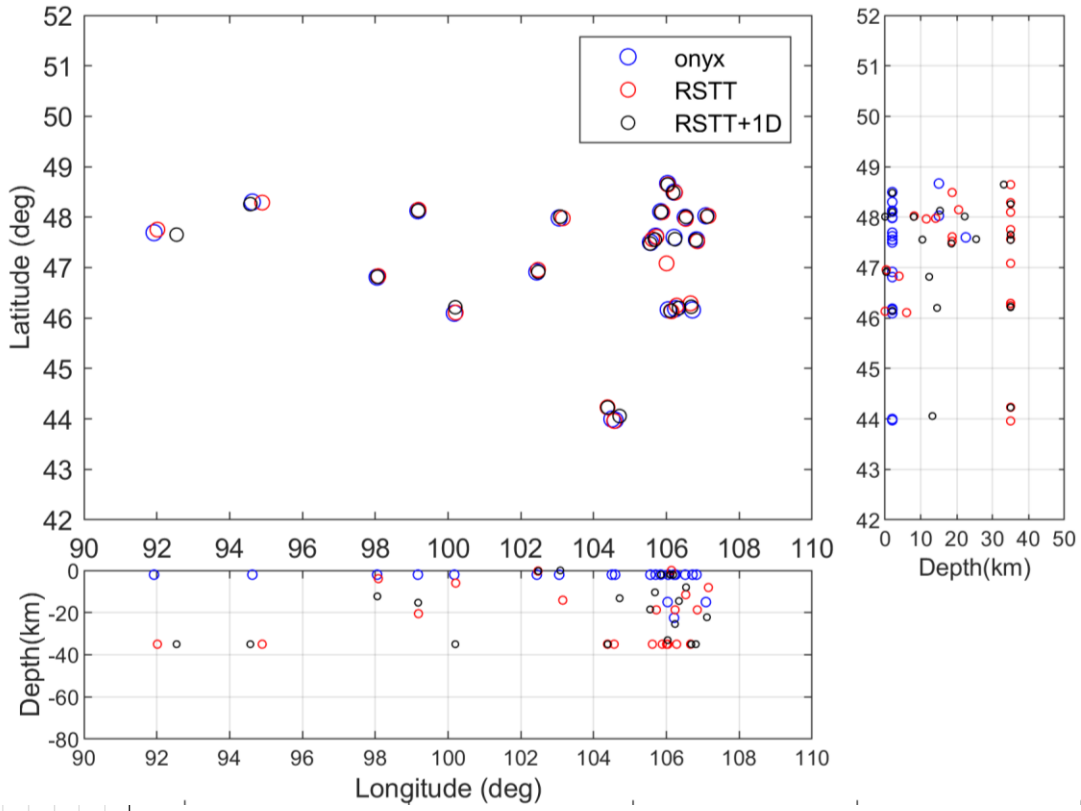


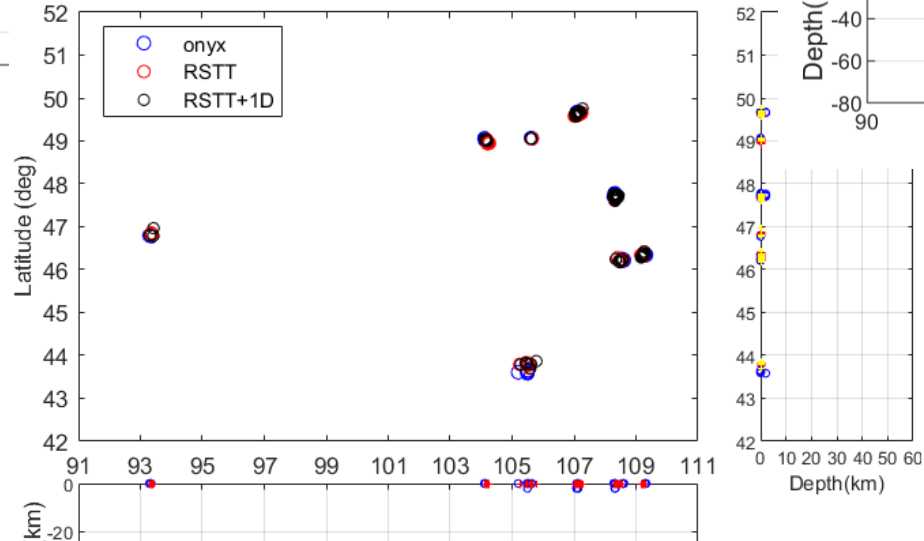


Generally, the location shift was less with RSTT+1D models.

Results:


onyx
RSTT
RSTT+1D
Latitude (deg)
Depth(km)
Longitude (deg)


onyx
RSTT
RSTT+1D
Latitude (deg)
Depth(km)
Longitude (deg)


onyx
RSTT
RSTT+1D
Latitude (deg)
Depth(km)

Conclusion

- Identified 205 events in the Hangay region and 30 of them were recorded further distances more than 2.5 degrees.
- Tested the location performance of the RSTT, RSTT+Hangay1D models for 3datasets.
- The epicenters were consistent with each other. It is because of the almost perfect azimuthal coverage it is very difficult to demonstrate improvements.
- RSTT model is good to relocate the events and combining with the 1D velocity model was much better compared to the location with RSTT for the events recorded at many close stations.

THANK YOU FOR YOUR ATTENTION