T1.2-P19

Ground Truth Procedure to Improve the Seismic Locations, Velocity Model and Focal Mechanics Bulletin for Bolivia

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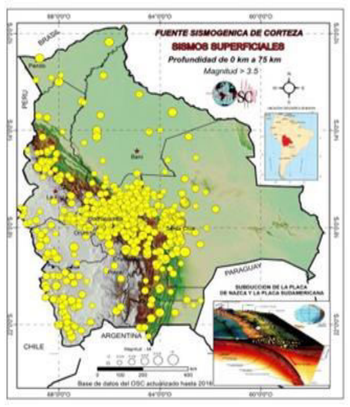
Abstract.

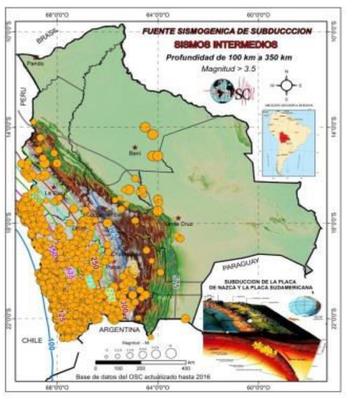
The seismic ground truth (GT) procedure proposed by Bondar et al. was applied at the San Calixto Observatory not only to improve seismic location, but also the velocity model and focal mechanism bulletins were improved. Furthermore, the deployment of temporary seismic stations in our country has allowed us to have a better azimuthal coverage for seismic events. Taking advantage of IMS station LPAZ and SIV plus the La Paz short period seismic network have let us perform the inversion procedure of Kissling (1994) to get a new velocity model. This allowed us to have new focal mechanism solutions. Inside all the processes the seismic GT procedure has given us a quality control tool to enhance the daily routine and the future seismic installation to fill the gap.

1. Bolivian Seismogenic Sources.-

SHALLOW



INTER-SLAB



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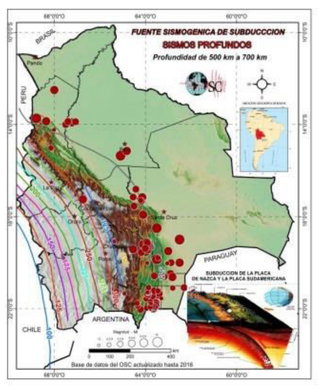


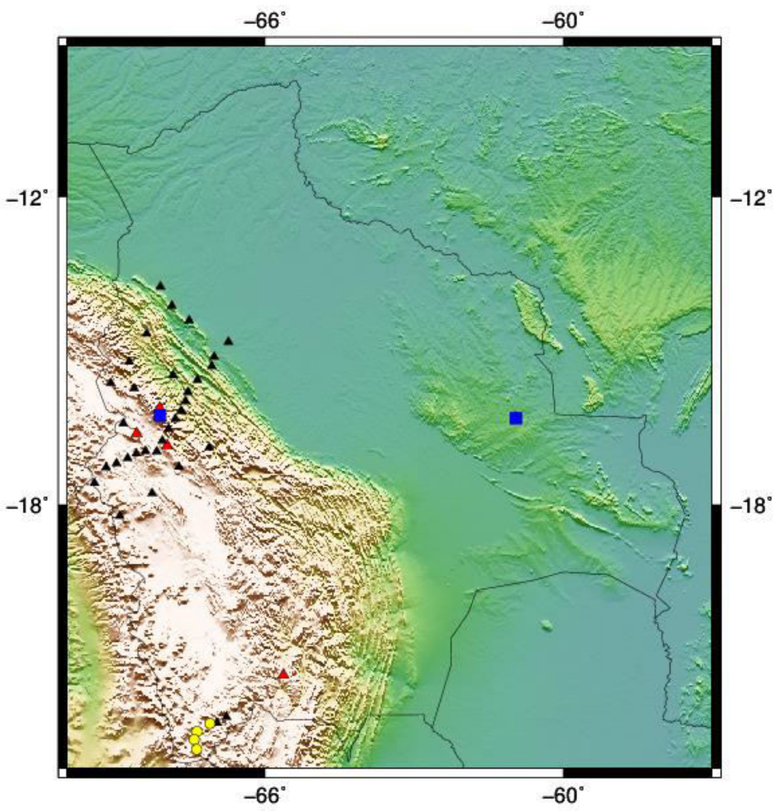
2. Catalog Review and Seismic Network.-

Historical Catalog: 1913 – 1960, only local bulletins (from 1 to 2 seismic stations)

International Catalogs (USGS, NEIC, ISC): 1961 - 2015, Magnitude > 4

Our Old Local Catalog: 1962 – 2010, Magnitude > 4 (from 3 to 5 seismic station) → LPAZ & SIV were present

LPAZ & SIV + IMS stations + shared data ← Our New Local Catalog: 2011 – 2015, Magnitude > 3 (from 6 to 22 seismic stations)



OSC Seismic Stations

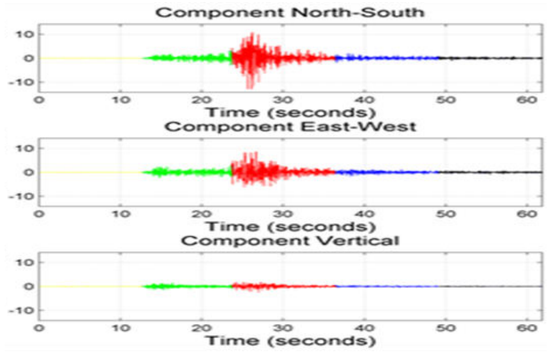
U. Arizona/ CAUGHT Seismic Stations (temporally)

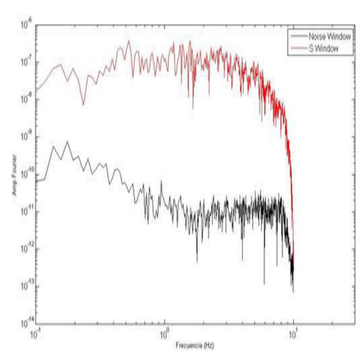
IMS Stations LPAZ & SIV

PLUTONS / Seismic Stations (temporally)

IMS stations are LPAZ (PS06) and SIV (AS08), OSC seismic stations works since 1913, CAUGHT and PLUTONS seismic stations stayed at Bolivia from 2010 to 2011

3. Quality Control & GT Procedure.-





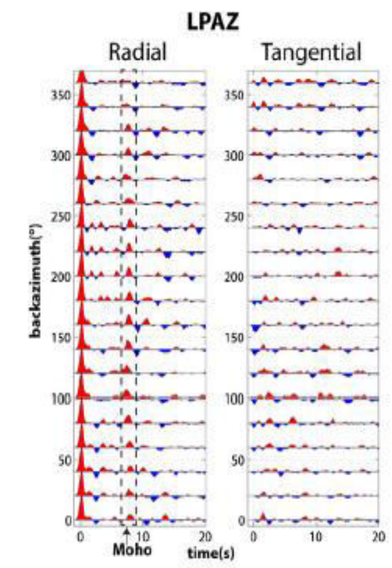
Kishida et al.(2016) proposed a windowing method to perform control quality to waveforms, minimum 3dB SNR between S wave window and Noise window.

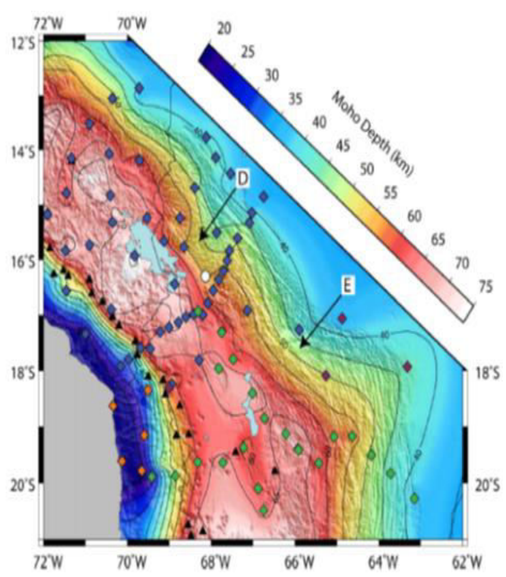
>10 Seismic Stations → <250km of 'aperture' → < 110 of Azimuth

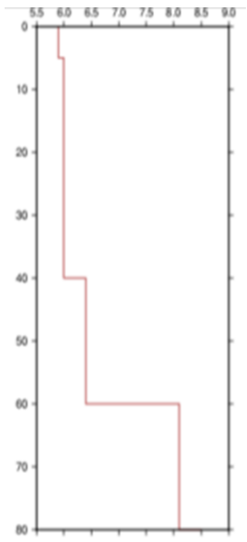
4. Receiver Function Analysis and New velocity Model

(J. Ryan – U. Arizona).-

Radial and tangential receiver functions are calculated by deconvolving the vertical component from the radial and tangential components of teleseismic waveforms (343 events), Teleseismic receiver functions used in this study were stacked using the common conversion point (CCP) method, which stacks receiver functions in subsurface bins based on the location of the P-to-S conversion to increase the signal to noise ratio. During the stacking process all of the receiver functions were migrated from the time domain into depth using a 3D S-wave velocity model determined from a combination of the ambient noise tomography study by Ward et al. (2013) above 60 km, and the IASP91 global model below 60 km.



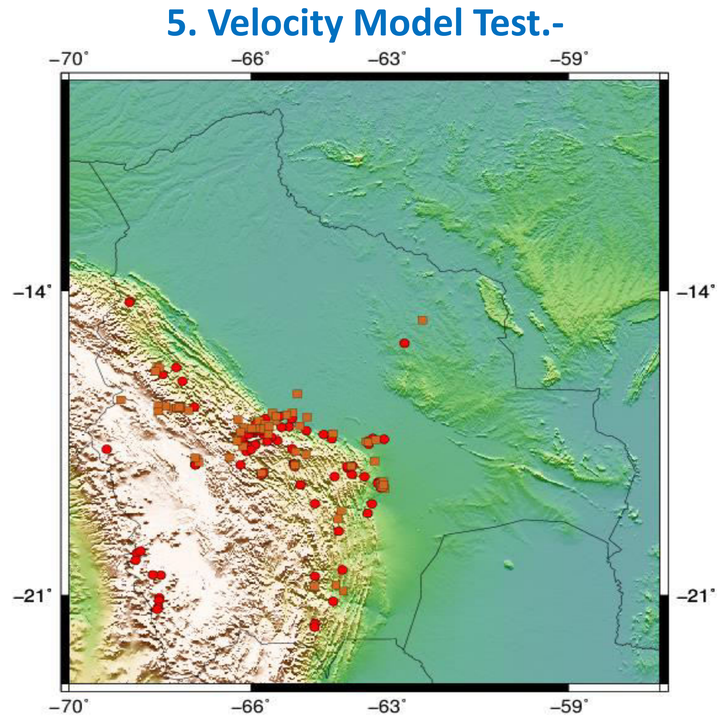




The new velocity model on 1D was based on the Receiver function Analysis, because we work with SeiSan software, this model also was compared with Geotool IDC tables, to get more accurate vales we fined the velocity model by Inversion method with VELEST software, the reach of this model is until the center part of Bolivia due to the lack of stations.

Velocity (km/s)	Depth (km)	Number of Layer
5.9	0.0	1
6.0	5.0	2
6.4	40.0	3
8.1	60.0	4 – Moho
8.5	80.0	5

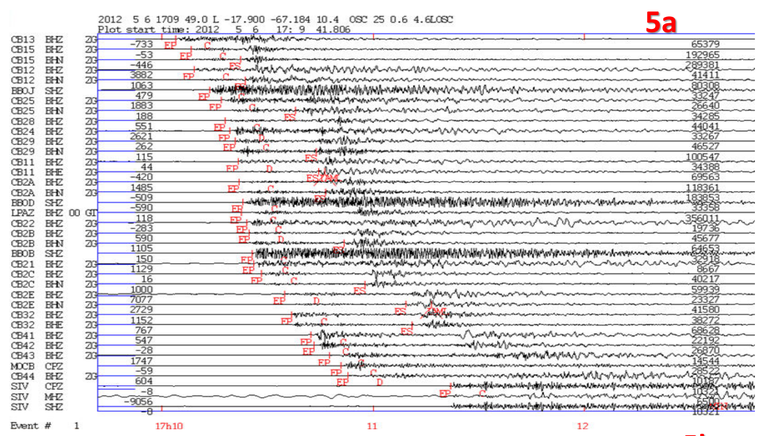
5. Velocity Model Test.-



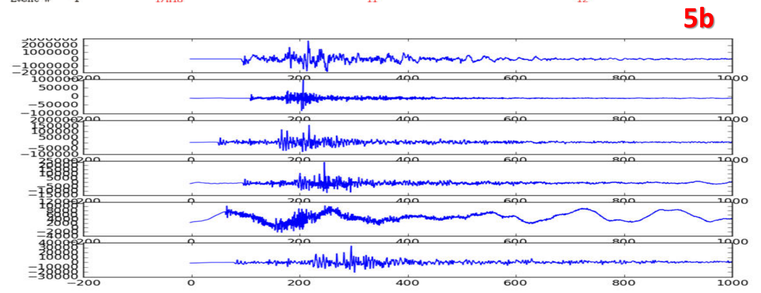
Bad Epicenter Locations — New & Good Epicenter Locations

A seismic event on 06-06-2012 located near Oruro city, 4.6Mw, 10km depth, 22 seismic station, 0.6RMS and 80'GAP, had aftershock to let us perform a relative location an to get the Focal Mechanics Solution, shown in 5a, 5b, 5c, 5d

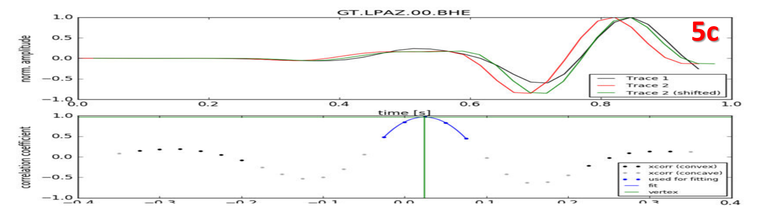
5a



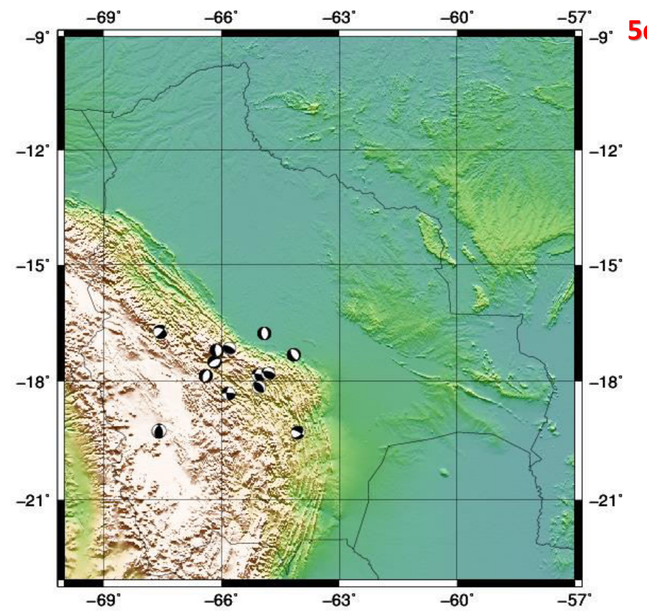
5b



5c



5d



6. On going work – Conclusion .-

A. The GT procedure let us to get more accuracy events to include in the analysis.
B. The automatic relocation procedure by VELEST is being done and JHD method.
C. The new Focal Mechanics Bulletin gave us a clear panorama of geological faults in Bolivia.
D. The need to have a 3D model is now the goal for OSC.