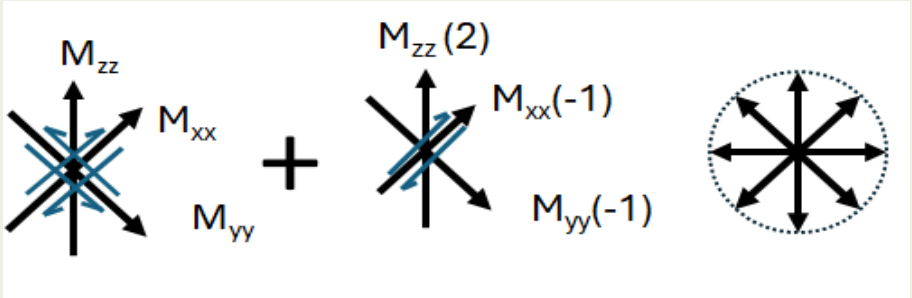
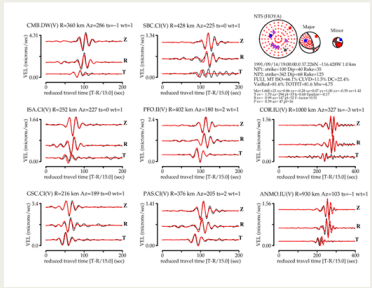
Yield and Depth of Explosions Inverted from Regional Seismograms with Source Complexity – Effectiveness Using Synthetic Seismograms

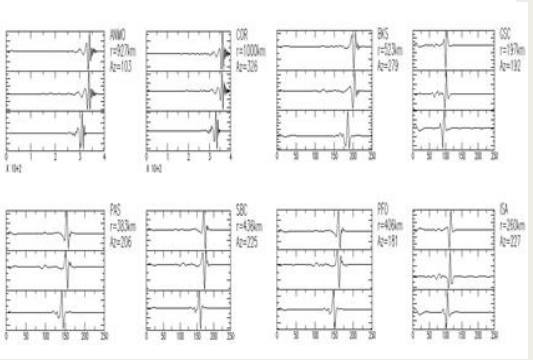
LIGHTNING TALK

P2.1-389

- Expressed recorded wavefield as a linear sum of the contributions from explosion (EX), compensated linear vector dipole (CLVD) and double-couple (DC) sources with scalar seismic moments M_{EX}, M_{CLVD} and M_{DC}, respectively.
- Used waveforms from NTS explosions and moment tensor solutions from Pasyanos and Chiang (2022) to validate the current method.
- Used DC mechanism and partitioned scalar moments to construct synthetic seismograms. These seismograms were used as data for the proposed grid-search method validation.
- Explosion waveforms were computed by convolving the time-domain source function (TDSF) for an explosion of yield **W** Kt and depth **h** with the green's functions. Explosion seismic moment **XMOM** is partitioned to scalar moments of the DC, CLVD and EX.
- Grid search was performed over the entire focal sphere of the DC source and possible ranges of depth and strength of the CLVD and EX sources. **L1, L2** error norms and **variance reduction (VR)** were used to recover the best solutions. **VR** constraint performed poorly.
- For detailed mathematical formulation, please visit the poster.







Dip deg	Slp deg	Str deg	W Kt	h meter	M_w	M_o-10^{24} dyne-cm	L1 Norm	L2 Norm	VR	Partition DC:CLVD:EX
0	60	180	150	1100	4.93	0.280	-0.114e-10	0.352e-06	99	03:-05:26
30	30	30	50	900	4.67	0.115	-0.482e-07	0.244e-06	99-	-55:-50:159
20	120	150	100	1000	4.84	0.203	-0.450e-13	0.105e-10	100	30:20:50
80	120	270	100	1100	4.83	0.196	0.104e-10	0.140e-06	99	27:02:51
50	90	60	100	900	4.85	0.214	-0.158e-10	0.207e-06	100-	29:21:46
50	**90**	**60**	**100**	**1000**	**4.84**	**0.203**	**-0.450e-13**	**0.105e-10**	**100**	**30:20:50**
50	90	60	100	1100	4.83	0.196	-0.507e-10	0.196e-07	100-	31:19:54
80	120	270	100	1100	4.83	0.196	0.104e-10	0.140e-06	99-	27:02:51
50	60	240	200	1000	5.01	0.372	-0.255e-09	0.210e-06	99+	12:05:15
10	150	360	50	900	4.95	0.210	0.272e-10	0.336e-06	98	-19:-04:44
70	60	90	50	1000	4.66	0.111	0.201e-10	0.318e-06	98+	-25:-20:163
60	90	30	200	1000	5.01	0.372	0.320e-11	0.303e-06	98+	11:03:15
90	90	270	100	900	4.85	2.10	0.876e-10	0.3459e-06	97+	-02:-03:46
90	180	360	200	1100	5.0	3.72	-0.452e-10	0.151e-06	99+	-08:-09:15