

Earthquake collapse mechanisms and periodic, migrating seismicity during the 2018 summit collapse at Kīlauea caldera

Celso Alvizuri¹, Robin Matoza², Paul Okubo³

1. Univ. Of Lausanne, Switzerland;

2. UC Santa Barbara, USA; 3. Univ. of Hawaii Manoa, USA

celso.alvizuri@unil.ch

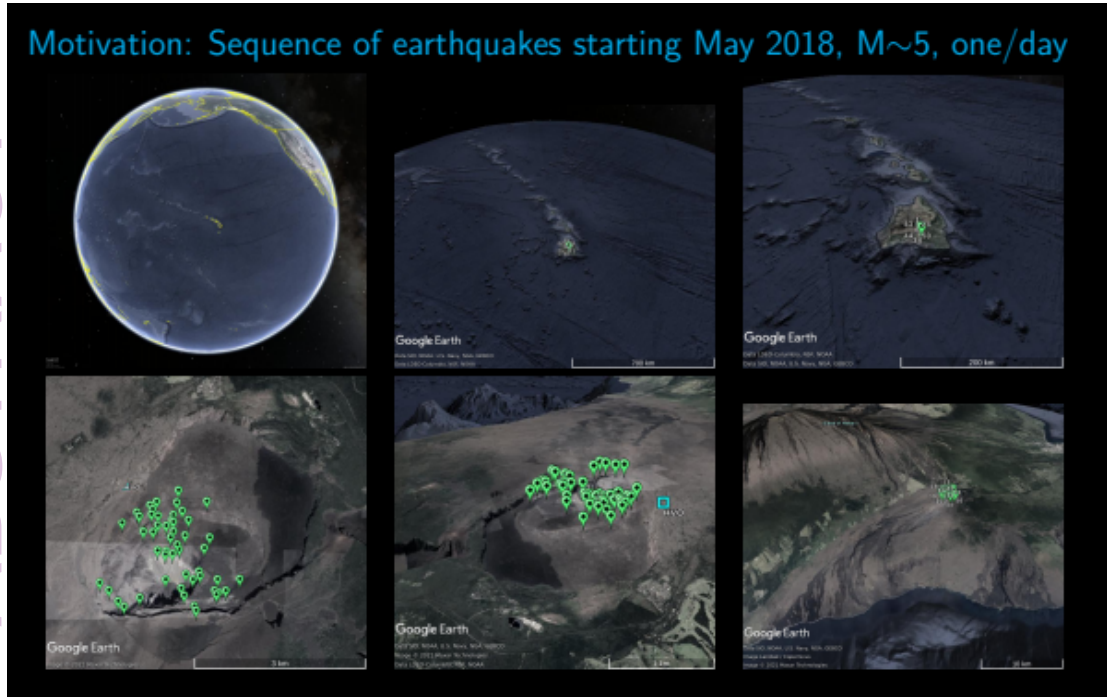
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POSTER



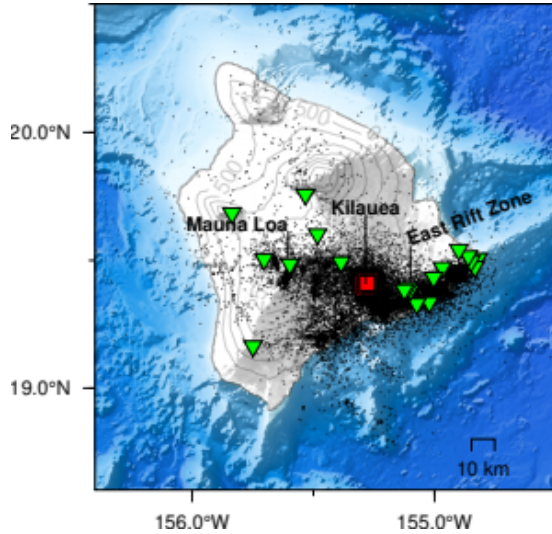
Motivation: Sequence of earthquakes starting May 2018, $M \sim 5$, one/day



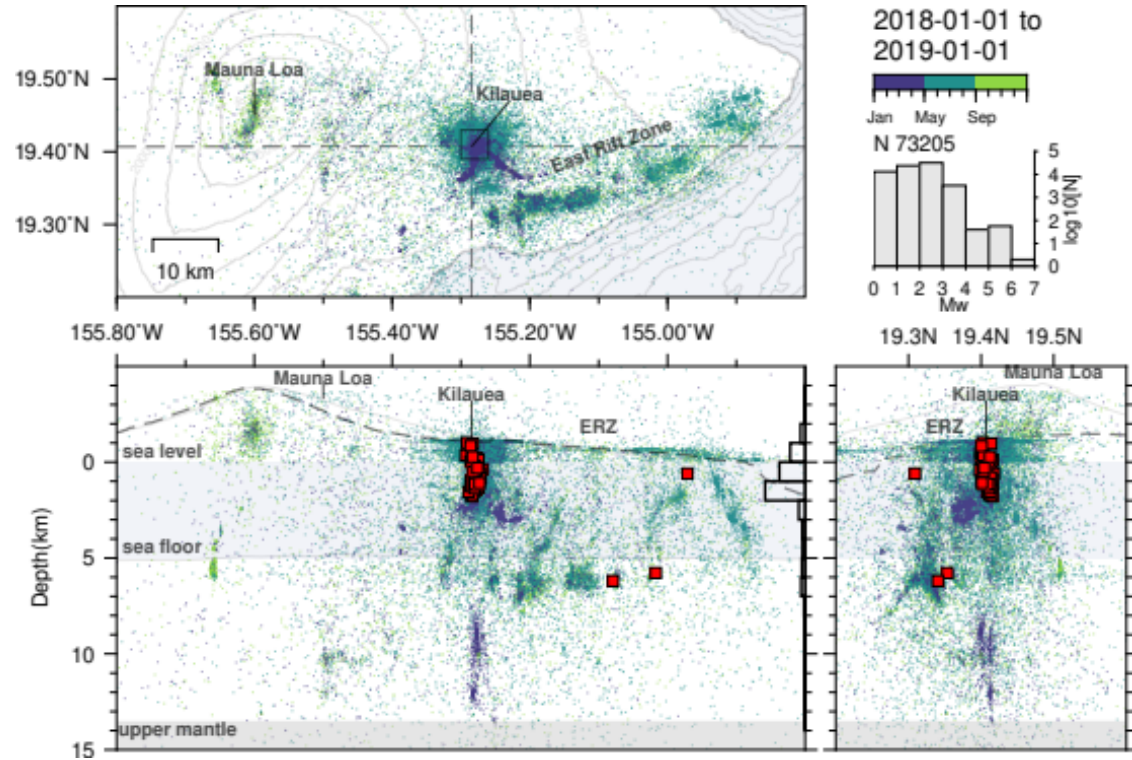
ABSTRACT

- A sequence of 54 ($M \geq 5$) events observed worldwide and over 70,000 smaller events ($M \geq 0$)
- We estimated full moment tensors and uncertainties for the $M5$ events using waveform data
- We analyzed spatio-temporal patterns in accompanying seismicity
- The focal mechanisms reveal collapses similar to collapses following nuclear explosions in North Korea and the Nevada Test Site
- Hypocenters reveal partial elliptical patterns (map view) that migrated downward and outward

INTRODUCTION



- **Hypocenters in the island 2018**
- Red squares: the Mag~5 events
- Green triangles: seismic stations used for moment tensor analysis
- Black points: seismicity in Kilauea and the summit region, Jan-Dec 2018

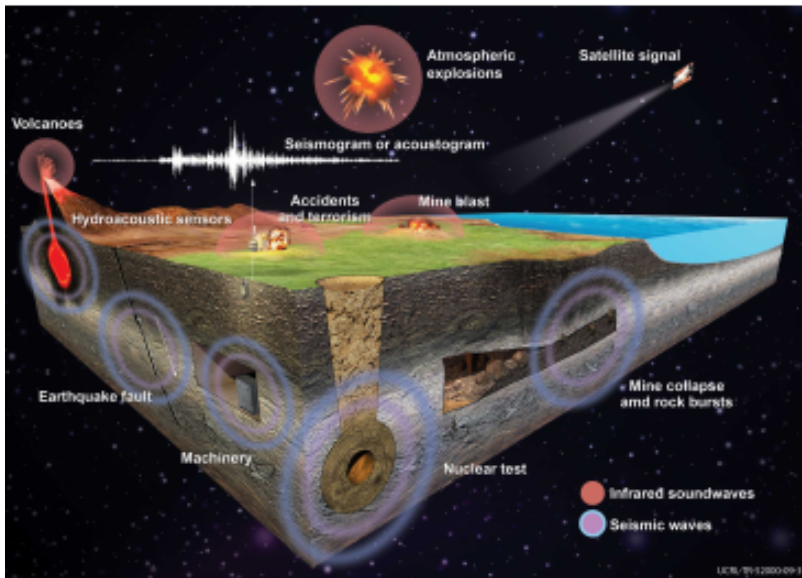


(Hypocenter data from comprehensive catalog for Hawaii; Matoza et al., 2021)

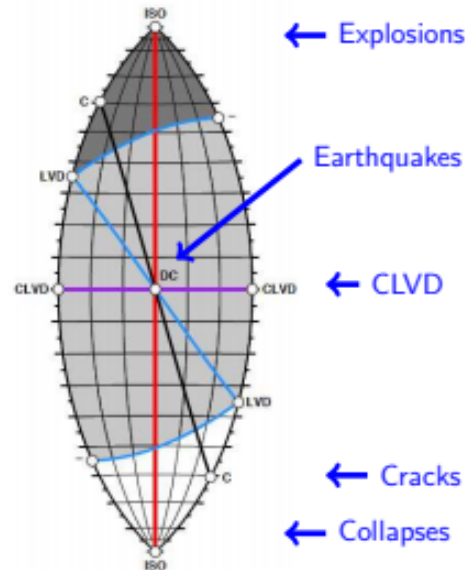
Disclaimer: The views expressed on this poster are those of the author and do not necessarily reflect the view of the CTBTO

Methodology: earthquake mechanisms + characterization + uncertainties
(Alvizuri et al., 2018, JGR)

METHODS



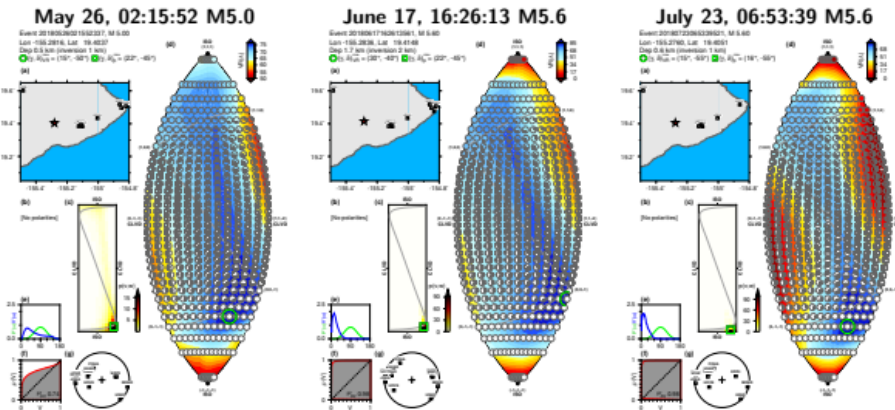
Sleuthing seismic signals (Walter, 2009)



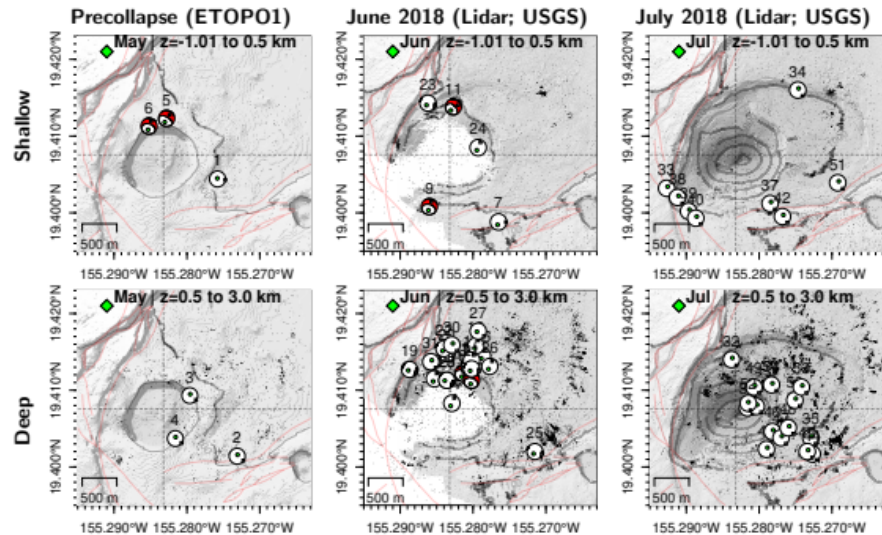
The moment tensor **lune**
(e.g., Tape & Tape, 2012, 2019, JGR)

Moment tensors

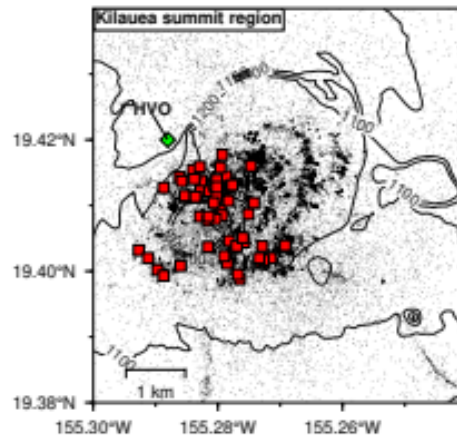
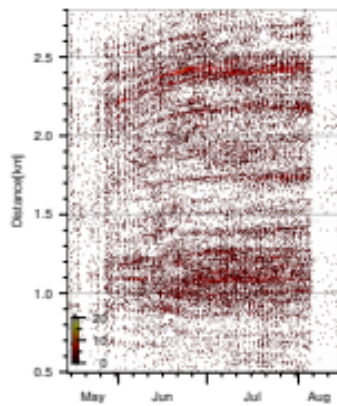
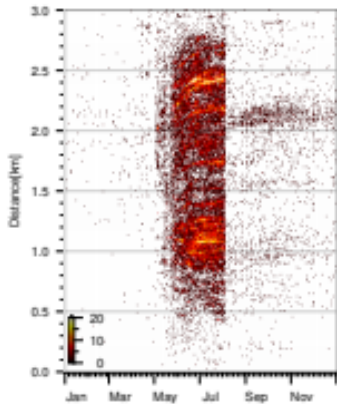
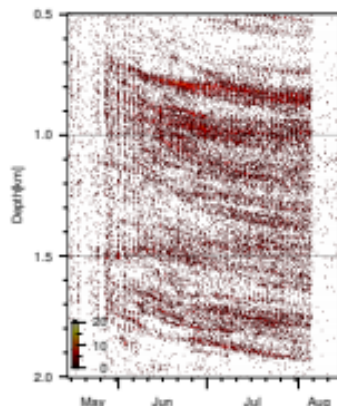
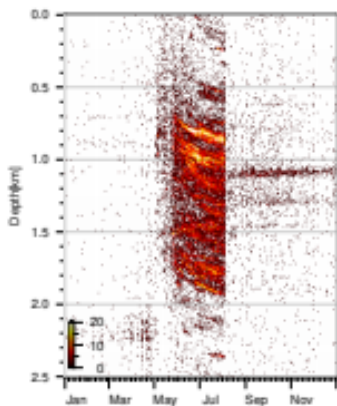
3/54 earthquake characterization and uncertainty analysis from Kilauea



The M5s and ETOPO & Lidar imagery. Depths surf-1.5 km, 1.5-3 km



Results seismicity

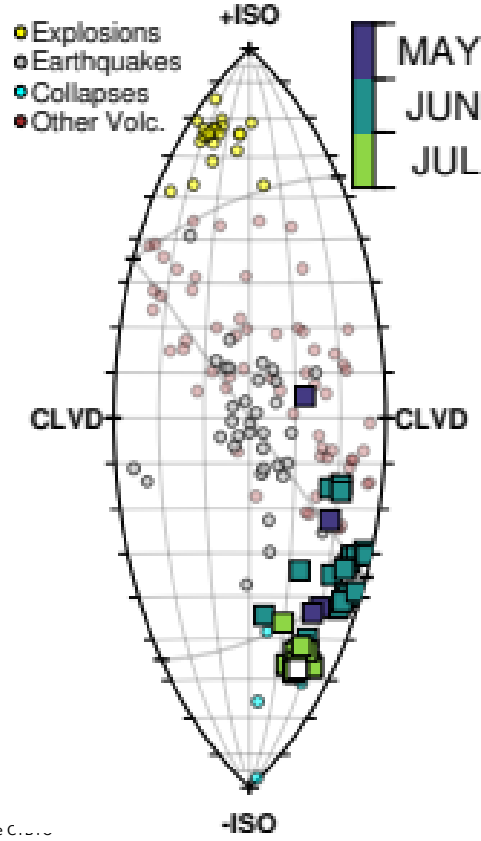
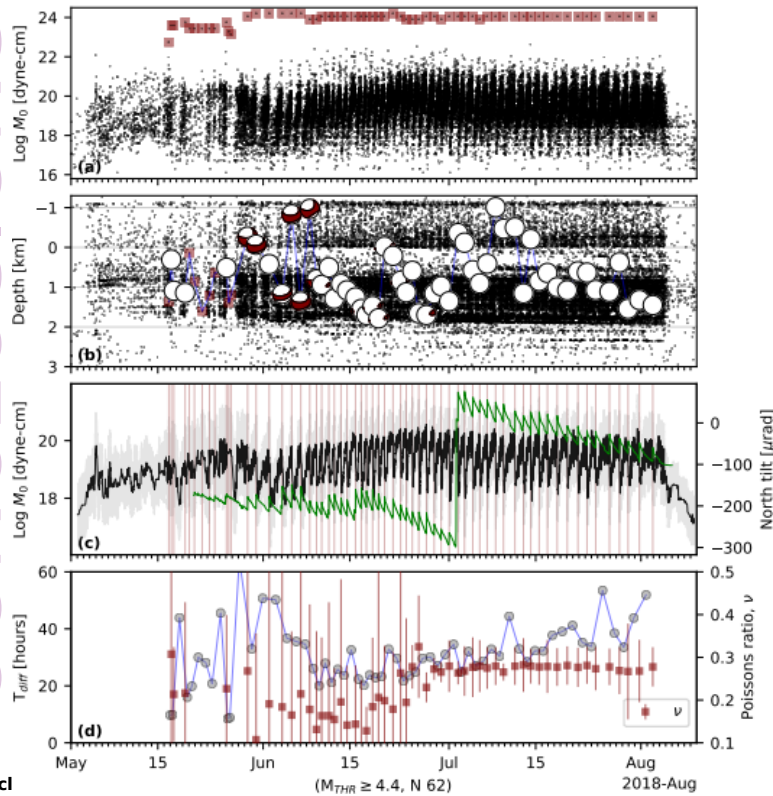


The 2018 seismicity, Kilauea summit region

- downward migration ~200 m
- radially outward ~300 m
- arcuate bands (map view)
- seismicity swarms align with times of M5s

CONCLUSIONS

Seismicity 2018-05-01 00:13:40 to 2018-08-09 22:56:20
N 45228, tbin 1.0 hr



- **Conclusion**
- We estimated full moment tensors and uncertainties for 54 Mw~5 earthquakes,
- Analysed the seismicity
- **Convergent collapse mechanisms (-ISO)**
- **Migrating seismicity**
- Progression similar to loading cycles in lab experiments
- Waveform similarity (xcorr) between M5s and background seismicity suggests a **widely collapsing medium**
- *For details please join me in the breakout sessions!*