



APPLICATION OF TEMPLATE MATCHING TO OBS ARRAY OBSERVATION IN ORCA VOLCANO (BRANSFIELD STRAIT, ANTARCTICA)

Helena Seivane*⁽¹⁾, Rosa Martín⁽¹⁾, Javier Almendros⁽¹⁾, William Wilcock⁽²⁾, Dax Soule⁽³⁾

(1) Andalusian Institute of Geophysics and Earthquake Disaster Prevention, University of Granada, Granada, Spain.

(2) University of Washington, Seattle, USA.

(3) Queens College, City University of New York, New York, USA.

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*Presenting Author. Address: helenaseiv@outlook.com

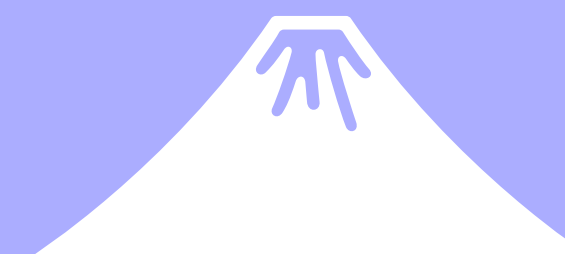
This presentation participates in OSPP



Outstanding Student & PhD
candidate Presentation contest

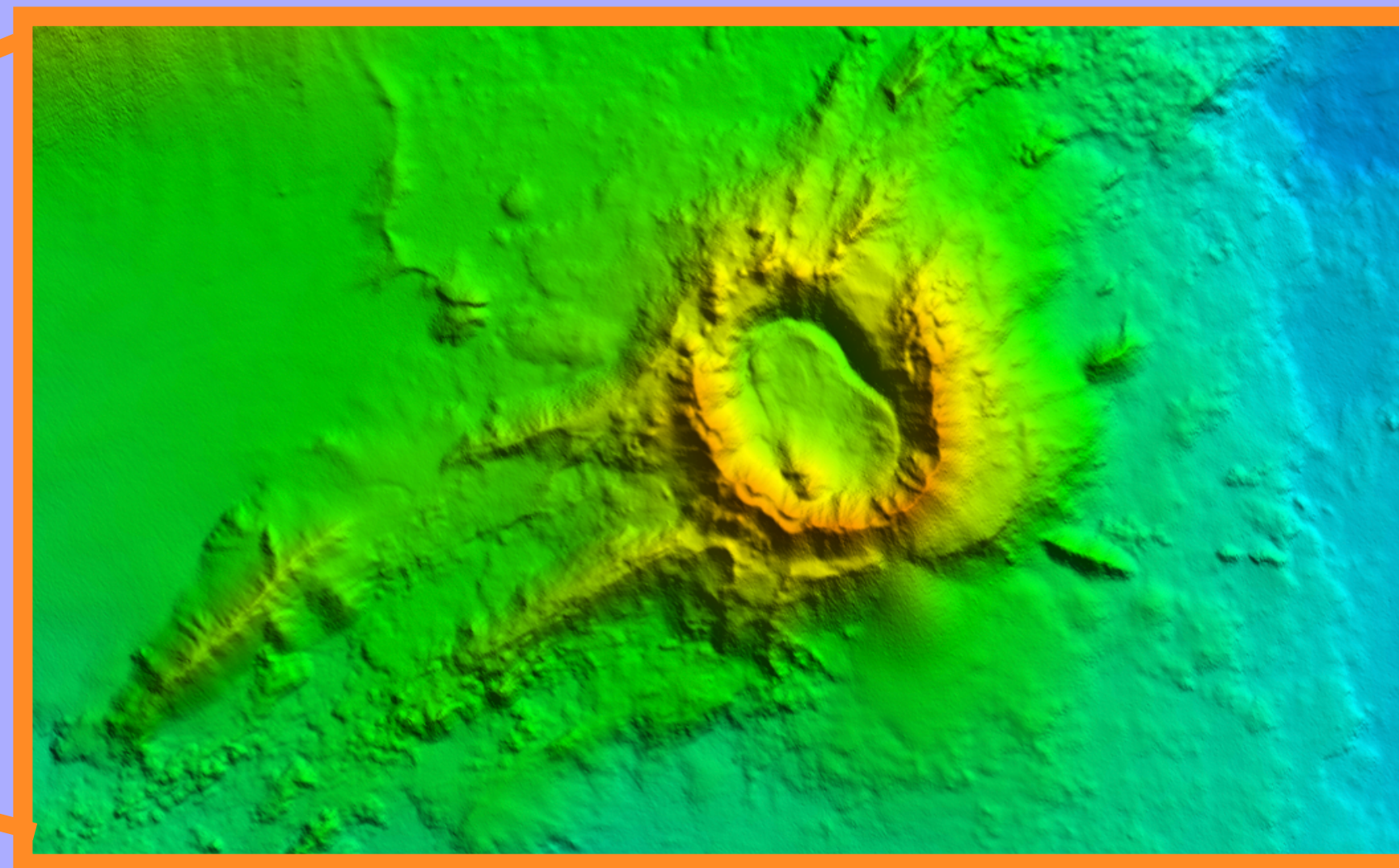
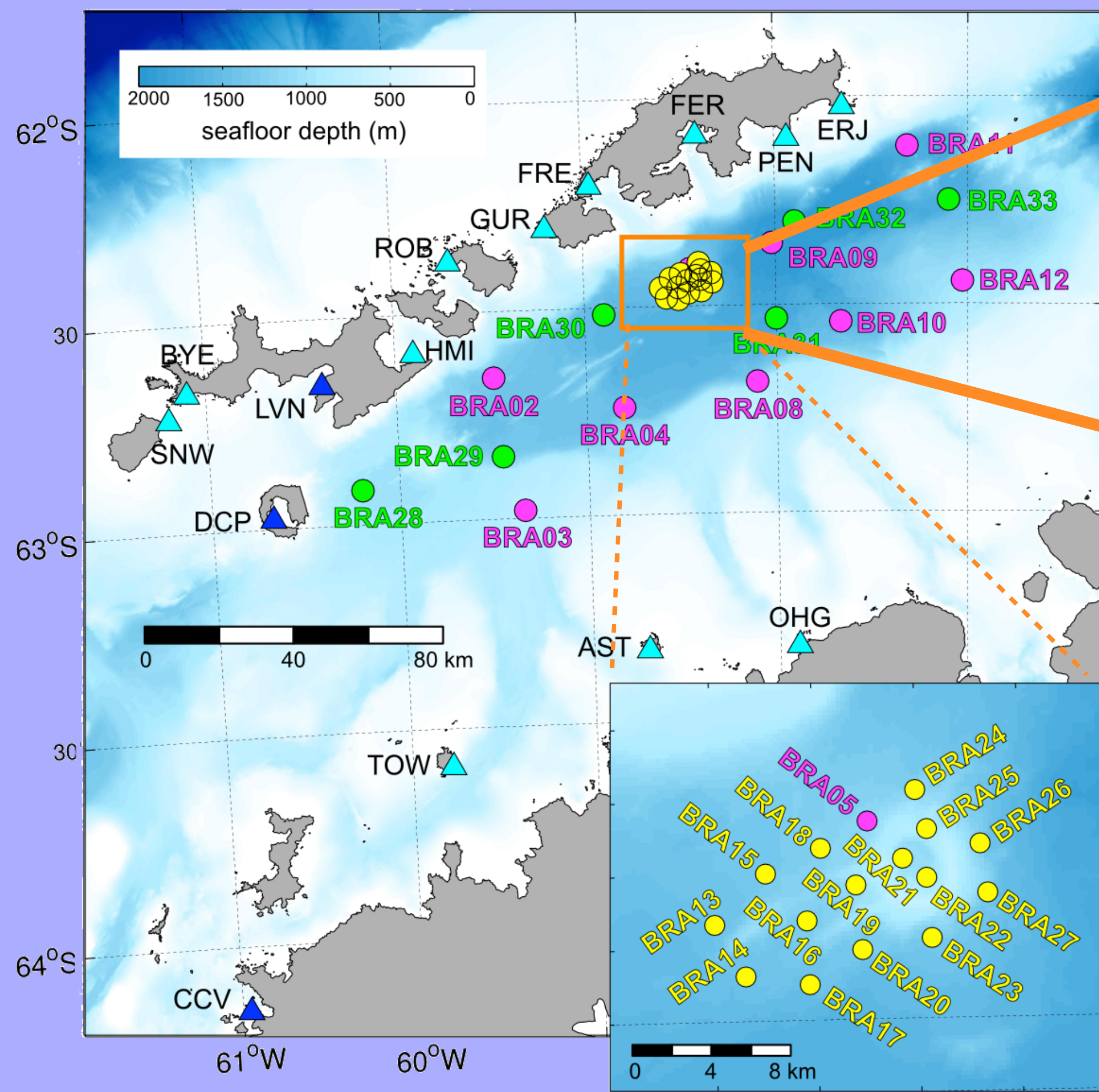


STUDY AREA



Orca Seamount

Central Basin Bransfield Strait



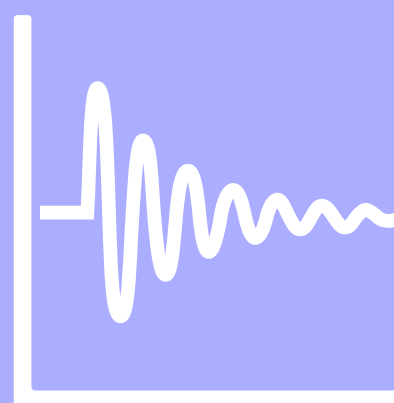
LOCAL OBS NETWORK

January 2019 - February 2020

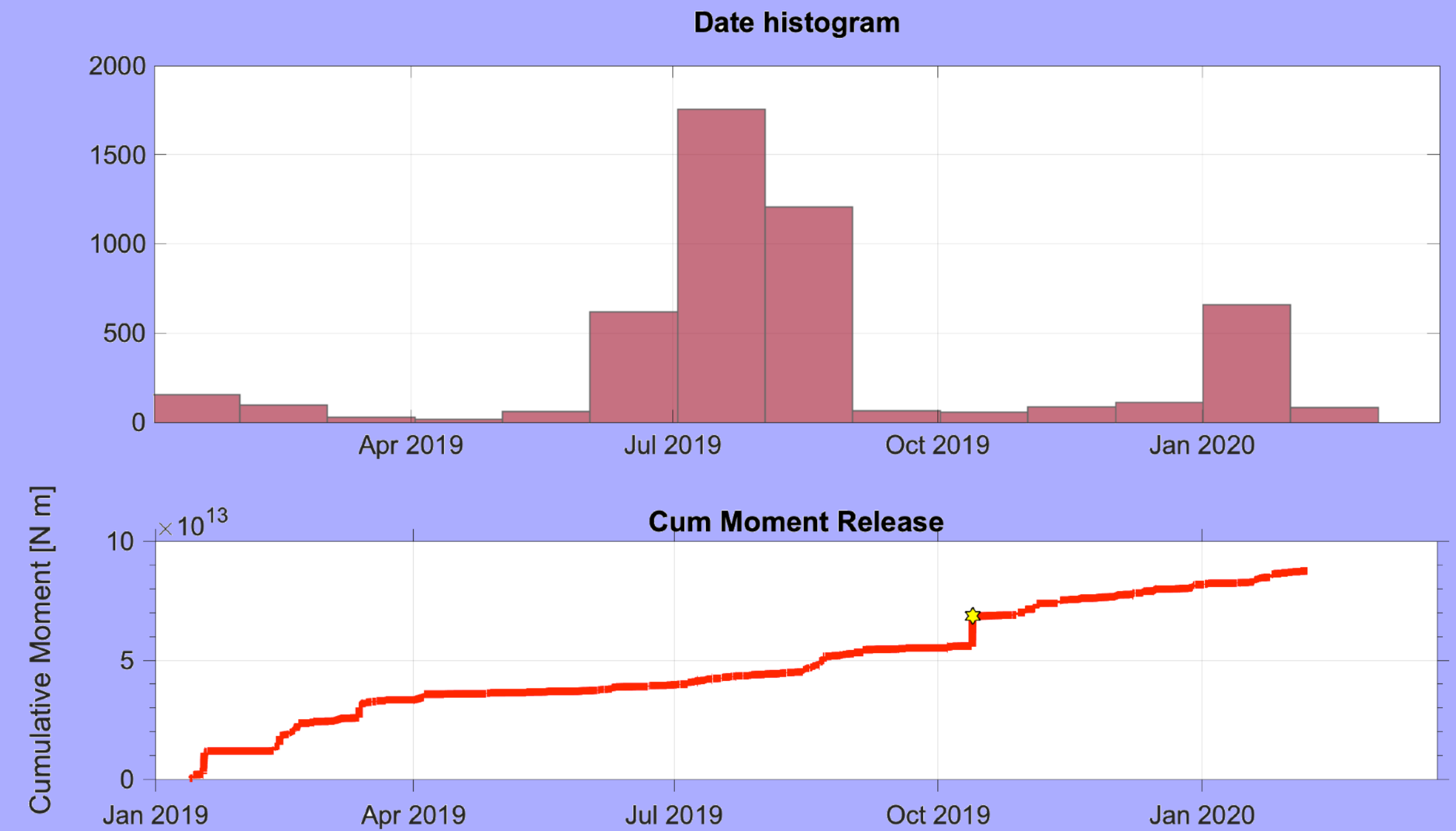
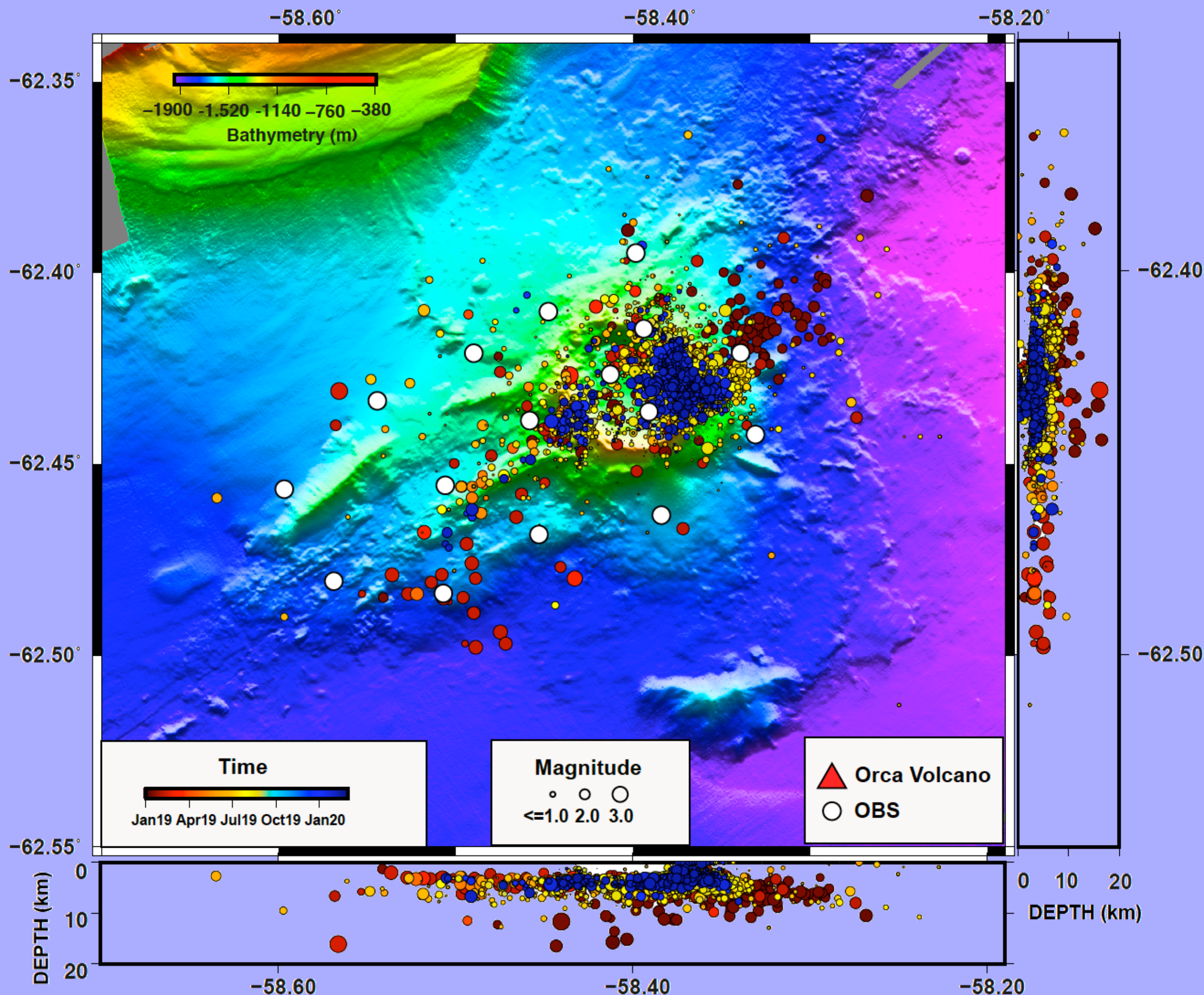
RECENT CONTEXT

Massive swarm M+6.0

August 2020



Microseismicity $-1 < M_L < 2.7$ 🔍



What's next ?

Are we observing precursory activity?

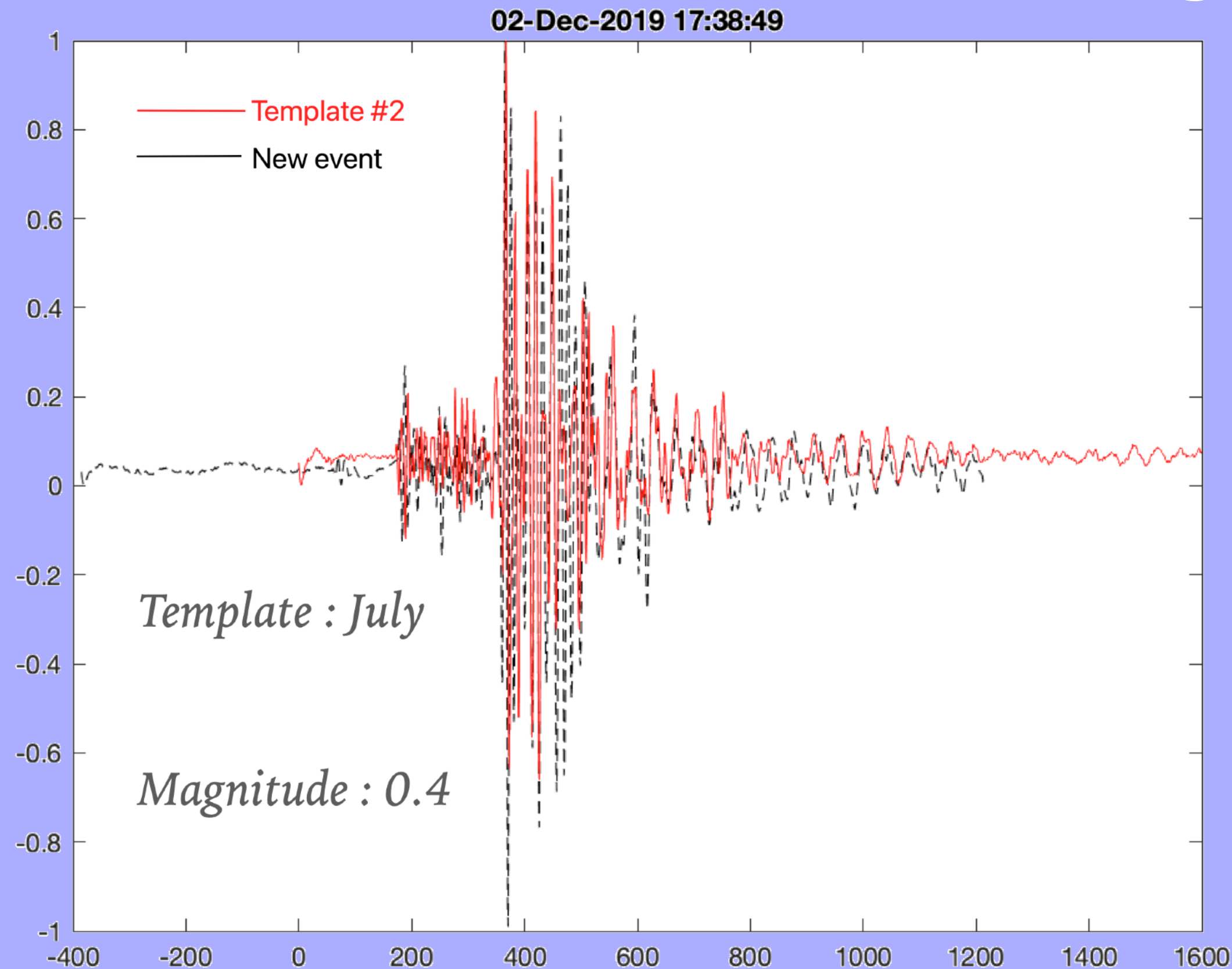
When 2020 swarm did really begin?

SUPER-EFFICIENT CROSS-CORRELATION

Senobari et al. (2019)

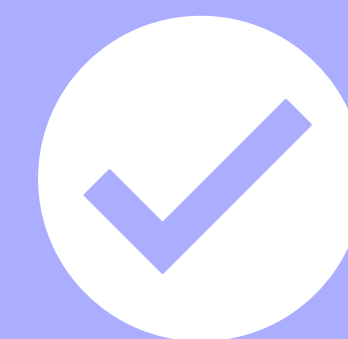


Matlab Environment



Detection Significance :

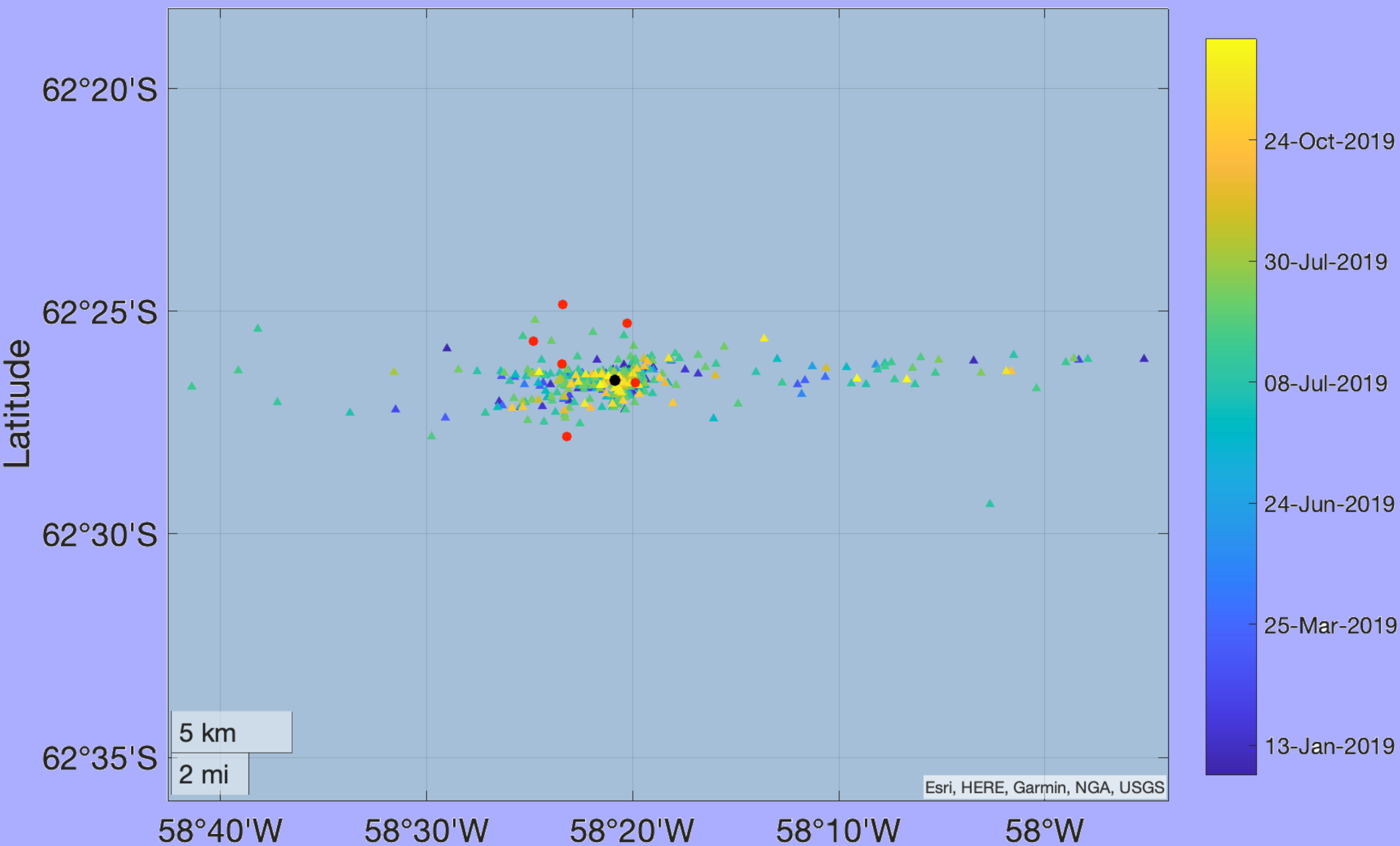
> 9 times Median Absolute Deviation



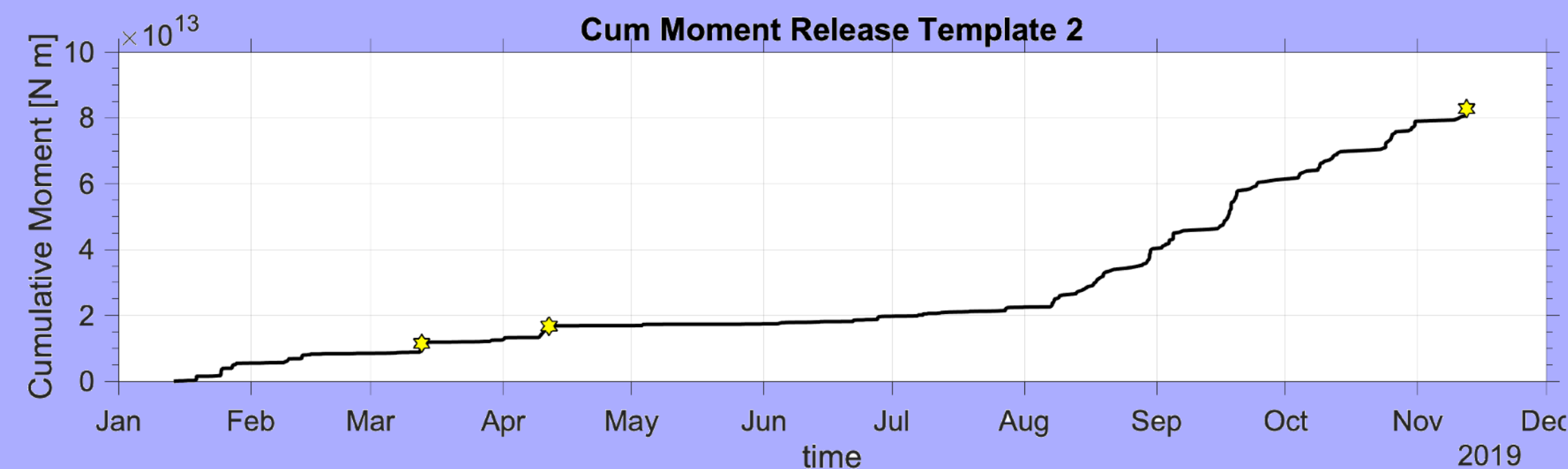
—> Positive Detection
Li and Zhan (2018)

- Senobari, N.S., Funning, G.J., Keogh, E., Zhu, Y., Yeh, C.M., Zimmerman, Z. & Mueen, A. (2019) Super-Efficient Cross-Correlation (SEC-C): A Fast Matched Filtering Code Suitable for Desktop Computers. *Seismological Research Letters*, 90, 322–334. [doi:10.1785/0220180122](https://doi.org/10.1785/0220180122)
- Li, Z. & Zhan, Z. (2018) Pushing the limit of earthquake detection with distributed acoustic sensing and template matching: a case study at the Brady geothermal field. *Geophysical Journal International*, 215, 1583–1593. [doi:10.1093/gji/ggy359](https://doi.org/10.1093/gji/ggy359)

446 events with Confidence ellipse and RMS < 0.31 s
From 13-Jan-2019 22:04:55 to 13-Nov-2019 22:15:54



—>Uncatalogued 1010 events
 ->963 events with ellipse
 of confidence
 ->446 events with low
 travel time residuals



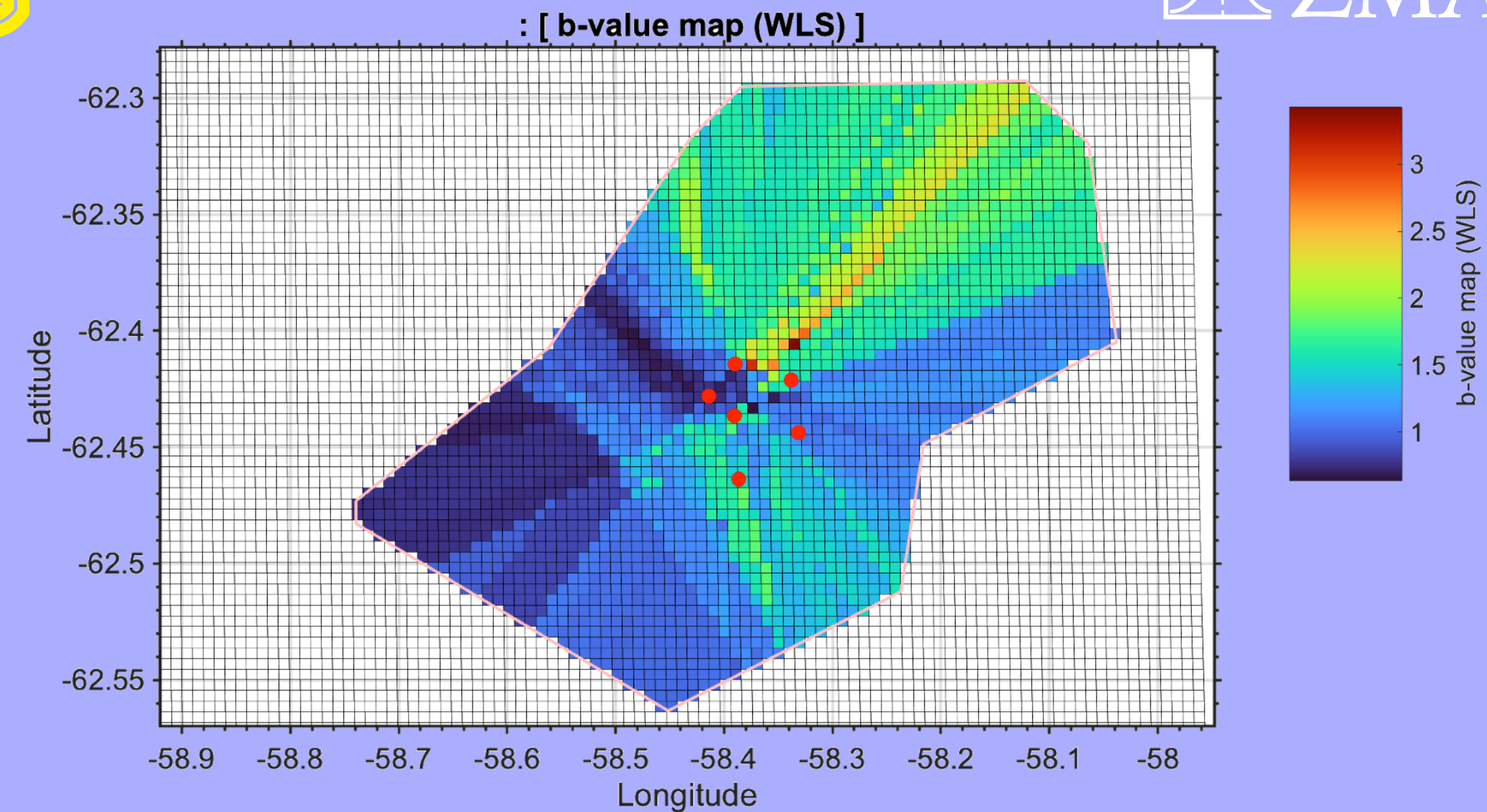
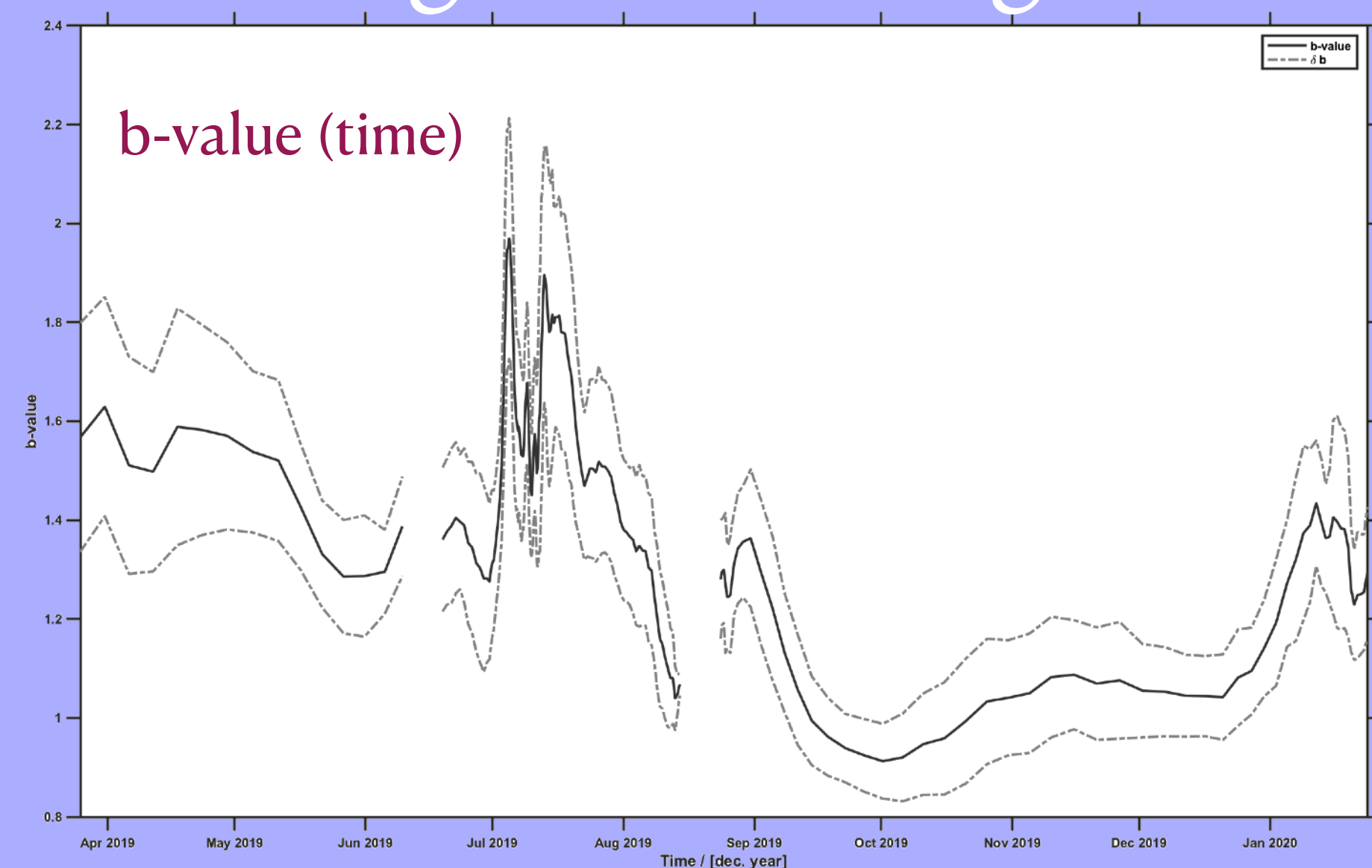
* Kalkan, E. (2016) An Automatic P -Phase Arrival-Time Picker. Bulletin of the Seismological Society of America, **106**, 971–986. doi:[10.1785/0120150111](https://doi.org/10.1785/0120150111)

** Saint Louis University https://www.eas.slu.edu/eqc/eqc_course/IntroSeis/Location/Location.html

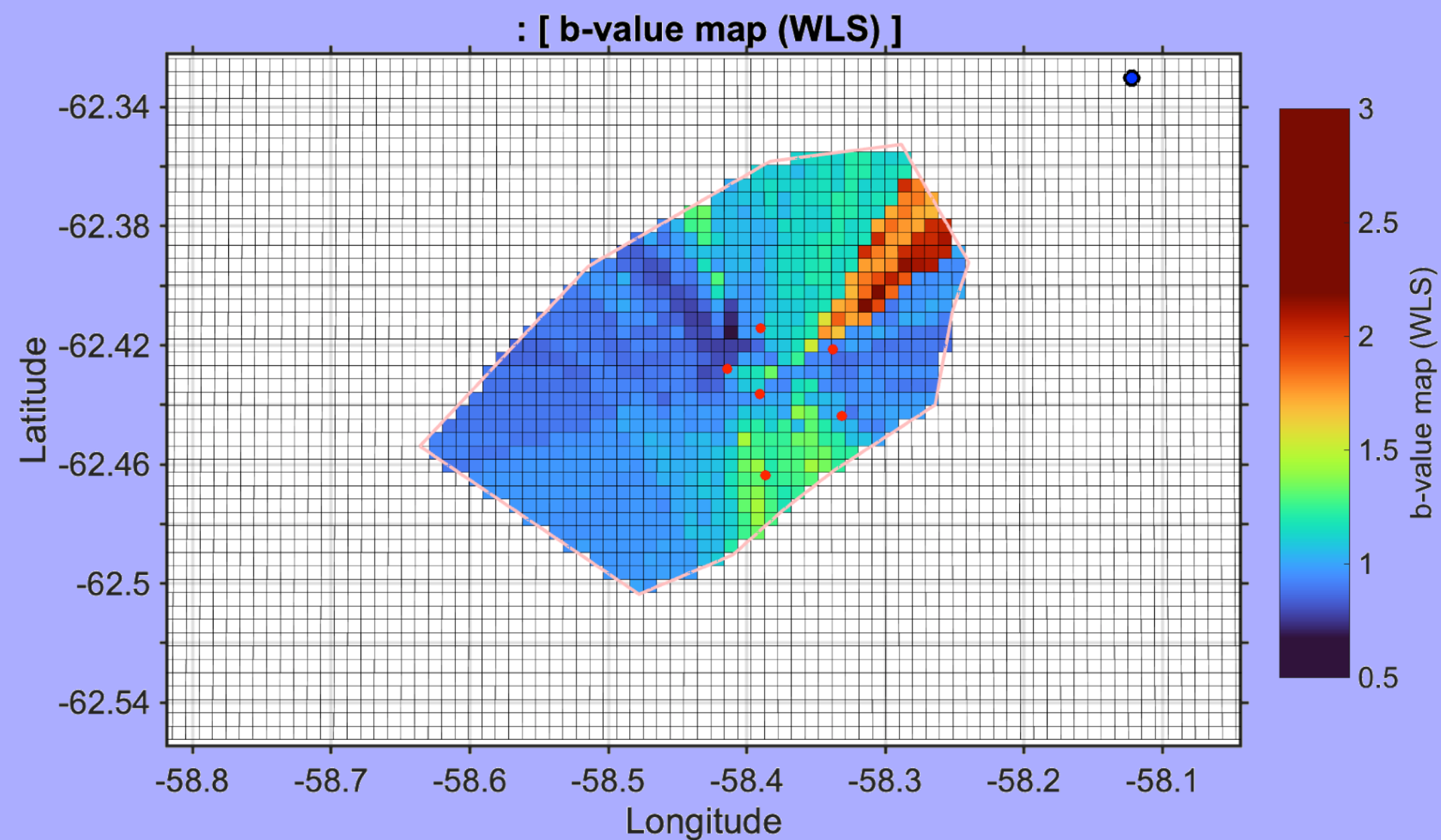
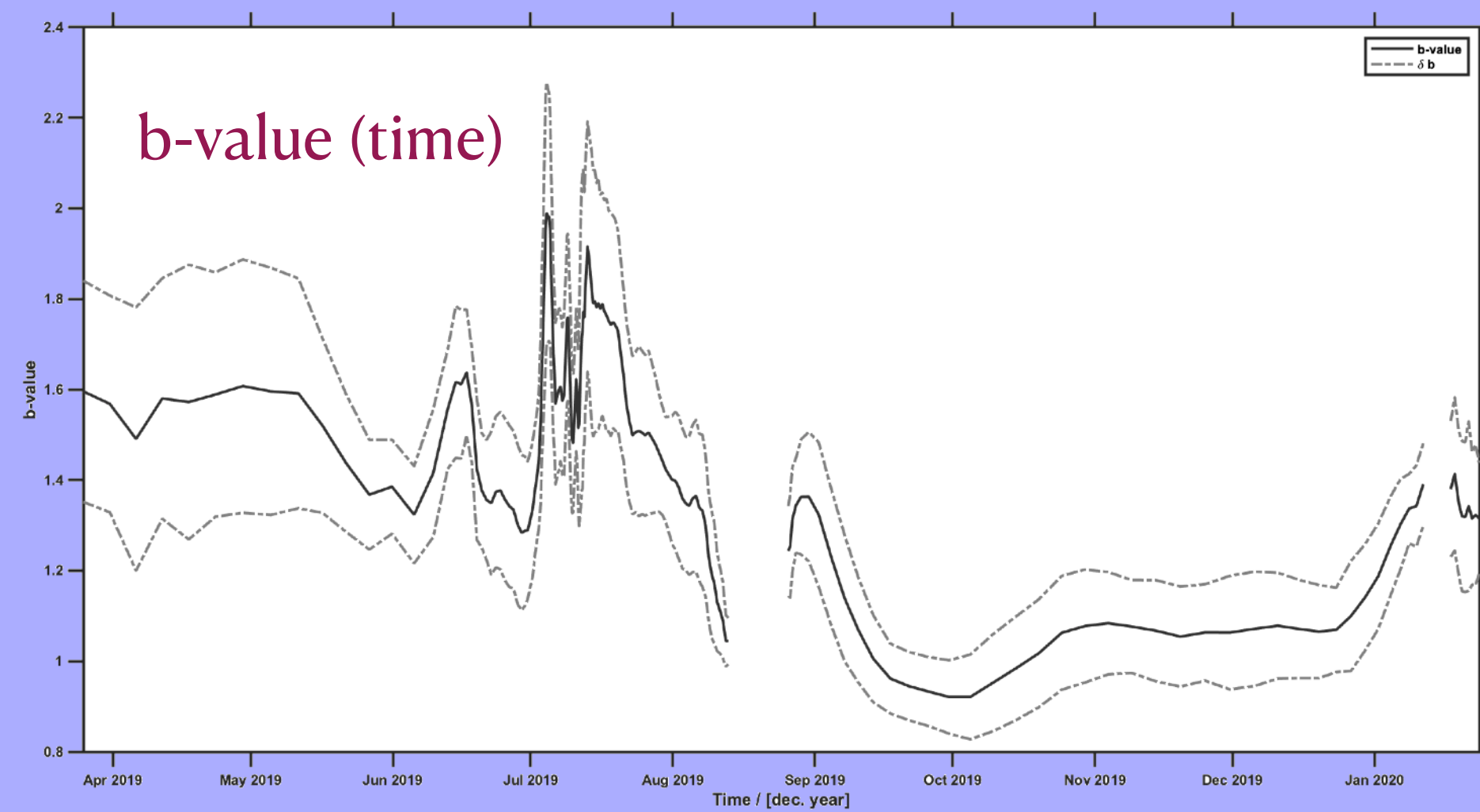


Automate phase-picker*
 Adapted Location code from
 SLU**

Original Catalogue



Adding Template Results



* Wiemer, S., 2001. A software package to analyze seismicity: ZMAP. Seismological Research Letters, 72(3), pp.373-382
<https://doi.org/10.1785/gssrl.72.3.373>

- ✓ Template Matching augmented ~ 20% Microseismic catalogue.
- ✓ Subtle b-value differences are observed.
- ✓ Trying more templates.
- ✓ Going Backwards 2018.