

Operational experience with next-generation automatic association software NET-VISA.

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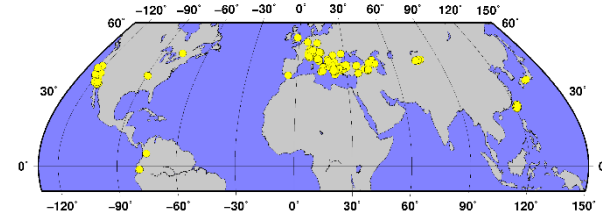
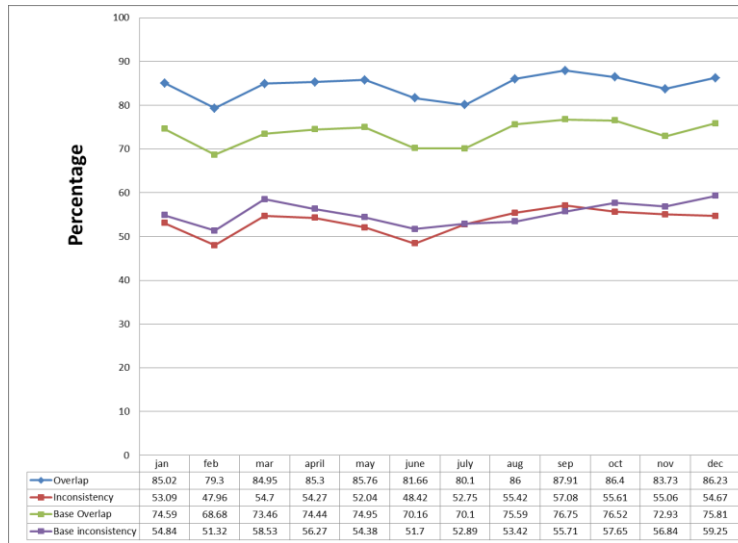
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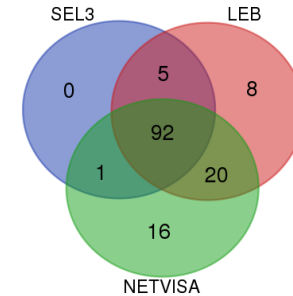
- Through reaching out to the science and technology community, including specialized workshops and a series of scientific conferences held in Vienna every other year, a Bayesian method was identified as promising to handle the automatic association problem.
- The software development plan started with a replacement of the current Global Association software by NET-VISA, which handles the stage of parametric data to bulletin. An initial plan, which has led to several research projects was to also explore the complete problem from waveforms to bulletins (SIG-VISA).
- Contrary to the current Global Association problem which is based on heuristics with no objective function to optimize the set of events formed from the set of detections, NET-VISA uses a probability model parameterized using the existing analyst-reviewed statistics and optimizes this set.
- Scientific paper published in BSSA: Arora, N.S., Russell, S., and Sudderth, E., 2013, NET-VISA: Network Processing Vertically Integrated Seismic Analysis, Bulletin of the Seismological Society of America, Vol. 103, No. 2a, pp. 709–729, doi: 10.1785/0120120107



Comparison of missed events and false alarms over a one year test (2013) is very favorable to Net-VISA.



Bulletin	Number events
Total GT	292
GT in LEB	125
GT in NET-VISA	129
GT in SEL3	98
GT only	146

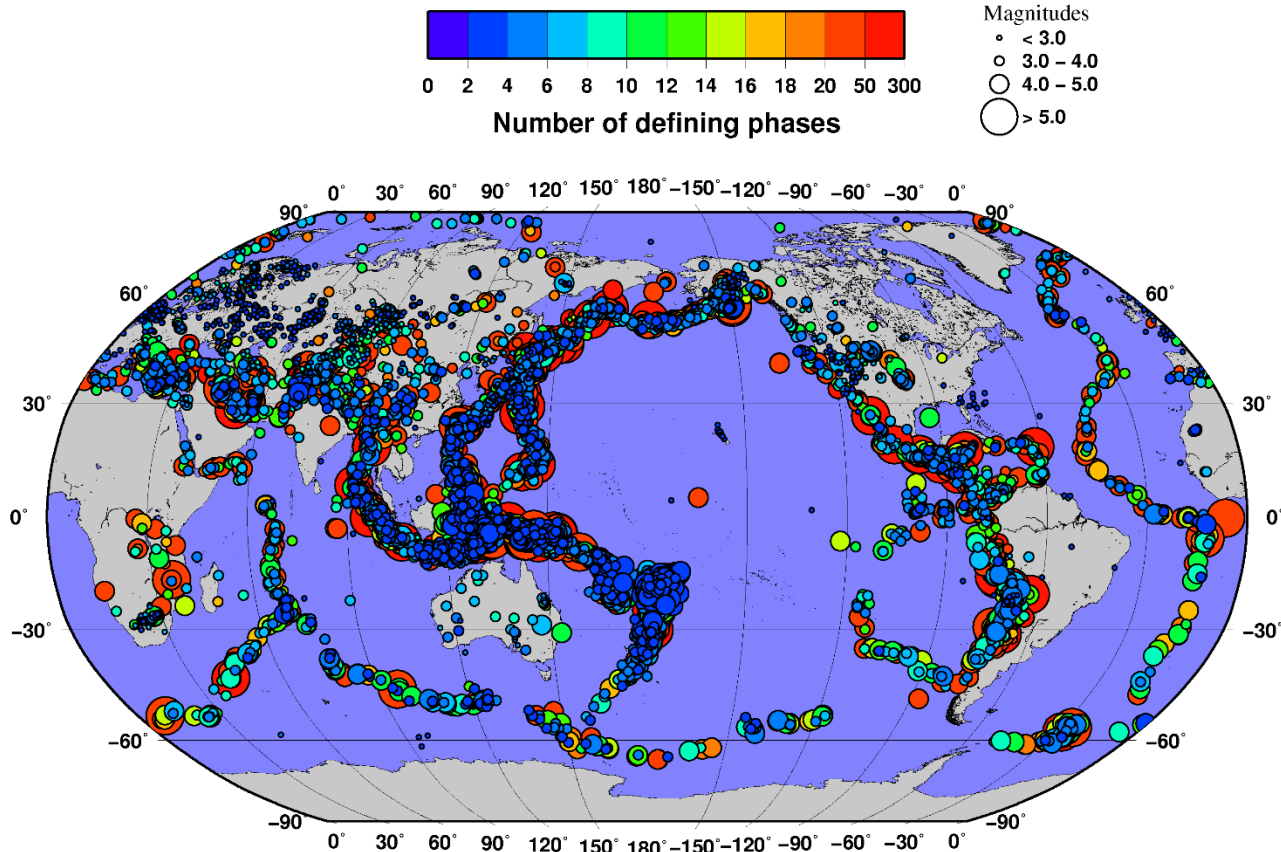


Comparison of performance on ISC Ground-Truth events for 2013 is also very favorable to NET-VISA.

- Global Association (GA) software operational at the CTBTO IDC since 11 June 1999, coming close to its 19th anniversary of continuous operation.
- Starting in July 2017, a parallel automatic pipeline is running NET-VISA, using the same input arrivals as GA, but processing only primary seismic stations.
- Since 1 January 2018, analysts have systematically used the ‘NET-VISA button’, an interactive device that allows them to access the events additional to the ones they have already analysed in provenance from the SEL3 automatic bulletin produced by GA.
- An analysis of the provenance of the LEB and REB events from either SEL3, VSEL3 or Scanner/manual scan is presented here for the period 1 January - 30 April 2018.

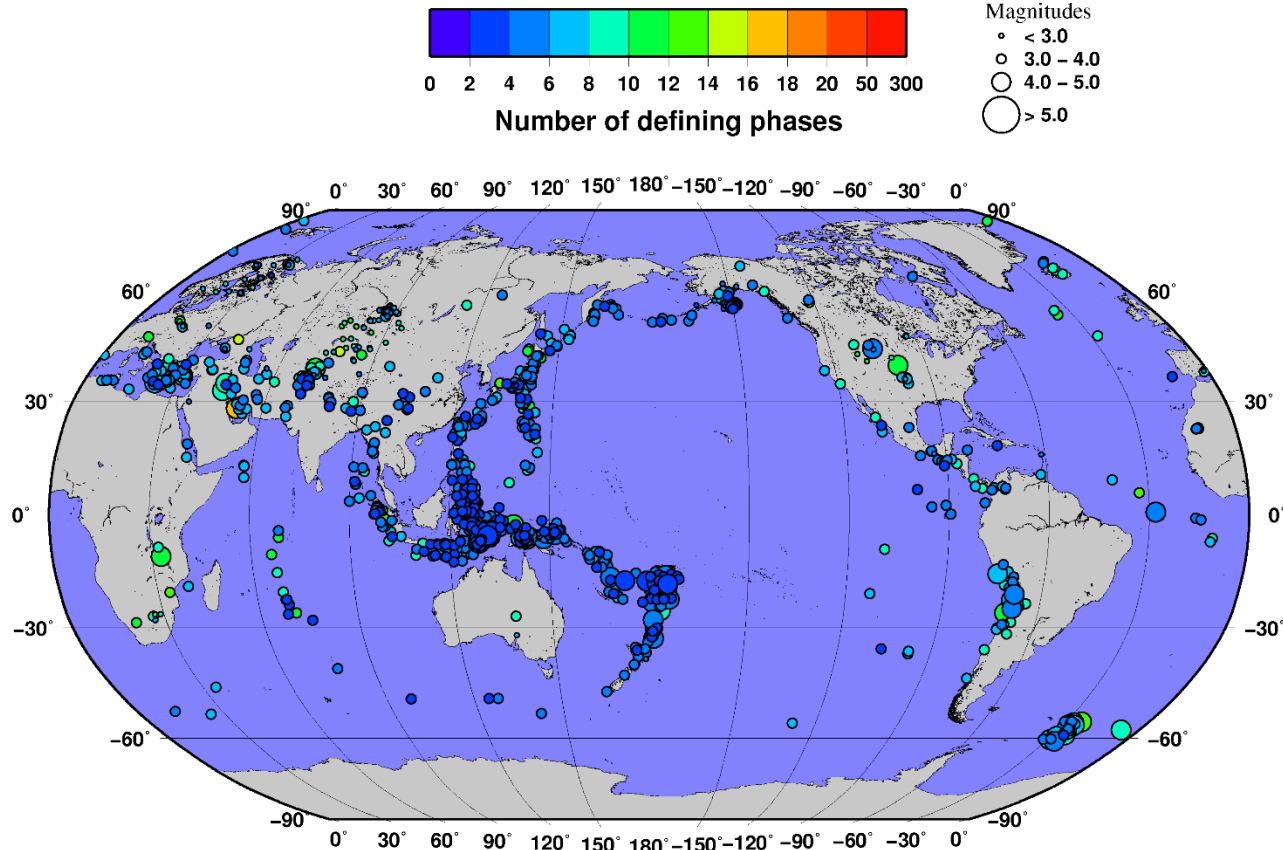
VSEL3 in operations – LEB bulletin

1 January – 30 April 2018 – 16,317 events



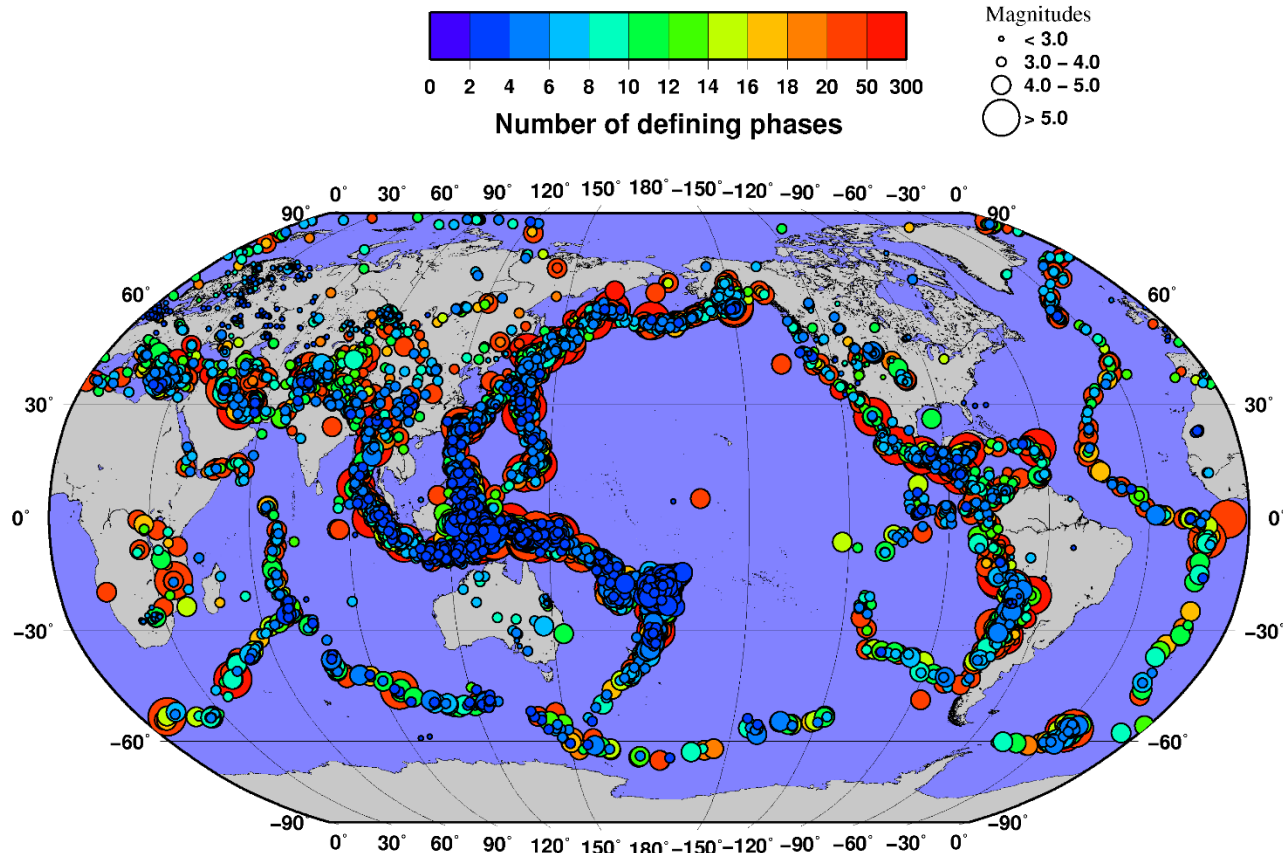
VSEL3 in operations – LEB events from VSEL3

1 January – 30 April 2018 – 1,569 events



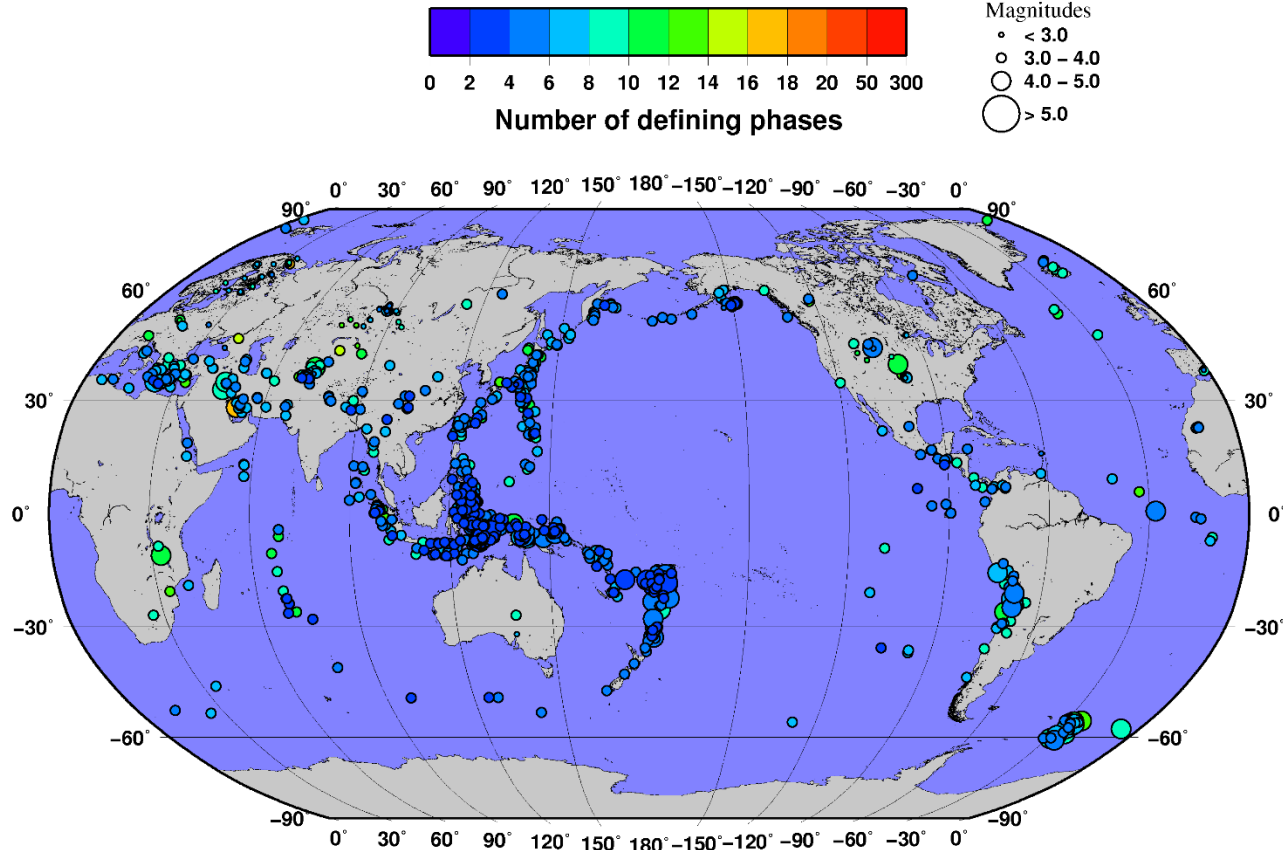
VSEL3 in operations – REB bulletin

1 January – 30 April 2018 – 12,819 events

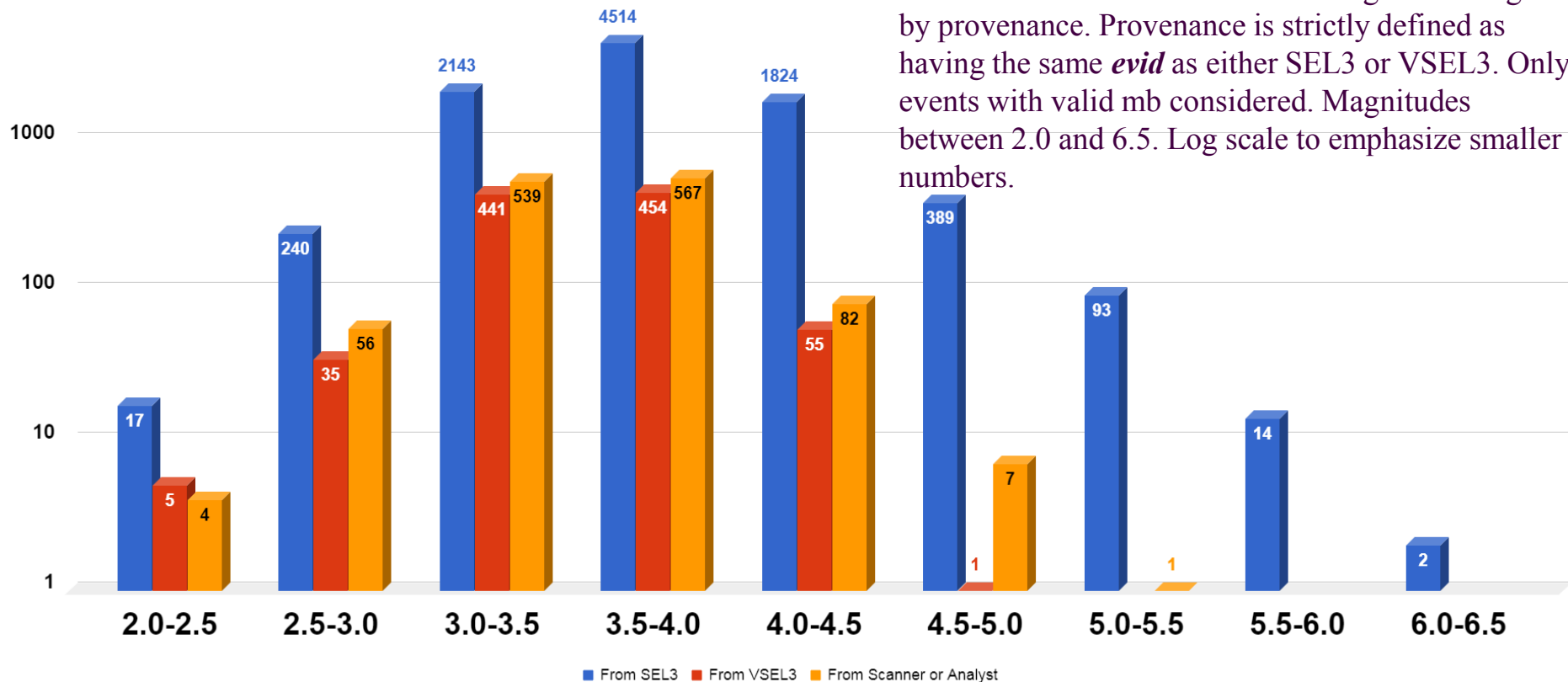


VSEL3 in operations – REB events from VSEL3

1 January – 30 April 2018 – 1,174 events



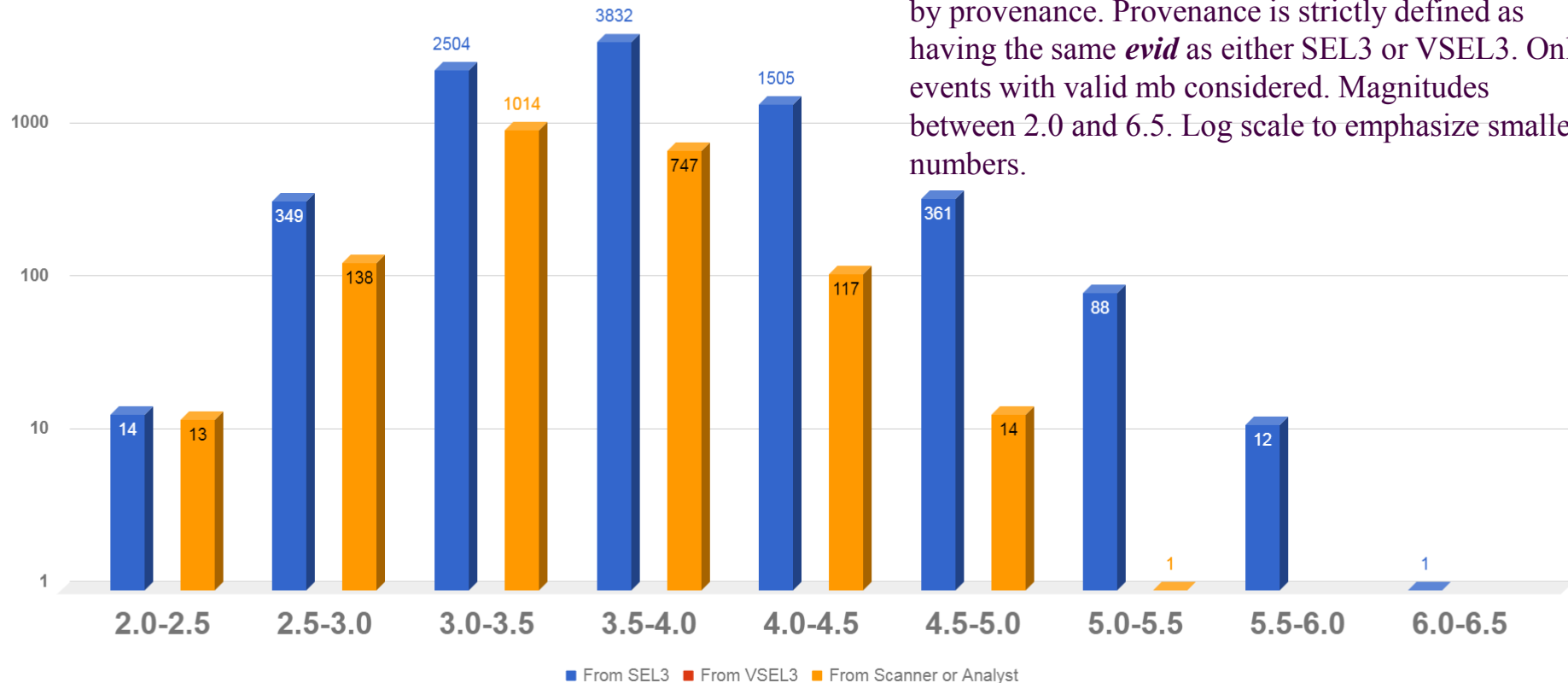
Provenance SEL3, VSEL3, Scanner or Analyst per mb interval



VSEL3 in operations – REB events provenance by mb value

1 January – 30 April 2017

Provenance SEL3, VSEL3, Scanner or Analyst per mb interval

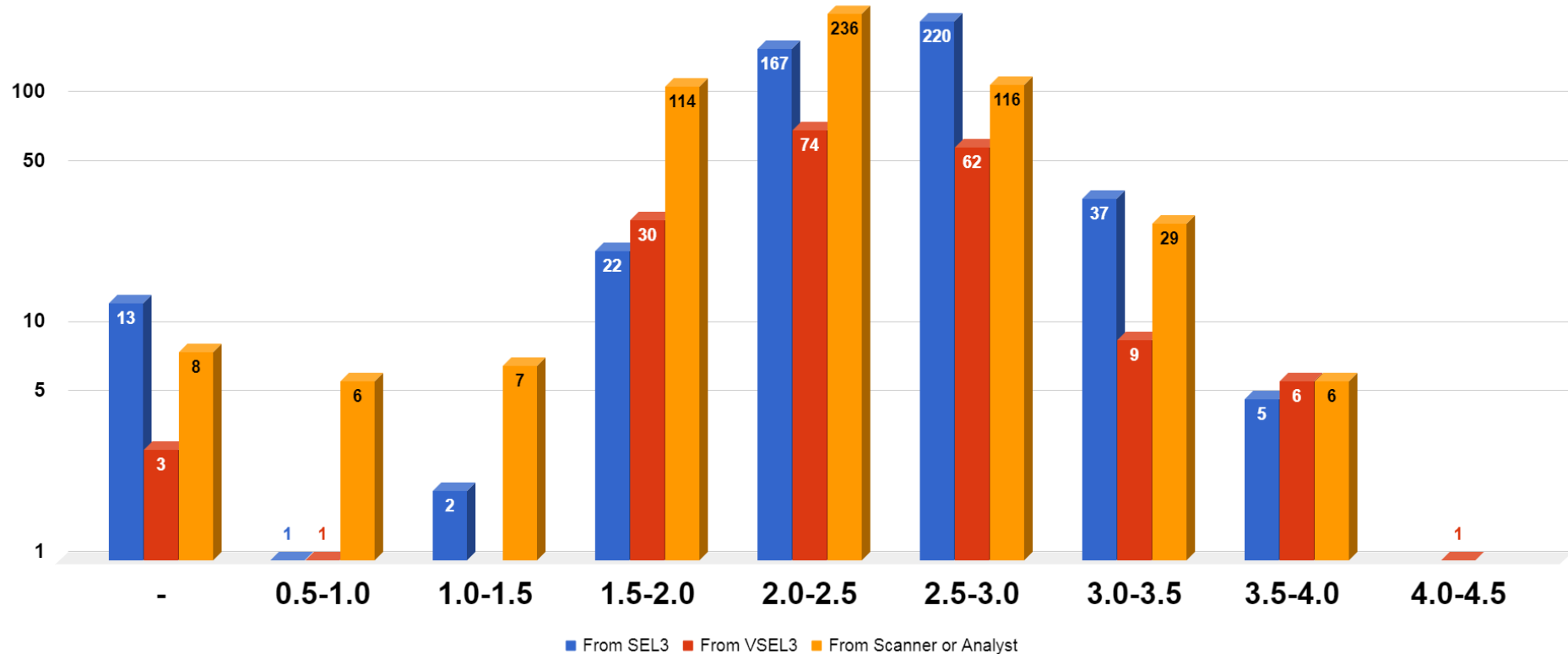


Number of events in each 0.5 mb magnitude range by provenance. Provenance is strictly defined as having the same *evid* as either SEL3 or VSEL3. Only events with valid mb considered. Magnitudes between 2.0 and 6.5. Log scale to emphasize smaller numbers.

VSEL3 in operations – REB events provenance by ML value

1 January – 30 April 2018

Provenance SEL3, VSEL3, Scanner or Analyst per ML interval

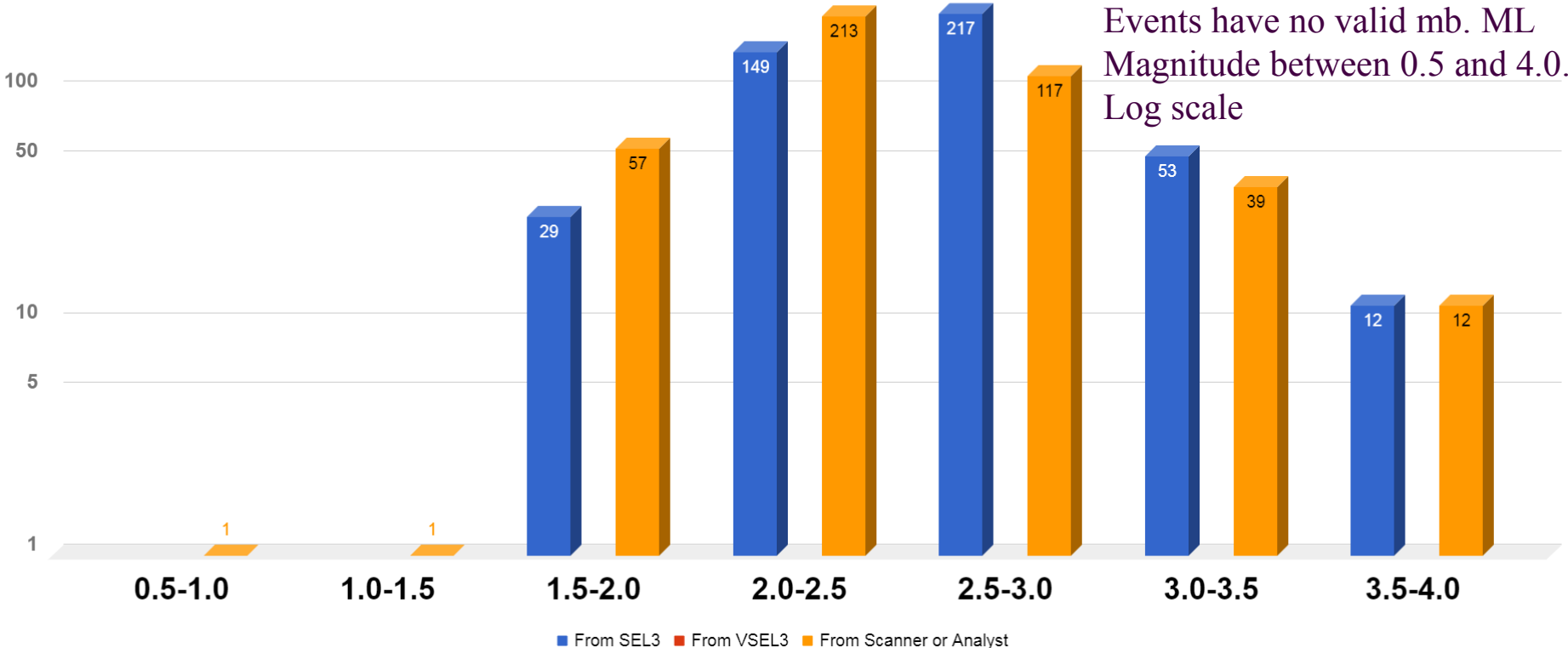


VSEL3 in operations – REB events provenance by ML value

1 January – 30 April 2017

Provenance SEL3, VSEL3, Scanner or Analyst per ML interval

Number of events in each 0.5 ML magnitude range by provenance. Events have no valid mb. ML Magnitude between 0.5 and 4.0. Log scale



- Use of the NET-VISA button in an operational context has confirmed that additional REB events are obtained from the VSEL3 pipeline as was expected from the statistical off-line results. At least 10% better overlap than SEL3.
- The majority of additional events complete the bulletin at magnitudes less than 4, but a small number are found within the magnitude range of mb from 4 to 4.5, which are significant for monitoring purpose.
- Further analysts tests should confirm additional advantages of NET-VISA such as completeness of events, when auxiliary seismic stations are included in the processing.
- A significant improvement in infrasound events overlap is expected when introducing infrasound processing.
- A more recent version of NET-VISA includes significant improvements to the detection of regional events and it is expected that bulletin completeness will further improve in the lower magnitude range.