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Experience with the NET-VISA "button" and VSEL3 bulletin at the IDC
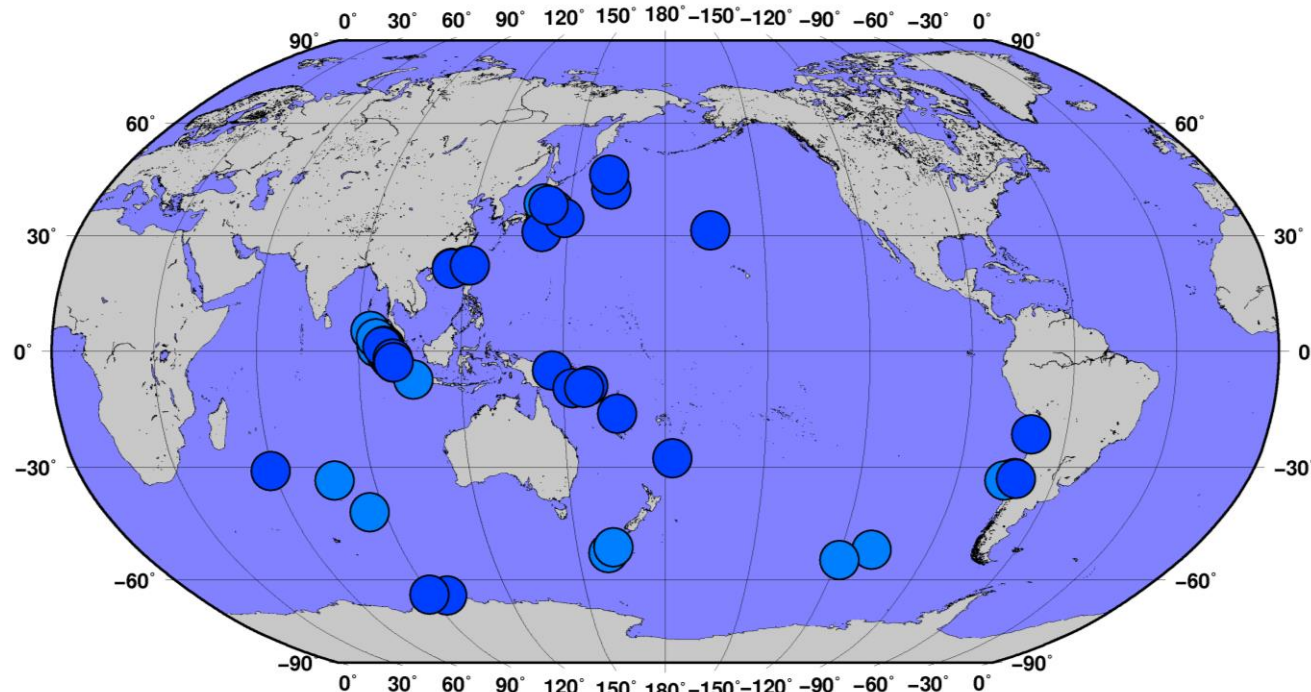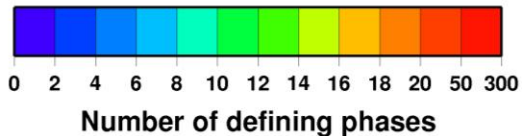
Waveform Experts Group 51
29 August 2018

Ronan Le Bras, Elena Tomuta, Pierrick Mialle, Noriyuki Kushida and Nimar Arora

- Development efforts have led to significant improvements in the latest development version 2.3.6 (see WEG 51 talk on the topic by Nimar Arora):
  - ➢ Handling of regional events. This has led to a 10 percent increase in overlap for regional events.
  - ➢ Taking into account noise level priors.
- Deployment of the VSEL3 pipeline and NET-VISA 2.2.50 in June 2018. Primary and auxiliary (requested by SEL1 and SEL2) seismic, hydroacoustic, and infrasound stations included.
- Upgrades to the NET-VISA 'button' to accommodate infrasound events analysis.
- Preparation for a full parallel and independent three-pipeline processing suite (VSEL1, VSEL2, and request of auxiliary stations from NET-VISA events. This is now being installed on the development LAN.

NET-VISA project status

- Since 1 January 2018, analysts have systematically used the 'NET-VISA button'. In a first stage which was reported on at the WEG50, NET-VISA version 2.2.44 was used to build VSEL3 with only primary stations. Since 20 June 2018, VSEL3 includes auxiliary station detections requested by SEL1 and SEL2 (GA). An analysis of the provenance of the LEB and REB events from either SEL3, VSEL3 or Scanner/manual scan is included in this presentation.

- To help in identifying Scanner events, a tracing mechanism is being put in place to understand if an event originates in Scanner or has been built manually by the analysts.

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Number of defining phases

0 2 4 6 8 10 12 14 16 18 20 50 300

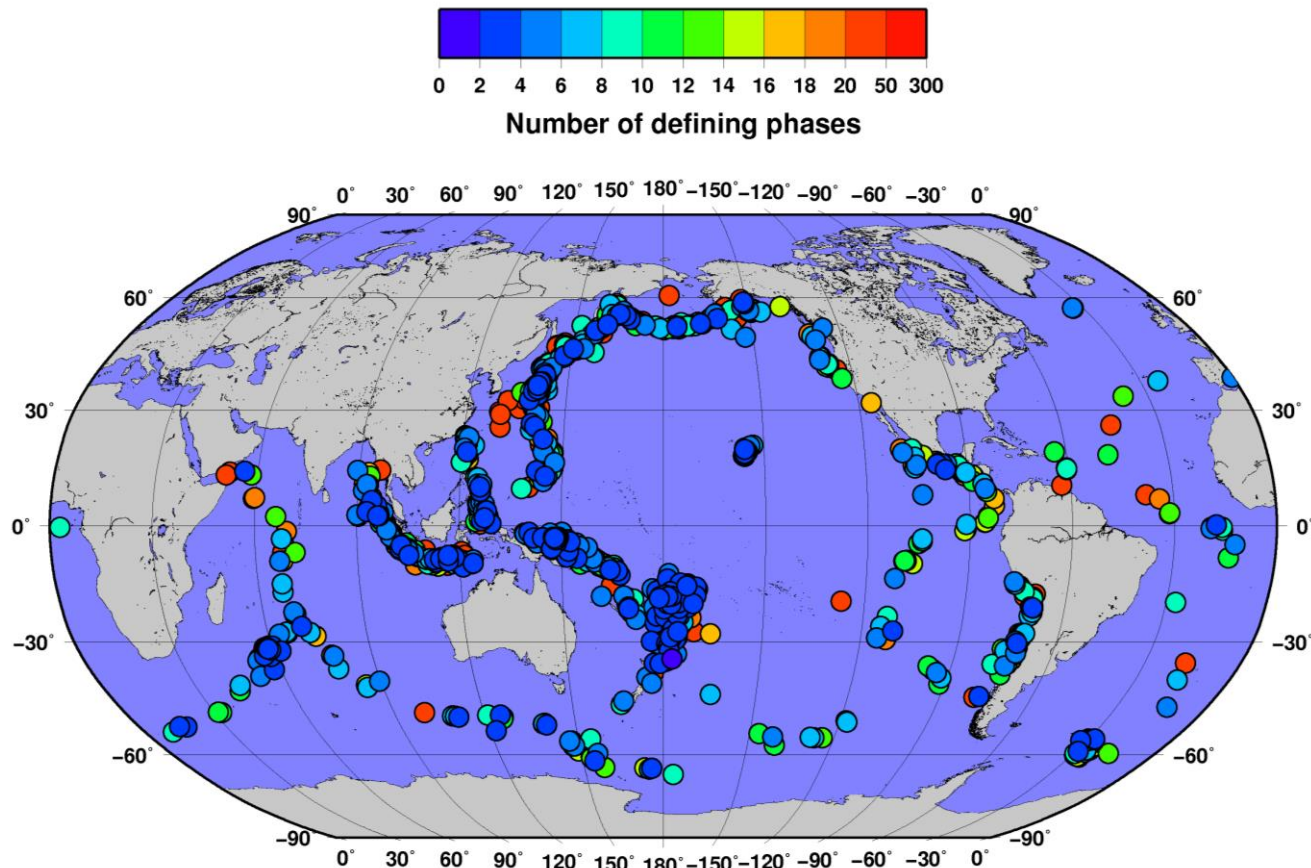22 June – 2 August, 2018
Events with H phases:

- VSEL3 54 events out of a
  total of 7117 events
  (0.8%). None end-up as
  in-water explosion.

For comparison:
- SEL3 28 events out of
  6003 (0.5%). None end-
  up as in-water explosion.

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Number of defining phases
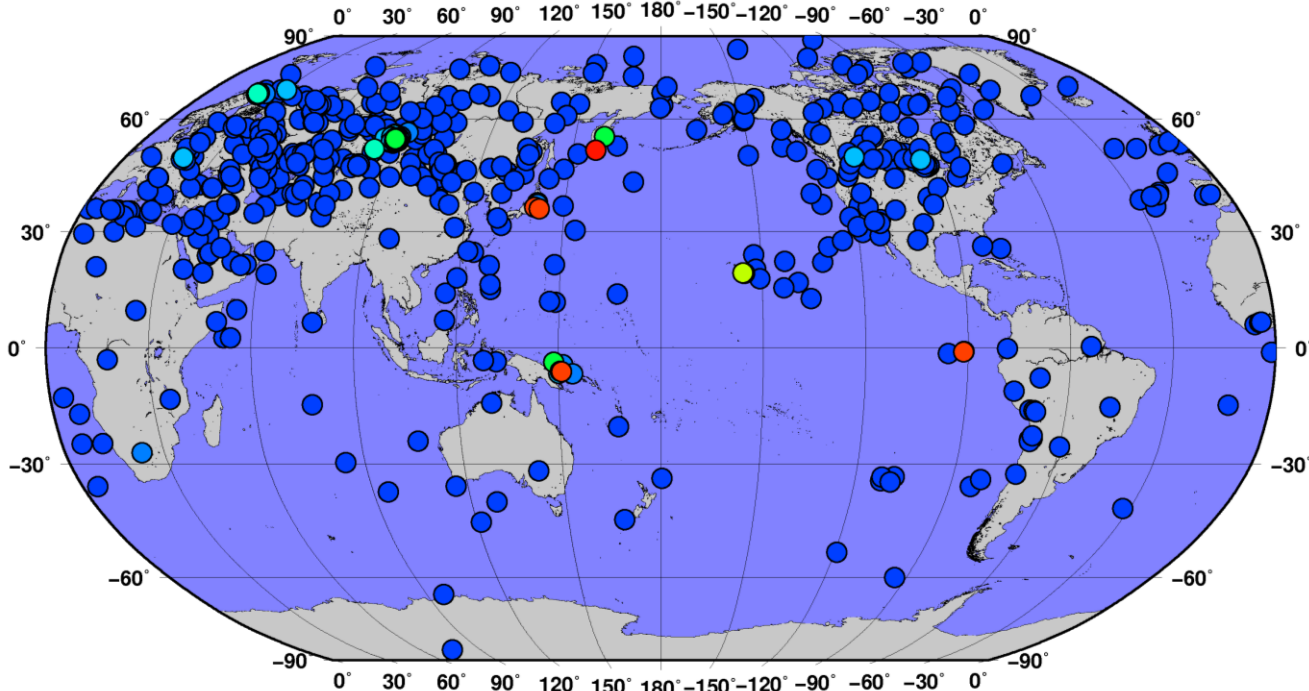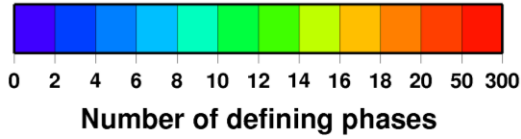
0 2 4 6 8 10 12 14 16 18 20 50 300

22 June – 2 August, 2018
Events with T phases:

- VSEL3 1382 events out of a total of 7117 events (19.4%).

For comparison:
- SEL3 1228 events out of 6003 (20.5%)

NET-VISA project status
Events with **I phases** in VSEL3

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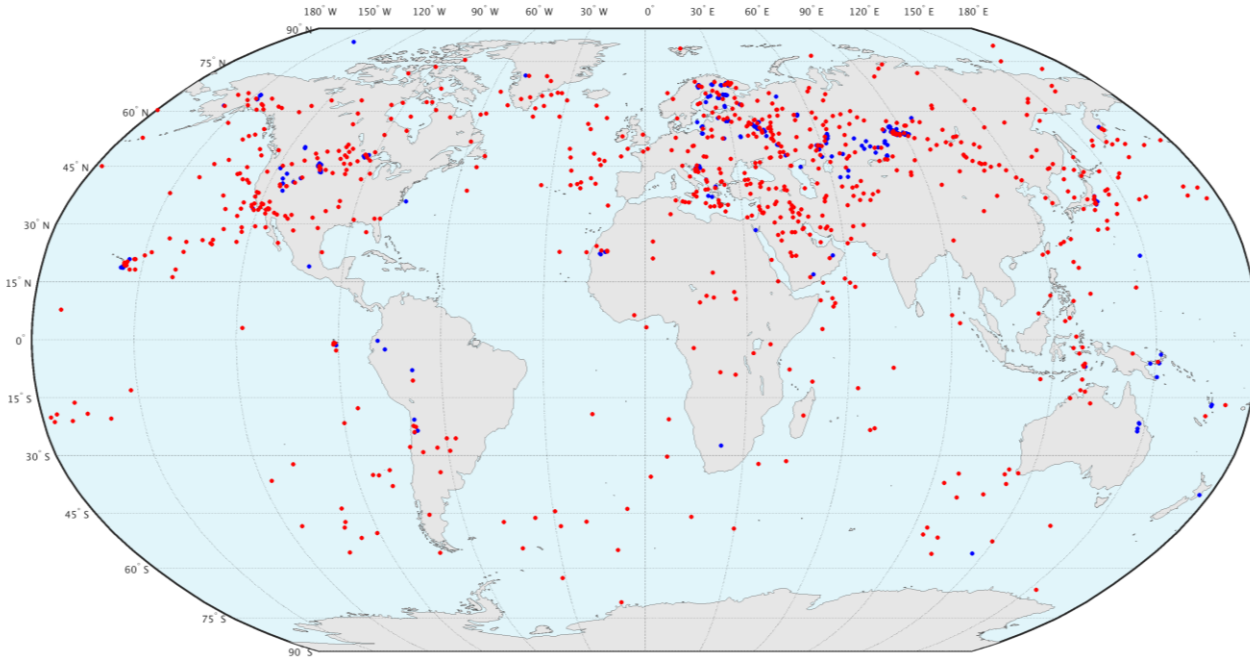treaty organization

Number of defining phases

22 June – 2 August, 2018
Events with I phases:

- VSEL3 590 events out of a total of 7117 events (8.3%).

For comparison:
- SEL3 768 events out of 6159 (12.5%)

Period: 22 June – 2 August, 2018

Comparison SEL3 vs LEB

All Infra events	Number of events	Number of events per day
LEB	623	15.2 /d
SEL3	768	18.7 /d
VSEL3	590	14.4 /d

All Infra events	Number of events	Number of events in LEB
SEL3	768	132 (17.2%)
VSEL3	590	161 (27.3%)

↓ +10.1%

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Period: 22 June – 2 August, 2018

Comparison LEB vs NET VISA
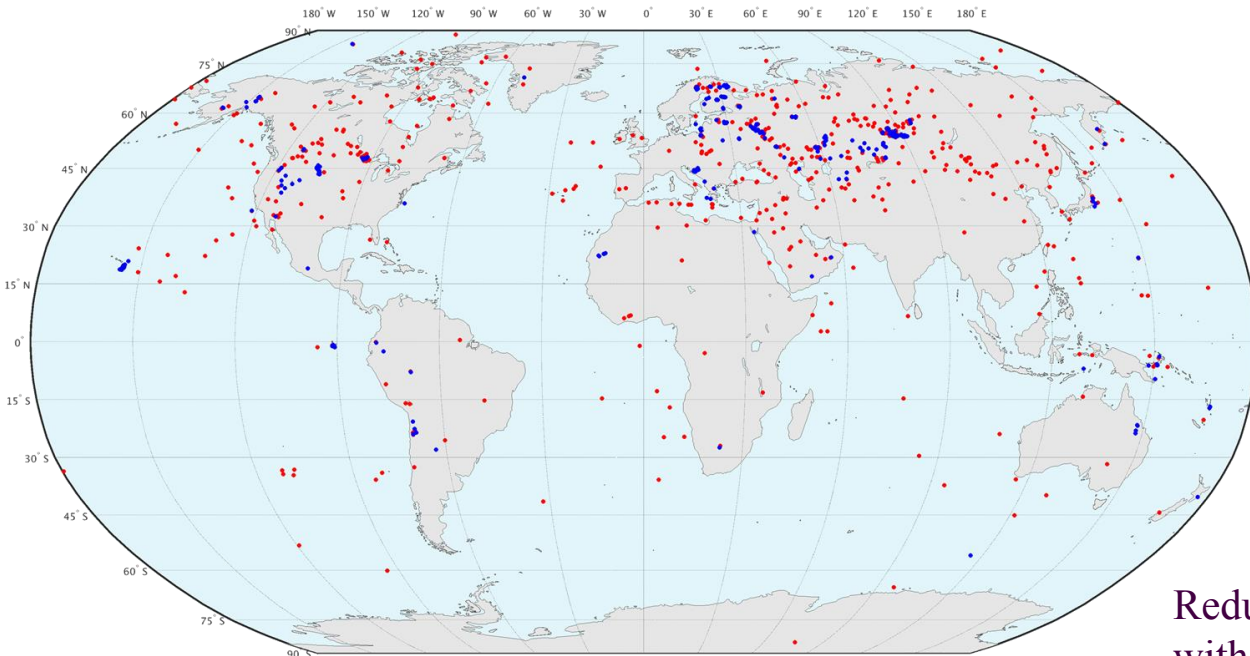
All Infra events	Number of phase associated	Number of phase in LEB
SEL3	1669	236 (14.1%)
VSEL3	1116	235 (21.1%)

Larger overlap

Pure Infra	Number of I seed events	Contribution to LEB
LEB	192	
SEL3	611	77 (40.1%)
VSEL3	491 (-20%)	76 (39.6%)

-19.6%

Reduced number of automatic events
with better performances = expected
reduction of analyst workload

VSEL3 in operations – REB events provenance by mb value
22 June – 2 August 2018

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 6.0. Log scale to emphasize smaller numbers.
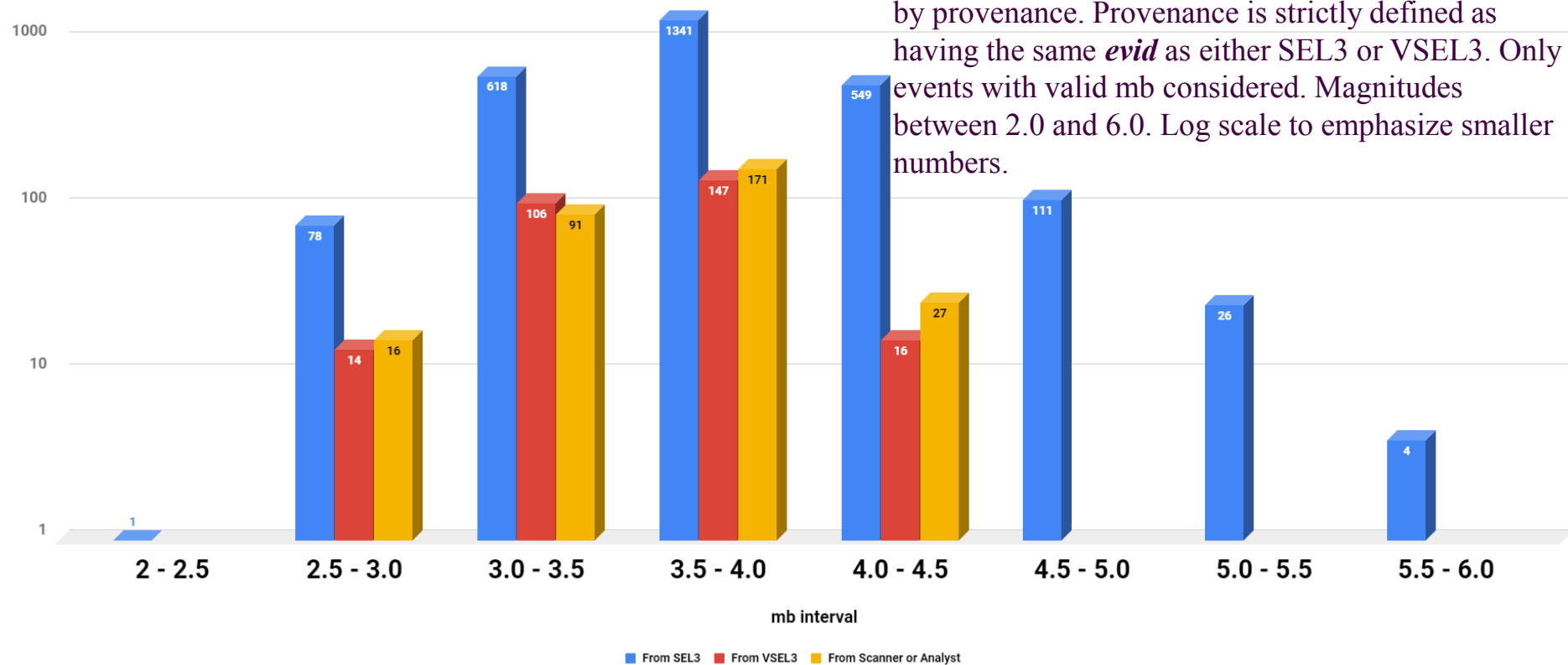
VSEL3 in operations – REB events provenance by ML value
22 June – 2 August 2018

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Provenance SEL3, VSEL3, Scanner or Analyst per ML interval
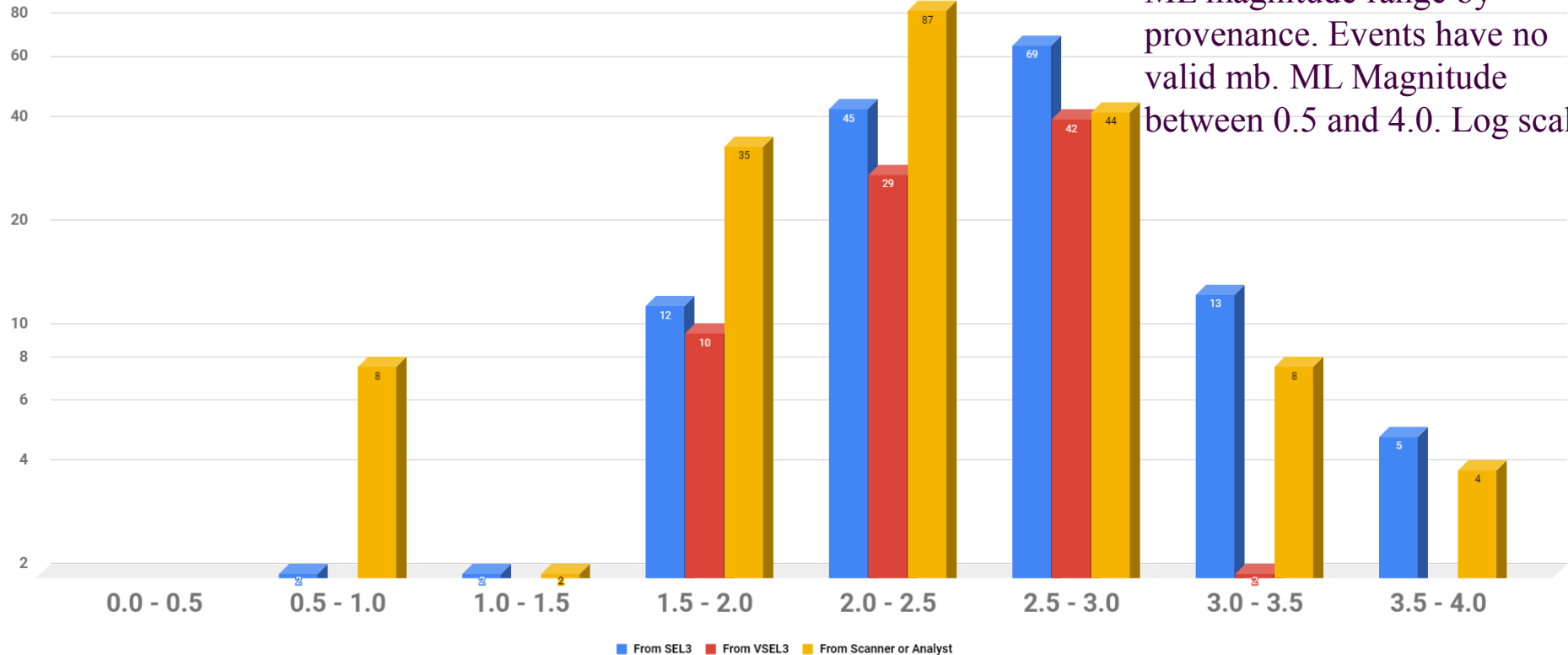
Number of events in each 0.5 ML magnitude range by provenance. Events have no valid mb. ML Magnitude between 0.5 and 4.0. Log scale

From SEL3   From VSEL3   From Scanner or Analyst

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Station contribution to IDC bulletins

Period: 22 June – 2 August, 2018
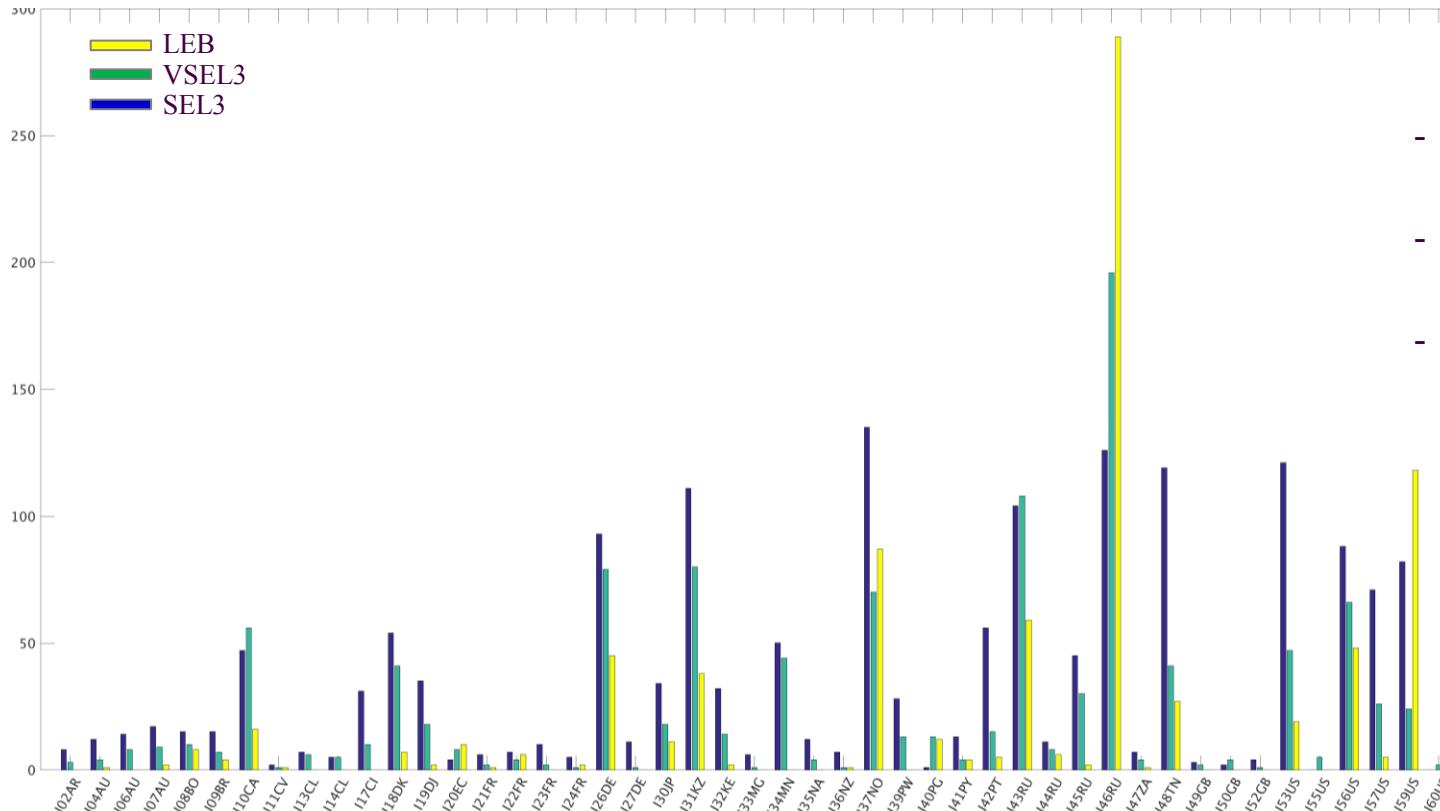
- Overall VSEL3 lower the contribution of I stations
- VSEL3 better match with LEB
- Seismo-acoustic activity (esp. around ZALV / I46RU) better captured by Net-VISA

VSEL3 in operations
Addition of auxiliary seismic network

	Bulletin	Total number of events	Number of events from VSEL3	Number of events from VSEL3 with AUX stations in LEB/REB	Percentage of events from VSEL3 with AUX stations	Number of events from VSEL3 with AUX stations common to VSEL3 and LEB/REB	Percentage of events from VSEL3 overall
January 1 – February 16, 2018 NET-VISA 2.2.44	LEB	6145	622	453	72.82	0	**10.12**
	REB	4925	484	315	65.08	0	**9.82**
June 22 – August 2nd, 2018 NET-VISA 2.2.50	LEB	4523	488	406	83.20 (+10.4%)	299	**10.79**
	REB	3766	367	285	77.66 (+12.6%)	200	**9.75**

About 10% of the events added by VSEL3 – Analyst's work facilitated by addition of Auxiliary stations to VSEL3.

VSEL3 in operations
Comparison with SEL3

	Bulletin	Total number of events	Average size (using *ndef* parameter)	Ratio of number of auxiliary stations to ndef	Number of auxiliary associations ending in REB (both in automatic and REB)	
June 22 – August 2nd, 2018 NET-VISA 2.2.50	SEL3	5892	6.11	0.25	3799	
	VSEL3	6982	7.63	0.34	9873	• Larger average *ndef* • Larger ratio of auxiliary associations
	LEB	4523	11.71	0.44	32544 (total in LEB)	
	REB	3766	13.19	0.46	30936 (total in REB)	

VSEL3 in operations
Gain in efficiency

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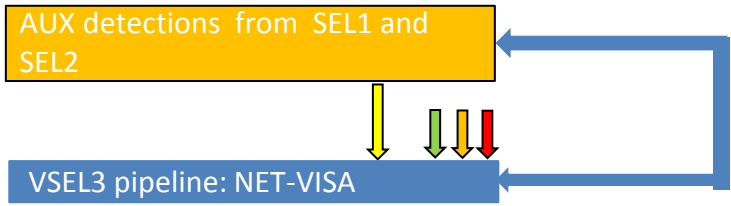
	Total automatic auxiliary detections in LEB	Automatic auxiliary detections both in VSEL3 and LEB	Automatic auxiliary detections both in VSEL3 and LEB associated to the same event	Auxiliary detections both in SEL3 and LEB	Auxiliary detections both in SEL3 and LEB associated to the same event	Percentage of correct automatic auxiliary detections
January 1 – February 16 2017 GA only	41531	0	0	4412	4295 (97%)	**10.34**
January 1 – February 16 2018 GA+NET-VISA 2.2.44	42505	0	0	4992	4864 (97%)	**11.44**
June 22 – August 2st 2018 GA+NET-VISA 2.2.50	33079	486	476 (98%)	3895	3742 (96%)	**12.75**

Slight improvement in the percentage of analyst-added auxiliary associations

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Running since 20 June 2018

Planned fall 2018

VSEL1 pipeline: NET-VISA + WaveAux

AUX pipeline: DFX + StaPro

VSEL2 pipeline: NET-VISA + WaveAux

AUX detections from SEL1 and SEL2

AUX pipeline: DFX + StaPro

VSEL3 pipeline: NET-VISA

VSEL3 pipeline: NET-VISA

Infrasound

Hydro-acoustics

Primary Seismic

Auxiliary Seismic

- Completely independent GA and Net-VISA pipelines
- Implement regional and noise level improvements

Backup slide
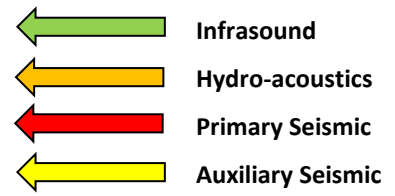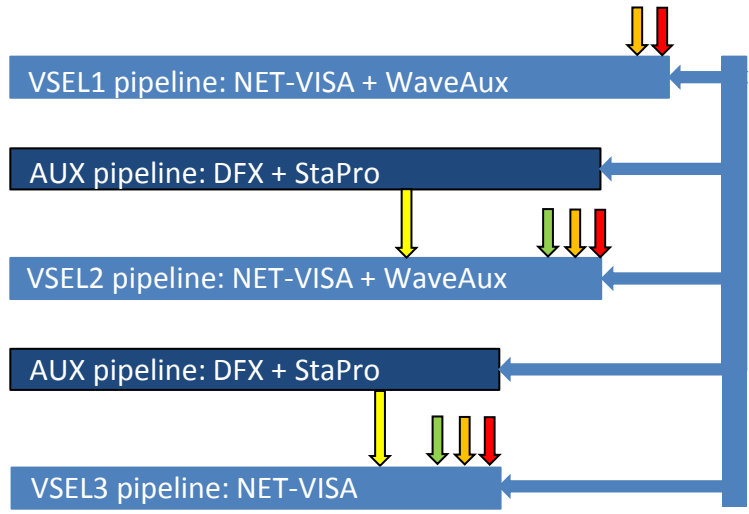
Infrasound spot check

Spot check for pure infrasound event on 22 June to 02 August, extract:

	Date	LEB	SEL3	VSEL3
Mariana Islands	2018/07/22	3 I stations event	Missed	Event built correctly
Off US West coast, reported Falcon 9 launch	2018/07/25	3 I stations event	2 I stations event, 1 missing phase	2 I stations event, 1 missing phase
Ural events	2018/07/25	2 events: 4 I + 3 I	One event built correctly, one partially	Both events built correctly
Northern Chile, reported activity of Lascar volcano	2018/07/25	2 I stations events	Missed event – a seismo-acoustic SEL3 event with spurious associated infrasound phases	Event built correctly

Mariana Island event: scanned by analysts because missed in SEL3, but available in VSEL3