

# Scientific Reports

Supplementary Information for

## Sub-Surface Magma Movement Inferred from Low-Frequency Seismic Events in the off-Nicobar Region, Andaman Sea

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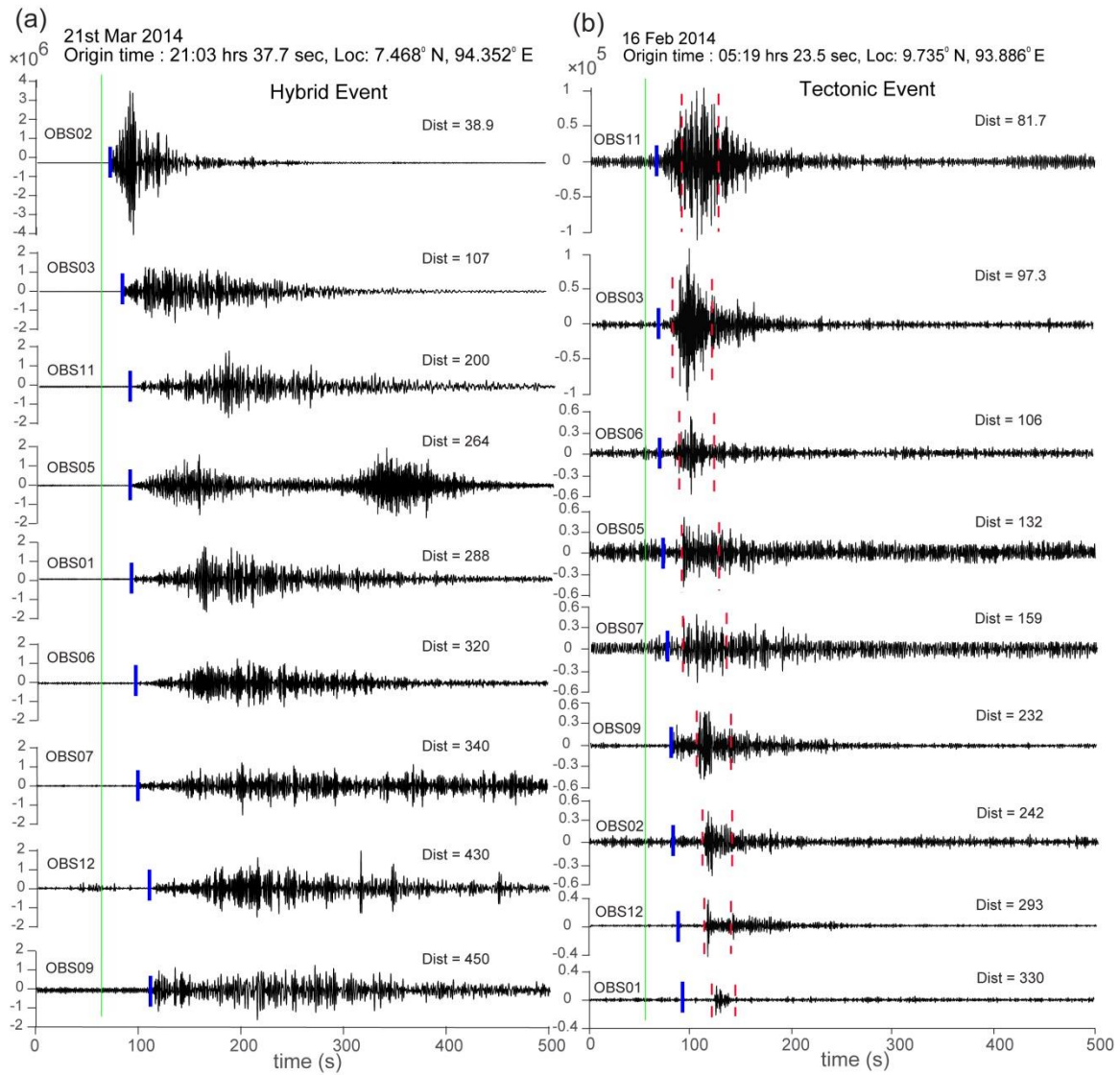
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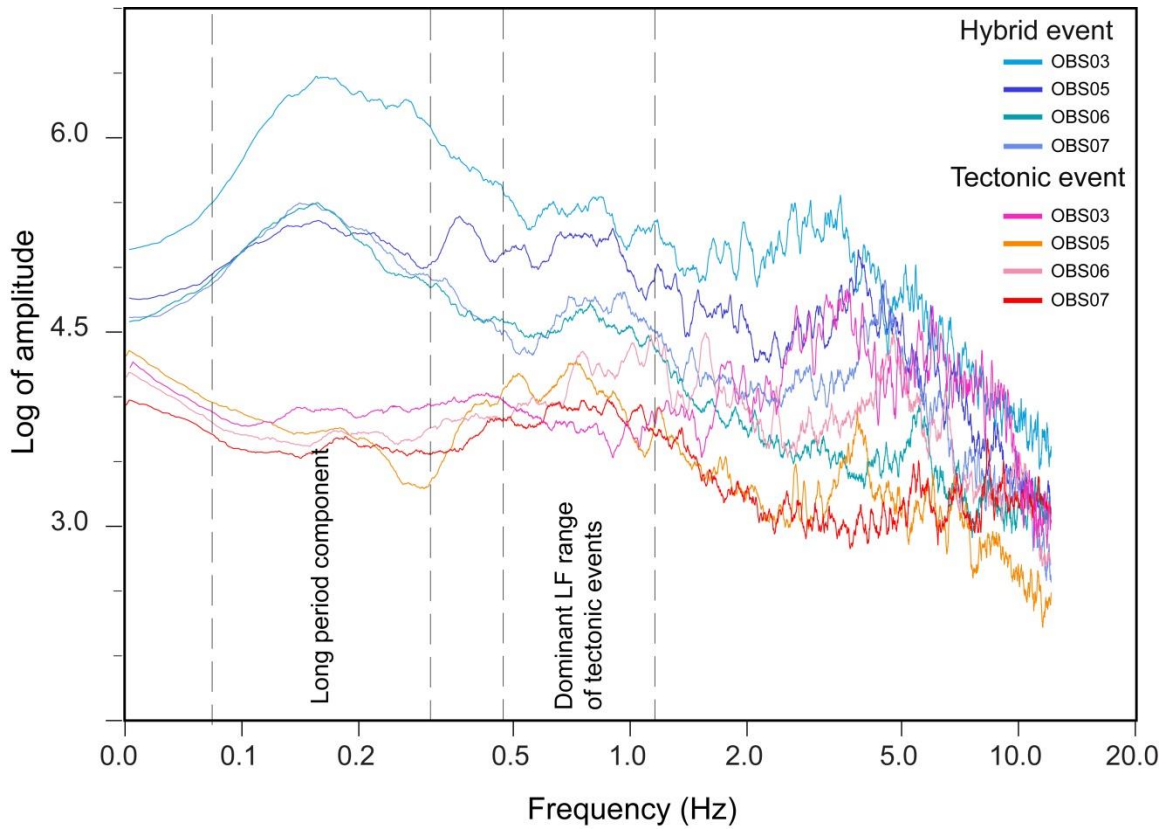
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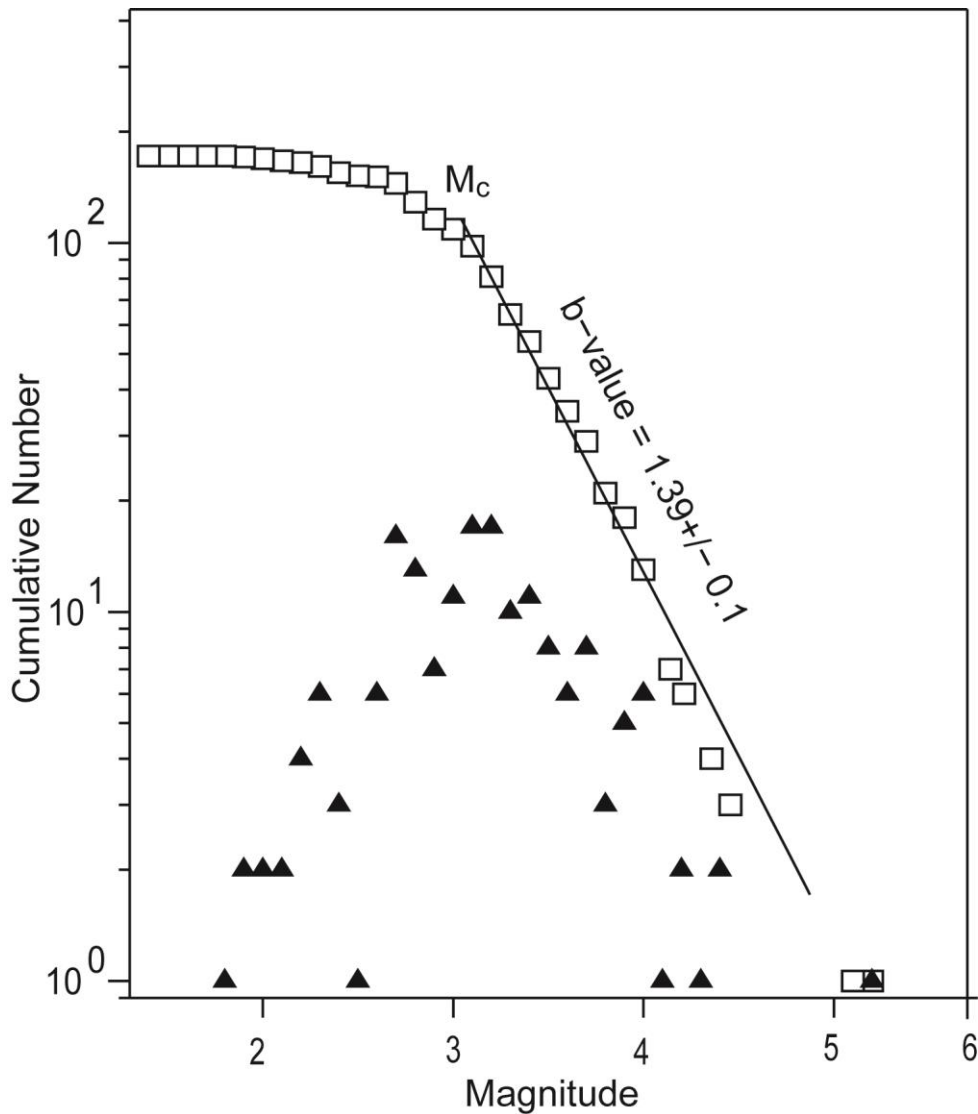
Figures S1 to S3



**Figure S1.** Comparison of waveform characteristics of earthquake event of  $M_L$  4.1 magnitude from off Nicobar swarm region and Andaman Nicobar Fault region as recorded in OBS receivers (locations in Figure 1). The velocity records are normalized by the peak of the trace and a 0.01-1 Hz filter was applied. (a) Waveform of  $M_L$  4.1 hybrid earthquake event of 21<sup>st</sup> March 2014 in the Swarm region (Location:  $7.468^\circ$  N,  $94.352^\circ$  E). Prolonged low frequency component present in the hybrid event can be seen. Green line indicates the origin time and the blue lines mark the p-phase. (b) Waveform of  $M_L$  4.1 tectonic earthquake event of 16<sup>th</sup> February 2014 (Location:  $9.735^\circ$  N,  $93.886^\circ$  E). Red dashed lines indicate the surface wave window. Note the amplitude of the hybrid event is ten times larger than the tectonic event (Y-axis, normalized amplitude  $\times 10^6$  for hybrid event).



**Figure S2. (a)** Example of velocity spectra performed for events 21<sup>st</sup> March 2014, 21:03 hrs. 37.7 sec ( $M_L$  4.1) hybrid earthquake and 16<sup>th</sup> February 2014, 05:19 hrs 23.5 sec ( $M_L$  4.1) pure tectonic earthquake. Long period window and dominant low frequency range of tectonic events are marked. The dominant frequency range of hybrid events is approximately 0.01-0.3 Hz. These spectra are for entire waveform.



**Figure S3.** Cumulative magnitude-frequency and b-value of March 2014 swarm. We estimated the b-value using maximum likelihood method<sup>1,2</sup> using Zmap software<sup>2</sup>. For calculating b-value distribution for the earthquake swarm we have chosen the maximum curvature fit of magnitude of completeness value ( $M_c$ ). Squares and triangles represent cumulative counts and per-bin counts, respectively.

### Reference

- 1 Aki, K. Maximum likelihood estimate of b in the formula  $\log N = a - bM$  and its confidence limits. *Bull. Seismol. Soc. Am.* **43**, 237-239 (1965).
- 2 Wiemer, S. A software package to analyze seismicity: ZMAP. *Seismol. Res. Lett.* **72**, 373-382 (2001).