



## **Long-period earthquakes in Bouillante hydrothermal system, French Antilles.**

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We present evidence of sustained Long-Period (LP) seismicity at the Bouillante geothermal field, Guadeloupe, French Antilles. More than a year's worth of records from a permanent broadband seismometer reveal the existence of small repetitive superficial LP events (amplitudes,  $1\text{-}5 \cdot 10^{-6} \text{ m}\cdot\text{s}^{-1}$ ; average repeat time, 15 – 40 s; frequencies, 0.5 – 10 Hz). To locate these earthquakes, we use the repetitive property of the source and sample ground motion with a second roving broadband seismometer recording for 20 minutes at each of 19 sites distributed within an area of  $1 \times 1 \text{ km}$  near the permanent station. Using this approach we identify events recorded by the permanent station that are also recorded at some of the temporary stations. We locate these events by using three complementary techniques, namely, first-arrival phase picks, amplitude analyses (using both temporal and spectral amplitudes), and full waveform inversion. The wave-form inversion points to a mechanism compatible with a composite source having a main contribution from a sub-horizontal crack at 40 m depth. The location of LP events coincides with an area where hydrothermal activity is manifested in anomalous He-gas emission on land, and sporadic 3-10-s-long submarine bursts of incondensable gas at sea. This hydrothermal activity occurs along a major tectonic feature crossing southern Guadeloupe. These observations suggest that water boiling and bubble cavitations may be the source of the LP events.