AN INTRODUCTION TO THE ASCENSION ISLAND SYNERGY EXPERIMENT

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ABSTRACT

Early in the DOE CTBT program, Lawrence Livermore National Laboratory (LLNL) had promoted a synergy experiment wherein data from multiple technologies would be combined, for common events, to demonstrate improvements in derived products over single technology results. The initial plans suggested work off the California coast, but due to a variety of problems (no longer remembered), the focus changed to Ascension Island, which is an IMS infrasound site and one of the hydroacoustic MILS sites. LLNL remains the lead lab for this experiment with LANL providing the infrasound capability.

This presentation will provide an overview of the Ascension Island environment and working conditions. In May of this year, we deployed one three component seismometer and a four element infrasound array in the region known as Butt Crater. During this period, LLNL also made contacts and arrangements to use some of the MILS data for certain events. We will provide good photographic coverage of the sensor sites and other Ascension views as well as provide discussion of some of the finer logistic points that need to be appreciated in working at this location, including data handling.

Key Words:: infrasound, seismic, hydroacoustic, synergy

OBJECTIVE

The objective of the synergy experiment is to demonstrate the utility of multi-technology data in improving the derived information from measured events. Ascension Island, a British territory, is the site of one US Missile Impact Locator System (MILS), a set of hydrophones around the island. It is also a planned infrasound site in the International Monitoring System, thus having two of the three waveform technologies. LLNL proposed deploying a three component seismic sensor and an infrasound array on the island for a one to two year to gather cooperative data, including MILS data, from natural and manmade sources.

RESEARCH ACCOMPLISHED

In March, 1999, personnel from LLNL and LANL went to the island to establish sites for the seismic and infrasound sensors, as well as establish locations for the seismic sensors to be used in the early May air-gun experiment (Harbin et. al., this volume). Arrangements were made with Merlin Communications to provide maintenance/operation support along with transfer of data tapes back to LLNL. We also briefed the Administrator of the island, Mr. R. C. Huxley, on the experiment plan and goals. This visit coincided with the start of the IMS infrasound site survey undertaken by Dr. Michael Hedlin and Chris Say of the University of California San Diego. We assisted them on getting their equipment to the field which allowed examination of several possible sites. With consideration of prevailing winds, logistics and costs, we chose an area in Butt Crater for the synergy deployment.

Figure 1 shows a map of the island, which is dominated by volcanic rock of various types and sizes, with several good examples of cinder cones. Trade winds blow most of the time and finding really quiet sites was not possible. Our experience indicates that Ascension is an excellent candidate for added elements in the future IMS infrasound installation. There is one large peak, Green Mountain, at 2871 ft elevation, and Figure 2 shows a view looking into Butt Crater from part way up Green Mountain. The near equatorial location ensures warm to quite hot temperatures most of the time, and Butt Crater is certainly warm.

In May 1999, LLNL and LANL personnel returned to install the seismic sensor and infrasound array. The four element infrasound array was deployed with nominal 100m interelement separations. This allowed for cost savings through the used of hard cable connections. Power is supplied with solar panels and battery backup. The seismic sensor is close to the infrasound array and in the general area of the IRIS seismic installation. We used Chaparral Physics Model 2 sensors (essentially the same as the former Globe 100C) for the infrasound array and are recording at 20 sps. The three component seismic sensor is a Springnether S-6000 two hertz free period unit, sampling at 250 sps. The seismic sensor was located on a large concrete pad that had been used a cable tie-down for a former radio tower. The pad provided the best possibility for coupling to the rock as it extended to a depth of at least 10 feet.

Figure 3 shows one of the infrasound array elements and gives a view of the terrain at the array site. Figure 4 shows Don Rock at the solar panel pole. The utility box houses the Ref Tek recorder and battery backup. The diagram in Figure 5 gives the layout of the infrasound array and seismic sensor.

CONCLUSIONS AND RECOMMENDATIONS

The deployment was completed as planned, and we now enter the data collection phase. Analysis of the data will begin soon. Ascension may be a site where added elements in the IMS infrasound array will provide improved performance through increased signal to noise.

REFERENCES

Ascension Island has an excellent web site with rather good information on the island and it's history. The web site is: http://www.ascension-island.gov.ac

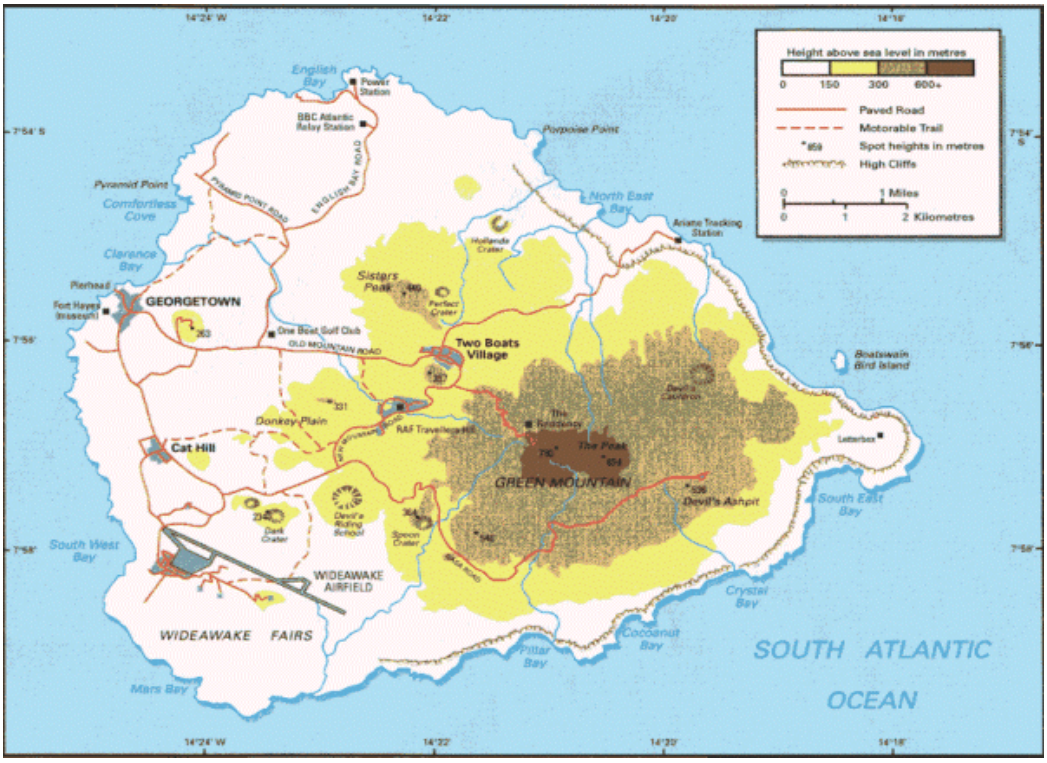

Figure 1: A map of Ascension Island.

Figure 2: Looking into Butt Crater from midway up Green Mountain. Two cinder cones are clearly visible.

Figure 3: In Butt Crater showing the white microphone cover with the South microphone just to the right. One porous hose is seen just left of center in the foreground.

Figure 4: Don Rock at the solar panel, battery box installation, which supplies power to the infrasound array. It is hotter than it looks, and the wind is blowing.
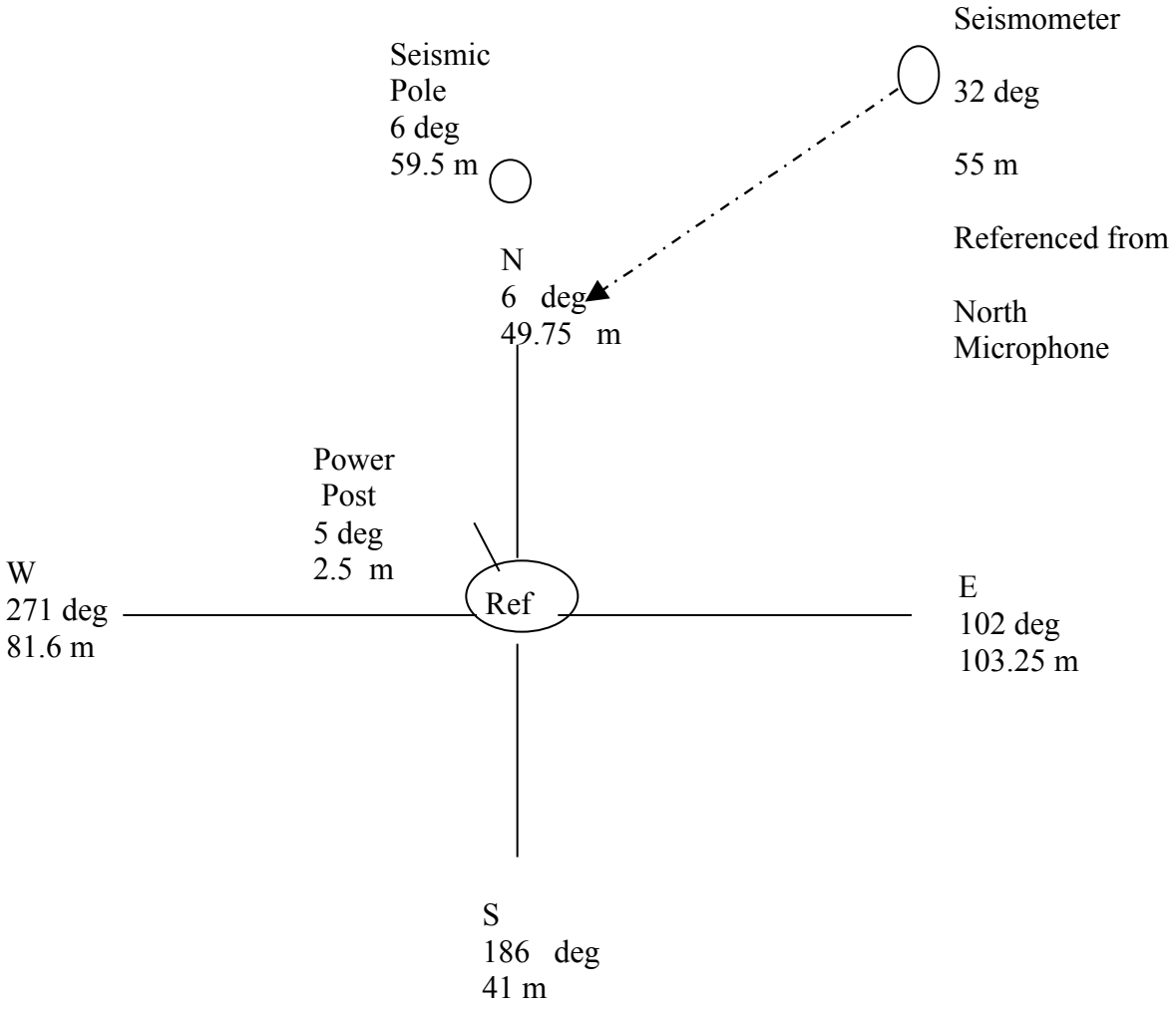
Figure 5: Schematic layout of infrasound array. Bearings are with respect to magnetic north.