ARRAY ANALYSIS OF AIR-GUN SEA-SHOTS RECORDS FOR IMAGING THE HIGHLY HETEROGENEOUS CRUST BENEATH CAMPI FLEGREI CALDERA (ITALY)

INTRODUCTION & DATA-SET

An extended active survey SERAPI2 (Seismic Reflection Acquisition Project for Imaging Structures) was performed September 2001 in the Gulf of Pozzuoli (Fig. 1). The aim of experiments was to provide new insights on the Campi Flegrei caldera structure and investigate the feeding system (Fig. 1). In the Solfatara crater (Fig. 2), we deployed an on-axis 138 vertical-component 4-component sensor array. The array was located at 0.2 km below seafloor and it was deployed for 18 hours in the Gulf of Pozzuoli. The results of this survey are consistent with the results from independent studies of scattering and velocity tomography. Next steps will include:

1. Calculation of synthetic waveforms aimed at elucidating the significance of scattering and velocity tomography. Next steps will include:
   - Calculation of synthetic waveforms aimed at elucidating the significance of scattering and velocity tomography.
   - Improving the resolution of double-beam results to estimate the location and size of the inferred anomalies.

2. Double-beam method (Kruger et al., 1996) is a technique that integrates source and receiver array beamforming. It is applied to study the lateral heterogeneity in the uppermost 3 km of the Gulf of Pozzuoli. The method enhances the resolution compared to the theoretical capability of the single array and allows detection of asymmetry occurring during the first arrival time. Independent variations of azimuth and backazimuth are correlated with observed backazimuths, irregularly distributed around the theoretical curve, giving evidence of anomalous wave propagation below the seafloor and near the array.

3. Observations show that the theoretical backazimuths are comparable to the measured backazimuths, but the theoretical ray parameters derived from the velocity model show significant differences.

4. ZLCC analysis along 16 N-S shot profiles (Fig. 5) shows marked crustal heterogeneity in the eastern part below the Gulf (about 1-1.5 km depth).

5. CONCLUSIONS

The observed backazimuths (green circle) with the theoretical backazimuths (red line) show good agreement. The observed backazimuths (green circle) are irregularly distributed around the theoretical curve, giving evidence of anomalous wave propagation below the seafloor. The observed backazimuths (green circle) are irregularly distributed around the theoretical curve, giving evidence of anomalous wave propagation below the seafloor. The observed backazimuths (green circle) are irregularly distributed around the theoretical curve, giving evidence of anomalous wave propagation below the seafloor.