

Comparison of Knudsen 3260 Multiple Ping Sub-Bottom Profile Data off of the San Diego Harbor

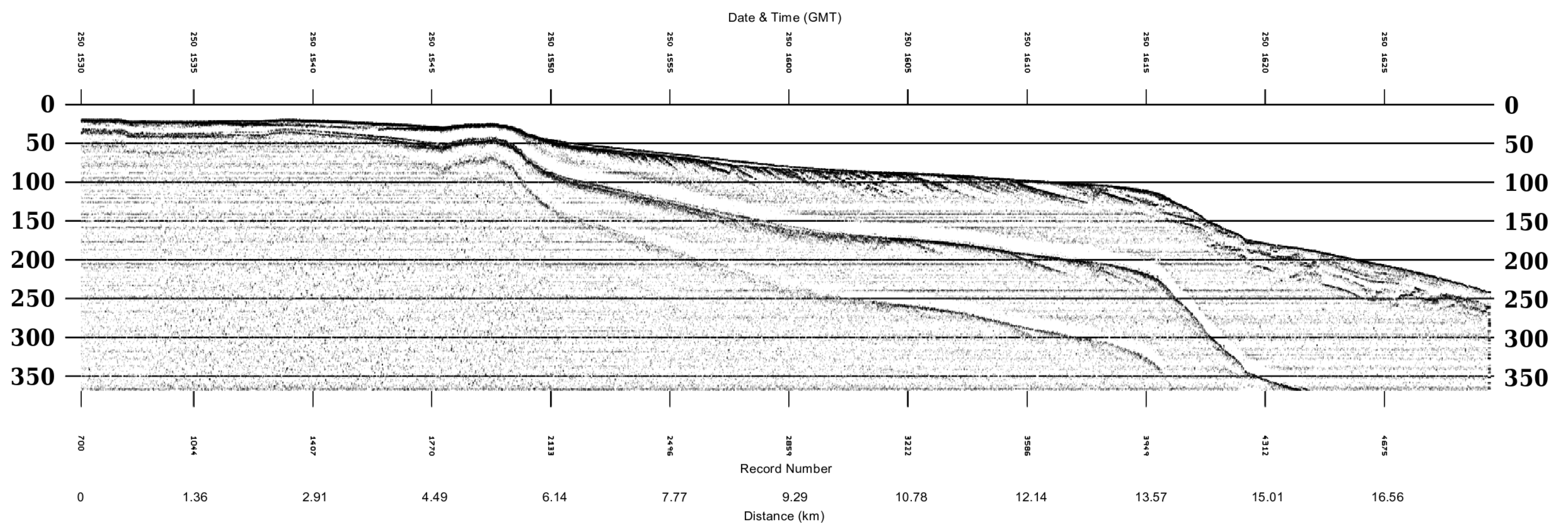
Objectives:

- To assess multiple ping sub-bottom profile (SBP) data collected from R/V New Horizon on Dr. Monica Kohler's Sept. 2011 Southern California research cruise.
- To compare the .keb data produced in Knudsen's SounderSuite PostSurvey and .sgy data processed through SIOSeis.
- To start a collection of SBPs off of the San Diego Harbor in order to compare and evaluate different settings, systems, and installations.

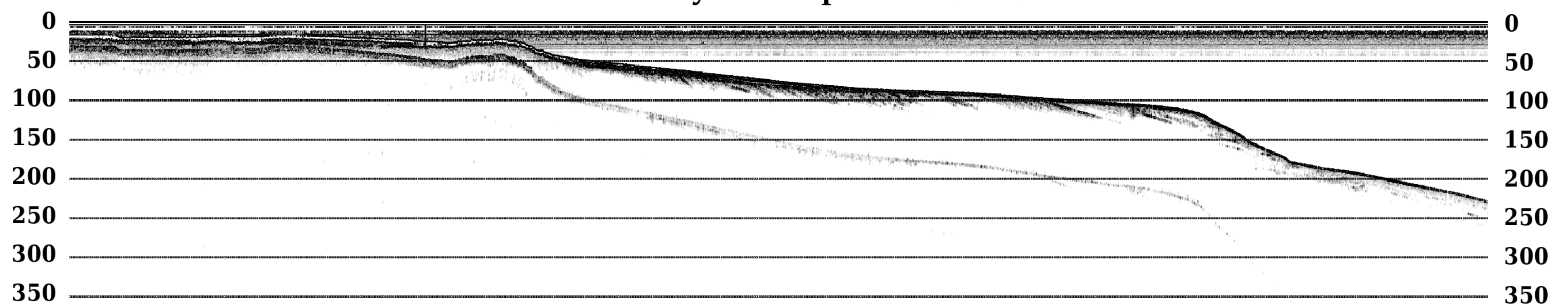
Map of R/V New Horizon's trackline shown to the right. Yellow corresponds to the data plotted below; white is the proposed trackline for future comparison studies.



SIOSEIS Processed Envelope Data (.sgy)



PostSurvey Envelope Data (.keb)



Definition of Envelope:

The envelope is the instantaneous amplitude of a trace. It is formed by: 1. creating a complex trace, where the real part is the original trace and the imaginary part is the Hilbert transform (90 degree phase shift) & 2. taking the complex modulus (square root of the sum of squares of the real and imaginary) of each sample. The envelope contains only positive numbers, and has lost its phase information, but it is much lower in frequency and can be displayed in a more readable form for a geophysicist.

Discussion:

The multiple ping provides faster data feedback in deep water, resulting in higher spatial resolution.

SIOSeis has more extensive processing capabilities than PostSurvey. In this case, there was significant noise above the water bottom (the dark line just below the surface) which was muted out in SIOSeis. The SIOSeis plot displays more detail below the water bottom, and shows two multiple reflections, which only faintly show up in the PostSurvey plot.

SIOSEIS Processing Steps:

- **Make Envelope from Correlate Files** (mkenv)
- **Swell:** dampens effects of ship heave in heavy seas by computing the average water bottom time of a group of traces, then shifting the middle trace of the group by the difference of the middle trace water bottom time and the average water bottom time
- **Mix:** running, weighted sum of adjacent traces
- **Filter:** frequency domain bandpass filter from 20-1000Hz
- **Automatic Gain Control (AGC):** amplitude normalization (modification); agc calculates the average absolute value of each sample, which is used as a multiplier applied to the entire window by dividing the average by an output level
- **Mute:** zeroes the beginning of selected traces; used to silence the noise preceding first arrivals – in this case the noise in the water column. In this example, the water bottom was selected using the process "wbt peak pos" which chooses the time associated with the largest positive amplitude of each trace.
- **Time to Depth:** transforms the time domain traces to depth domain traces using a defined velocity function (in this case, a fixed average velocity of 1475m/s).

Credits:

Data obtained from Sept. 2011 R/V New Horizon Cruise; Principal Investigator: Dr. Monica Kohler, UCLA
SIOSeis Program: <http://sioseis.ucsd.edu>, Dr. Paul Henkart
SIO Shipboard Geophysical Group: Lee Ellett, Jay Turnbull, & Bridget Hass



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