Determining climate and sea-level changes using core-log integration methods

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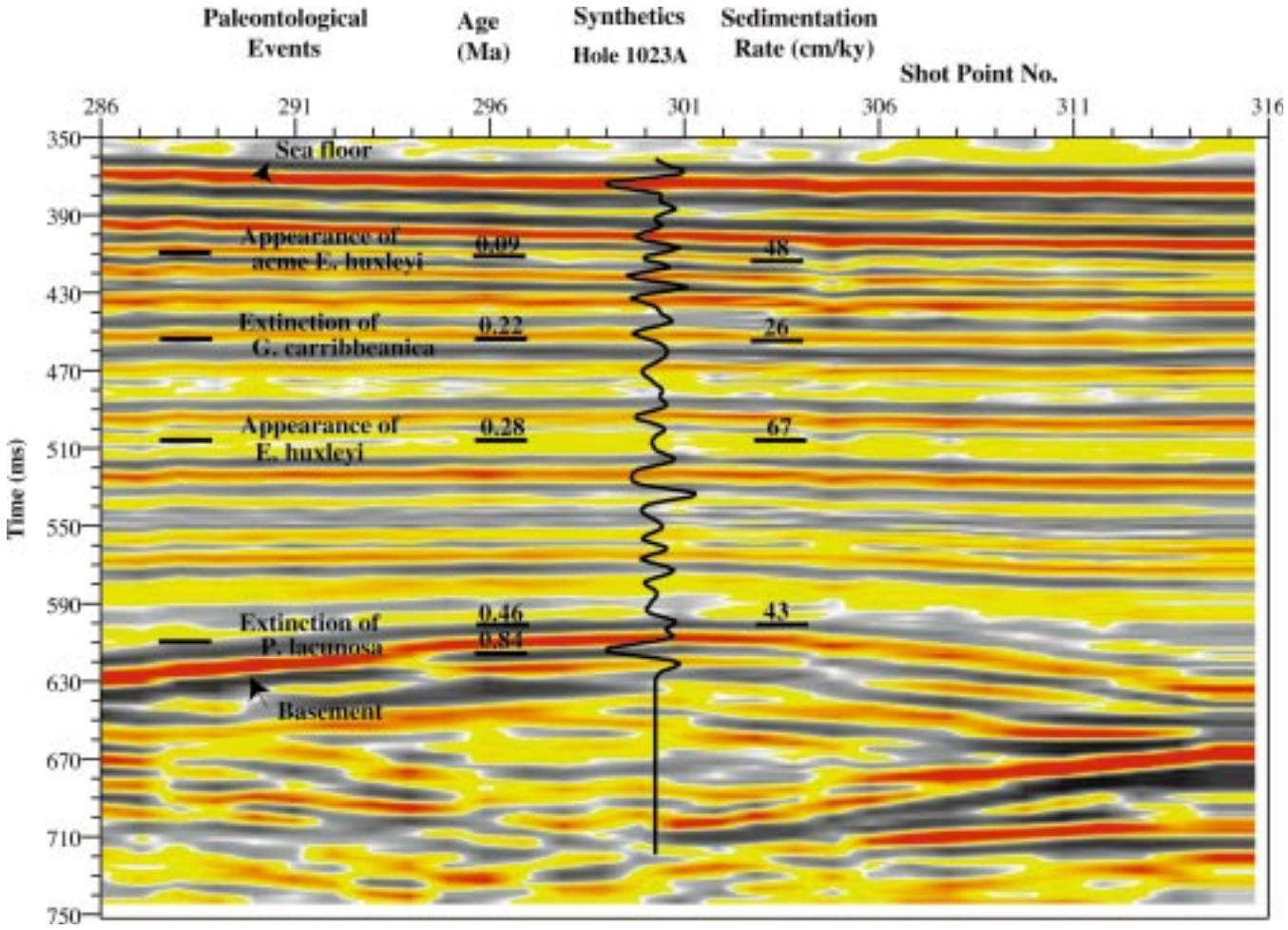
Paleontological ages and events determined from microfossils contained within sediment core samples are often difficult to correlate with seismic signatures from multichannel and other types of seismic records. Knowledge of the age of the sedimentary section over a wide area is important for determining regional sea-level history. To extend such knowledge beyond the drill site, we compute high-resolution synthetic seismograms and reconstruct the biochronology and paleoceanographic stratigraphy of Quaternary sediments on the eastern flank of the Juan de Fuca Ridge in the northeast Pacific. The figure shows the seismic line acquired in the area and the superimposed synthetic trace derived from bulk density data measured on core samples at one site. Because no velocity logging data were available at this site, we used the core-log relationships in the sediments at a nearby site to compute the synthetic. The excellent agreement in polarity, amplitude, and waveform shape between the resulting synthetic seismogram and the nearby seismic traces allows the extension of depths of nannofossil events and paleontological ages spatially around the drill site, producing a chronostratigraphic cross section. To interpolate sedimentation rates away from the boreholes, however, seismic inversion methods must be used. This integrated core-log-seismic approach will be used to estimate the late Quaternary biochronology for sediments in nearby areas that have not been drilled and to reconstruct climate/sea-level changes in the region, providing additional data for evaluating past global sea-level changes.



Correlation of seismic signatures with paleontological events at Hole 1023A on the Juan de Fuca Ridge.