The southernmost branch of the Lucia Canyon, informally referred to as the Lucia Chica, crosses an area of decreased slope between 950 m and 1250 m water depth where it changes from a single confined channel into a set of weakly-confined channels with varying sinuosity and complex architectures. The weakly-confined region was investigated with an Autonomous Underwater Vehicle (AUV) developed by the Monterey Bay Aquarium Research Institute for high-resolution seafloor mapping. The AUV carries a 200 kHz multibeam sonar and a 2-16 kHz chirp sub-bottom profiler. Bathymetric data was collected at 50-m above the seafloor, so it has a 1-m lateral and 0.3-m vertical resolution. Sub-bottom profiles collected with 75 to 150-m line-spacing have 11-cm vertical resolution and penetrations up to 40 m.

Chirp data indicate that a ~4 m thick drape of transparent sediments cover these channels. Foraminifera $^{14}$C-calibrated ages from 1.5-m long ROV-collected vibracore samples yield a sedimentation rate of ~30 cm/ka, indicating that deposition within Lucia Chica channels was a last active before $\geq 12$ ka BP, during the last sea level low stand.

The AUV bathymetry image reveals channel and channel-like features that could not be resolved with prior methods. These seafloor features include bifurcating channels, knickpoints, avulsed channels, aligned and elongated depressions, changes in channel relief, and shifts in sinuosity. High-resolution bathymetry allows direct measurement and comparison of variables, such as gradient and channel dimensions, that appear to influence the continuum of channel features.

The variation and discontinuity of features imaged within this single system challenges the conventional view of deep-water systems as analogous to continuous fluvial channels where flows are confined to a single leveed-channel. A revised concept of deep-water channel formation must include the possibility of mid-slope weakly-confined channels and the development of those channels through low-relief, discontinuous architectures.