Overview
Examination of water column data collected in the 2016-2017 field seasons along the US west coast revealed hundreds of distinct vertical features, presumably plumes of methane gas released from the seafloor. While seafloor reservoirs of methane are thought to contribute 5-10% of the global discharge, inventories of seafloor methane seeps are poorly constrained due to the lack of data such as the distribution and abundance of seafloor gas plumes. The results of mapping efforts reveal an unexpected number of methane seeps (Fig. 1). ROV dives were then used to provide geological context to the seeps and associated unique biological communities.

Sensors and Systems
The Exploration Vessel (E/V) Nautilus has mapped more than 80,000 km² of seafloor off the west coast of the United States between July 2015 and September 2017. The 30 kHz Kongsberg EM122 multibeam mapping system collects water column data in addition to bathymetry and backscatter. The 1x1.5° beam width is fixed to 65° for seep detection surveys. When Kongsberg EM122 multibeam mapping system was used to examine and carry specialized equipment to sample the seep sites (Fig. 3).

Water Column Data Analysis
The initial processing used the QPS Midwater tool to locate the seeps and determine their size and location. This was achieved using a number of different modes: the single fan, stacked fan (20-20 pings to improve detection of faint seep returns in noisy environments, and stacked range mode for a chronological view (Figure 5). Each line of data was viewed in playback mode. When a seep was detected, the focus of the seep at the seabed (bottom pick) and maximum height above the seafloor (rise) was geo-picked and saved (Figure 4). Geospatial distribution was then used during processing in 3D scenes example to relate the seeps to the multibeam bathymetry and backscatter.

Significance & Conclusions
The results of mapping efforts reveal an unexpected number of methane seeps. ROV dives were then used to provide geological context to the seeps and associated unique biological communities. Altogether these findings contribute significantly to our baseline inventory of seeps and associated unique biological communities. The presence of unexpectedly large numbers of methane seeps on the US Pacific, Gulf and Atlantic margins may influence the management of human extraction activities on the margin seabed. In future work, we hope to gain insight from this data through analysis of seep location in relation to backscatter, slope, depth, and geological setting, with the goal of more automated detection. We also hope to analyze the spatial distribution of seep clusters and what factors constitute a grouping.

Acknowledgements
Research was conducted by the Ocean Exploration Trust on the E/V Nautilus cruises NA065, NA066, NA067, NA067, NA067, NA073, NA074, NA075, NA076, NA077, NA078, NA079, NA080, NA081, NA083, NA085, NA086, and NA088. We would like to thank NOAA’s Office of Exploration and Research and the National Marine Sanctuaries for funding. Special thanks to the onboard mapping team for data acquisition and processing.

Contact Information: Nicole Raineault (nicole@oet.org)