

### Geology of the Hawaiian EEZ



The U.S. ECS Project has motivated rescue and restoration of numerous geophysical datasets and interpretive products. This surficial geology map of the full Hawaiian exclusive economic zone (EEZ) was interpreted from GLORIA sidescan-sonar imagery in the early 1990's. Restoration involved digitization from original manual linework, re-registration and re-projection to yield a modern GIS product representing the entire 2.5 million sq km of this U.S. EEZ.

Barth, G.A., Holcomb, R.T., Au, M.V., Wong, F.L., Robinson, J.E., and DeGroot, P., 2023. Surficial Geology of the Hawaiian Exclusive Economic Zone from GLORIA Side-scan Sonar Surveys, American Geophysical Union Fall Meeting 2023, T43D-0292, 2023Dec14.

## Atlantic Margin Geology



This synthesis of surficial geology of the eastern North American margin has been interpreted from multibeam bathymetry, acoustic sub-bottom, backscatter and seismic datasets, including those collected in support of U.S. ECS. The mixing of fan systems, landslides, and drifts illustrates that the shape of the margin is controlled by both down-slope and along-slope processes at multiple scales.

Chaytor, J.D., Hutchinson, D., ten Brink, U.S., Brothers, D.S., Miller, N., and Andrews, B., 2015. Quaternary Sedimentary Processes along the U.S. Atlantic Continental Margin from the Shelf to the Abyssal Plain, Geological Society of America Abstracts with Programs, 47, 795.

# Science for the U.S. Extended Continental Shelf

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### Canada Basin Opening



The ECS project collected ~15,000 km of seismic data in the Canada Basin, providing the first imaging of deposition and deformation within the basin. The gravity map shows a gravity low anomaly traversing the basin, labeled Canada Basin Gravity Low (CBGL), which is interpreted as a seafloor spreading feature, logically bringing similar rock types of Alaska and the Canadian Arctic Islands together. A model of oblique opening, rather than rotation. makes for simpler movement in which the Chukchi Borderland reconstructs further north against Ellesmere Island.

Hutchinson, D.R., Jackson, H.R., Houseknecht, D.W., Li, Q., Shimeld, J.W., Mosher, D.C., Chian, D., Saltus, R.W., Oakey, G.N., 2017. Significance of Northeast-Trending Features in Canada Basin, Arctic Ocean. Geochemistry, Geophysics, Geosystems, 18, 4156–4178, https://doi.org/10.1002/2017GC007099

### Line Islands Hotspots



The Line Islands volcanic chain in the central Pacific Ocean exhibits many characteristics of a hotspot-generated seamount chain. A new model combines plate-tectonic reconstructions with seamount age dates and available geochemistry to identify a new melt source region (Larson melt region at 17°S, 125°W) that contributed to the formation of the Line Islands, as well as the Mid-Pacific Mountains and possibly the Pukapuka Ridae.

Pockalny, R., Barth, G., Eakins, B., Kelley, K.A., and Wertman, C., 2021. Multiple melt source origin of the Line Islands (Pacific Ocean): Geology, v. 49, p. 1358–1362 https://doi.org/10.1130/G49306.1

Large Atlantic Landslide

Pre-stack depth migrated multichannel seismic profile MGL1408-32 shows the Cape Hatteras Slide Event Deposit as a zone of chaotic reflectivity and distorted beds located beneath the younger Cape Fear slide. This Miocene mass transport deposit on the eastern North American margin covers ~16,400 sq km and involves an estimated 8,600 cubic km of slide material – possibly the largest (by volume) MTD ever discovered.

Gibson, J.C., 2022. Controls on surface and sedimentary processes on continental margins from geophysical data: New insights at Cascadia, Galicia, and the Eastern North American Margin [Ph.D. thesis], Columbia University.

### USGS: Ginger Barth, Jason Chaytor, Debbie Hutchinson, Nathan Miller, Dan Scheirer

Gulf of Alaska Fans **Baranof Fan** 

Bathymetric data in the eastern Gulf of Alaska provide detail about the evolution of fan systems along an active continental margin. This perspective view shows the glaciomarine Chatham fan, which occupies the upper slope and appears to have buried a pre-existing branch of upper Horizon Channel within the large Baranof Fan system. Geophysical data collected in support of U.S. ECS in this region have supported numerous graduate research studies integrating geomorphic, stratigraphic and tectonic insights into these systems.

Gardner, J.V. and Mayer, L.A., 2014. Chatham Fan and adjacent upper Baranof Fan channels and levee, US Gulf of Alaska margin, in Downeswell, J.A., Canals, M., Jakobsson, M., Todd, B.J., Dowdeswell, E.K., and Hogan, K.A. (eds.), Atlas of Submarine glacial landforms: modern, Quaternary and ancient, Geological Society, London, Memoir 46. p. 387-388.



This new best-quality compilation includes marine magnetic data from 291 cruises in the Northern Pacific Ocean and Bering Sea. Data originate from two sources: 266 cruises from the National Oceanic and Atmospheric Administration (NOAA) National Centers for Environmental Information (NCEI) Marine Trackline Geophysical Database (GEODAS) and 25 cruises from USGS holdings, including rescued data from 1955 and 1956. Scheirer, D.S., 2024. Marine Magnetic Anomalies of the Bering Sea and Pacific Ocean North of 35°N: U.S. Geological Survey data release, https://doi.org/10.5066/P14KXXS6

### Gas in the Bering Sea



High quality long-streamer MCS data acquired on MGL1111 in the Aleutian Basin illuminates the presence of natural gas and hydrate, including both focused concentrations in velocity amplitude anomalies and widespread but laterally intermittent gas at the base of the gas hydrate stability zone (BGHS). This far-offset stack image also illuminates a prominent silica diagenesis horizon, marking the opal A to opal CT transition (OACT) within the sediment above a basement ridge.

Wood, W., Barth, G., Scholl, D., and Lebedeva-Ivanova, N., 2012. Using Hi-res acoustics to VAMP up better estimates of methane hydrate concentrations: Deep water acoustic anomalies from methane hydrate in the Bering Sea, Naval Research Lab Review, 82–90.









### World ECS Map

The World Map of Extended Continental Shelf Areas depicts areas of continental shelf beyond 200 nautical miles from territorial sea baselines. The ECS areas shown are those asserted by coastal States worldwide, as of December 2023. Combined, these ECS areas cover approximately 9% of the ocean's seabed.

Access: https://www.state.gov/continental-shelf/