Continuing Mississippi Offshore Sediment Resources Inventory: Linking Late Quaternary Stratigraphic Evolution of the Mid Shelf (MS Co-Op2)

With the previous cooperative agreement “Mississippi Offshore Sediment Resources Inventory: Late Quaternary Stratigraphic Evolution of the Inner Shelf: M16AC00012” (hereafter referred to as MS Co-Op1) coming to an end in September 2021, this statement of work is aimed at a new Cooperative agreement (hereafter referred to as MS Co-Op2) which will build heavily on the previous. MS Co-Op1 focused on providing a better understanding of the geologic evolution of late Quaternary deposits offshore Mississippi and delineating and developing reserve estimates (volumes) of restoration quality sediment resources, with a focus on discrete sand bodies located on the Federal Outer Continental Shelf (OCS). MS Co-Op1 has identified important data gaps that warrant further investigation in MS Co-Op2.

MS Co-Op1 compiled all available legacy geophysical data for the study area, performed a QA/QC, and collected new data where appropriate. Importantly, the MIS 2 surface, which depicts the location of incised valleys, has been established from the mainland rivers and traced to the seaward limit of legacy high data quality on the OCS. The high-resolution framework of the MIS 2 surface also represents critical prior work on which to build on. Significant Holocene sediment resources were identified, almost all of which were located within incised valleys. Continuing to map and quantify these features will yield a full and complete assessment of sediment resources in these areas. This would include a quantification of the sediment type available (i.e., sand, mud, or mixed), volumes associated with each sediment type, as well as color, depth of deposit relative to sea level, and overburden thickness/sediment type. This assessment is useful for BOEM/interested stakeholders as it not only allows for a quantification of available sediment resources for future projects, but also allows BOEM to protect and manage those resources.

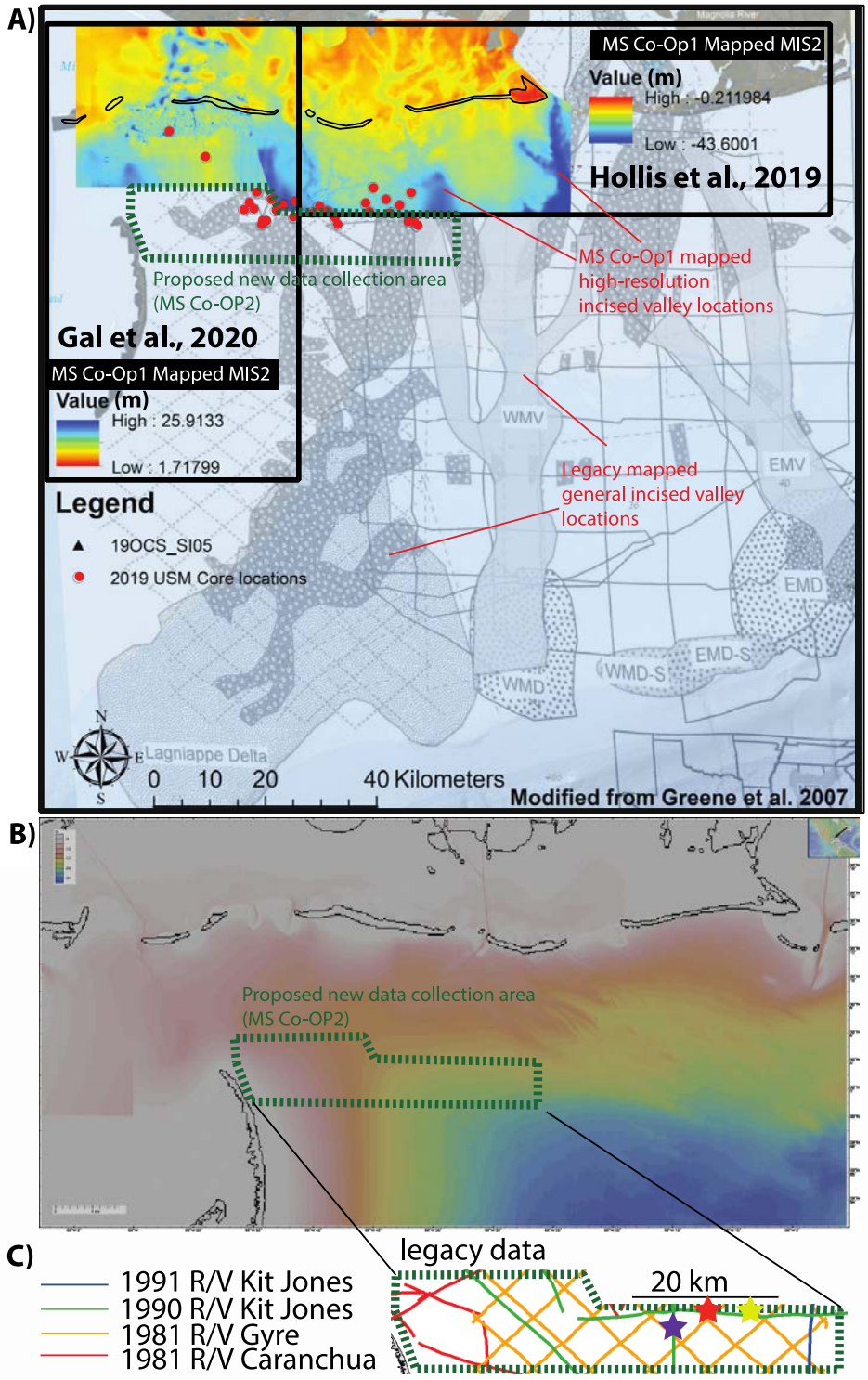

Figure 1. A) Northern Gulf of Mexico showing previously mapped general incised valley locations (Greene et al., 2007). Also shown are two insets with the high-resolution MIS 2 surface that resulted from MS Co-Op1 (Hollis et al., 2019; Gal et al., 2021). (B) Proposed new data collection area with modern bathymetry (from GeoMapApp). (C) Sparse legacy geophysical data exists in proposed new study area.

Examination of a few available sparse, low quality geophysical lines (Figure 1c) show the extension of the MS Co-Op1 mapped incised valleys suggesting that there are important sediment resource features seaward of the MS Co-Op1 study area (Figure 1a). However, these data currently cannot be mapped in high-resolution outside of the isolated 2-dimensional seismic lines, as they are 10 kilometers seaward of the MS Co-Op1 MIS 2 surface and contain no sediment cores. Therefore, the proposed new study area directly abuts that of the MS Co-Op1, extending roughly 10 kilometers offshore and 50 km in length (~500 km^2; Figure 1b). The water depths range from 10 to 25 meters below sea level (mbsl). This proposed new study area on the OCS is critical to further study because 1) there are limited to no data here and 2) they are in close proximity to anticipated BOEM sediment needs (i.e., Chandeleur Islands, MS Birdsfoot Delta, and the Mississippi-Alabama (MSAL) barrier islands). Thus, for MS Co-Op2, an approach which builds upon MS Co-Op1 is proposed; specifically:

1. Collect and analyze new geophysical data to improve geologic interpretations and estimate restoration-quality sand reserves in the new study area. Collect new geophysical data (boomer, chirp) over approximately 500 square kilometers, totaling a minimum 1,500 line km. All new data acquisition shall conform with the Sand Search EA (2019) and associated appendices (BOEM, 2019).
2. Collect 40-50 vibracores. Use existing bathymetric data for water depth (Taylor et al., 2008) as well as the ship's depth finder. Once retrieved from the field, the cores are to be split, sectioned into 1.5 meter sections, and housed in a core storage facility at 4 degrees C. The cores will be used to analyze the sedimentary characteristics, composition, and volumes of specific features documented in geophysics. They will also ground-truth the geophysics.
3. Cores shall be described, sampled and photographed and incorporated into existing databases. Particle size analysis will be run on 2,000 discrete samples using a Malvern Mastersizer 3000. The selection of grain size samples shall be based on representative facies to determine sediment volumes of a given size. EasyCore pdf logs which include photographs, core descriptions, grain size analyses shall be included.
4. Delineate (interpreted) sand-rich lithofacies in plan form (ESRI polygon shapefiles for GIS) and provide information on sediment textural properties, volumes of deposit, type of deposit, overburden thickness, percent sand, and other criteria agreed upon between BOEM and USM.
5. Using previously collected cores (Co-Op 1) and new cores from Co-Op 2, develop a surficial sediment map in areas covered by both Co-Ops.
6. Extend the developed conceptual stratigraphic model for late Quaternary to recent deposits offshore MS in Co-Op 1 seaward to link with the study area in Co-Op 2.
7. Integrate of all newly acquired and/or analyzed data, interpretations, and other relevant products into a final spatial database. Data will be provided in formats appropriate for incorporation into the BOEM MMIS.

References

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