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Event Stratigraphy and Geochronology of a Mudflow Lobe and Gully Complex on the Mississippi River Delta Front: Offshore South Pass, Louisiana, USA

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ABSTRACT

The Mississippi River Delta Front (MRDF) is an apron of muddy sediment wrapping around the Mississippi Birds Foot Delta in water depths of approximately 10–250 m. In 1969, storm waves from Hurricane Camille triggered submarine landslides that destroyed oil platforms on the MRDF, highlighting the threats of such geohazards to offshore infrastructure. A recent study showed that MRDF submarine landslides still occur on subdecadal timescales, despite the declining load of the Mississippi River. However, the temporal and spatial scales of such high-frequency events remain poorly documented. In this study, we present one of the first studies of submarine landslide and storm deposit geochronologies, using cores targeted by a high-resolution geophysical survey, and analyzed using modern Pb-210/Cs-137 and core-imaging methods. In 2017, the USGS conducted an extensive multibeam bathymetry and CHIRP seismic survey, which was used to target cores in key MRDF depocenters on a subsequent cruise led by LSU geologists. We report here on results from piston cores from a mudflow lobe and gully complex in water 150–200 m deep, 20 km south of the South Pass of the Mississippi River. Cores were logged using a Geotek multisensor core logger, then split, imaged with a digital X-ray system, and selected cores were analyzed for Pb-210/Cs-137 geochronology and grain size. Results suggest that suspension settling, storm-wave resuspension, and mudflows have all delivered substantial sediment to the study area over the last 50+ years, despite the distal location, and after approximately a century of declining load from the Mississippi River. Return periods of mudflows capable of delivering decimeters of sediment per event are approximately several decades or less, and confirm the most recent time-series bathymetric studies of seabed morphodynamics at this locale.

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