Sediment-filled oceanic basins found near continents provide important resources, present diverse hazards, and pose problems for reconstructing their tectonic evolution. New strategies for studying these basins are needed to address these challenges. The Gulf of Mexico (GoM) is an excellent example of such basins. The Mesozoic opening of the GoM remains a subject of debate, as the thick and complex sedimentary fill obscures and distorts seismic imaging and effectively prevents drilling to basement almost everywhere. Multiple tectonic models have been published, but they differ, and sometimes drastically, in the style of basin opening, the pre-break-up location of crustal blocks, and even in the order/timing of key tectonic events. Many datasets acquired in the basin over the last three decades have triggered new ideas about the GoM tectonics. Our group of academic and industry geoscientists are taking advantage of the dawning “Zoom era” of enhanced collaboration to re-evaluate existing data, interpretations, and models, to review key findings about GoM tectonic history, highlight published tectonic models, outline major controversies, and define remaining questions.

Published tectonic models agree that the formation of oceanic crust in the GoM ceased by no later than 135 Ma (Valanginian), so we focus only on earlier Mesozoic events. We describe pertinent public domain data for GoM genesis and early evolution/opening, comment on uncertainties, and outline the range of interpretations these permit. We then list the key geological observations that serve as constraints on the tectonic evolution of the basin. We compare and contrast the published tectonic reconstructions of the GoM in terms of their pre-break-up fit, proposed order, duration and timing of major tectonic events, and kinematic parameters. Finally, we identify the major remaining controversies in the published tectonic models and outline the types of data that can resolve them. Our approach may be usefully adapted for studies of other sediment-filled oceanic basins.