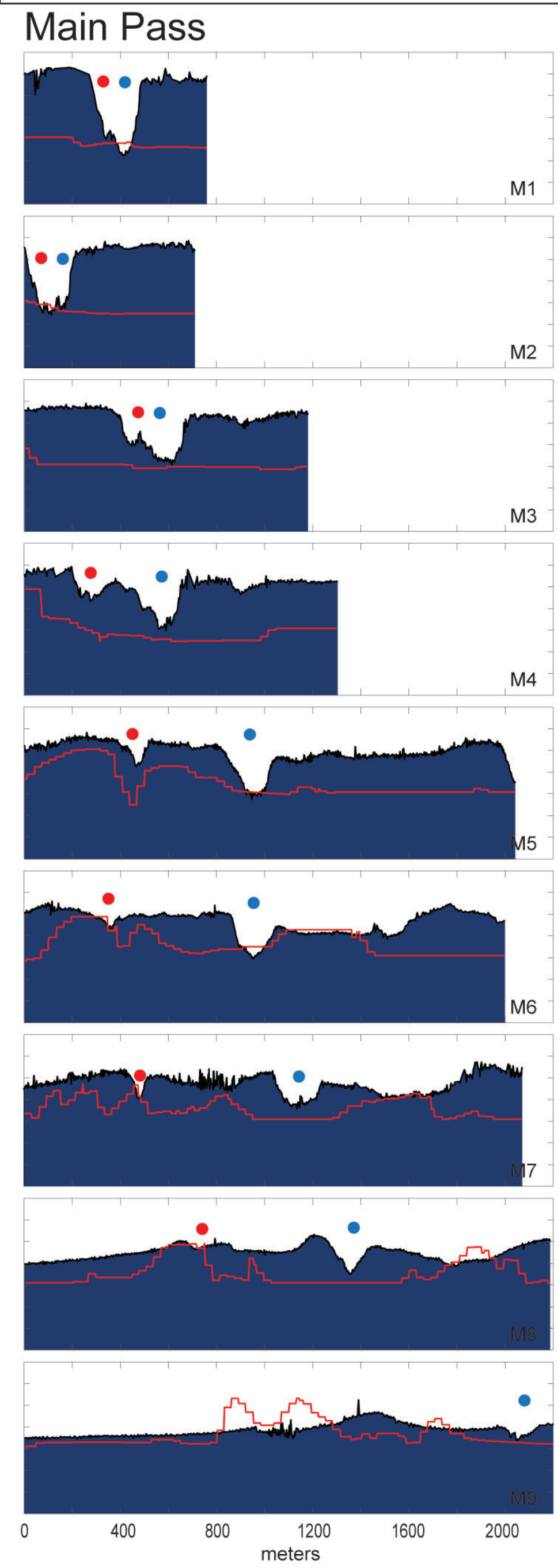
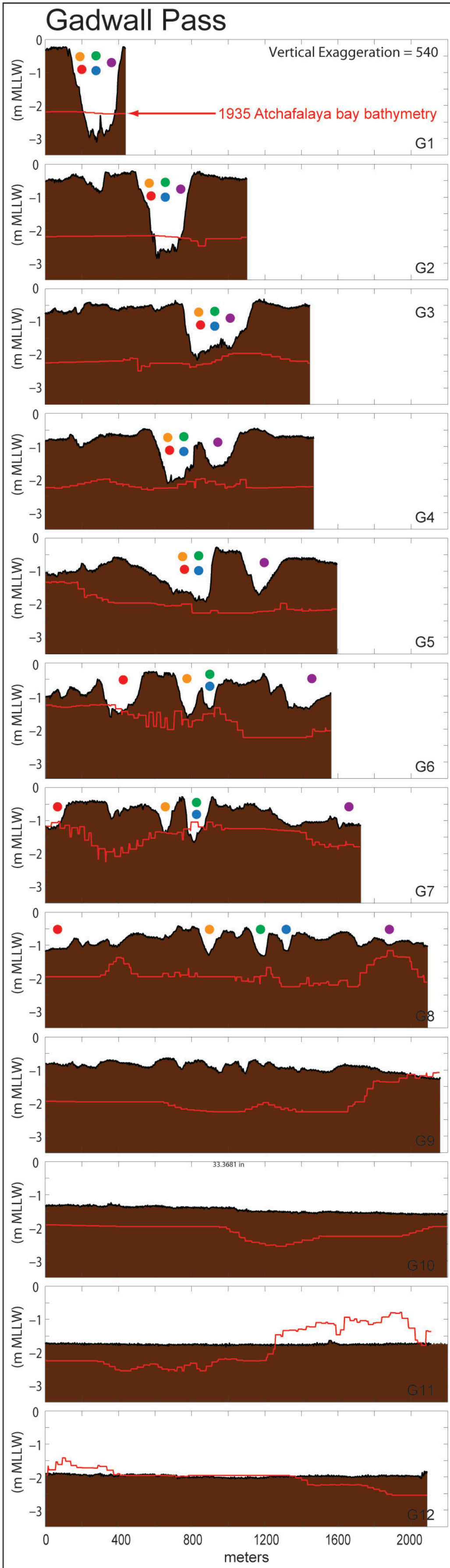


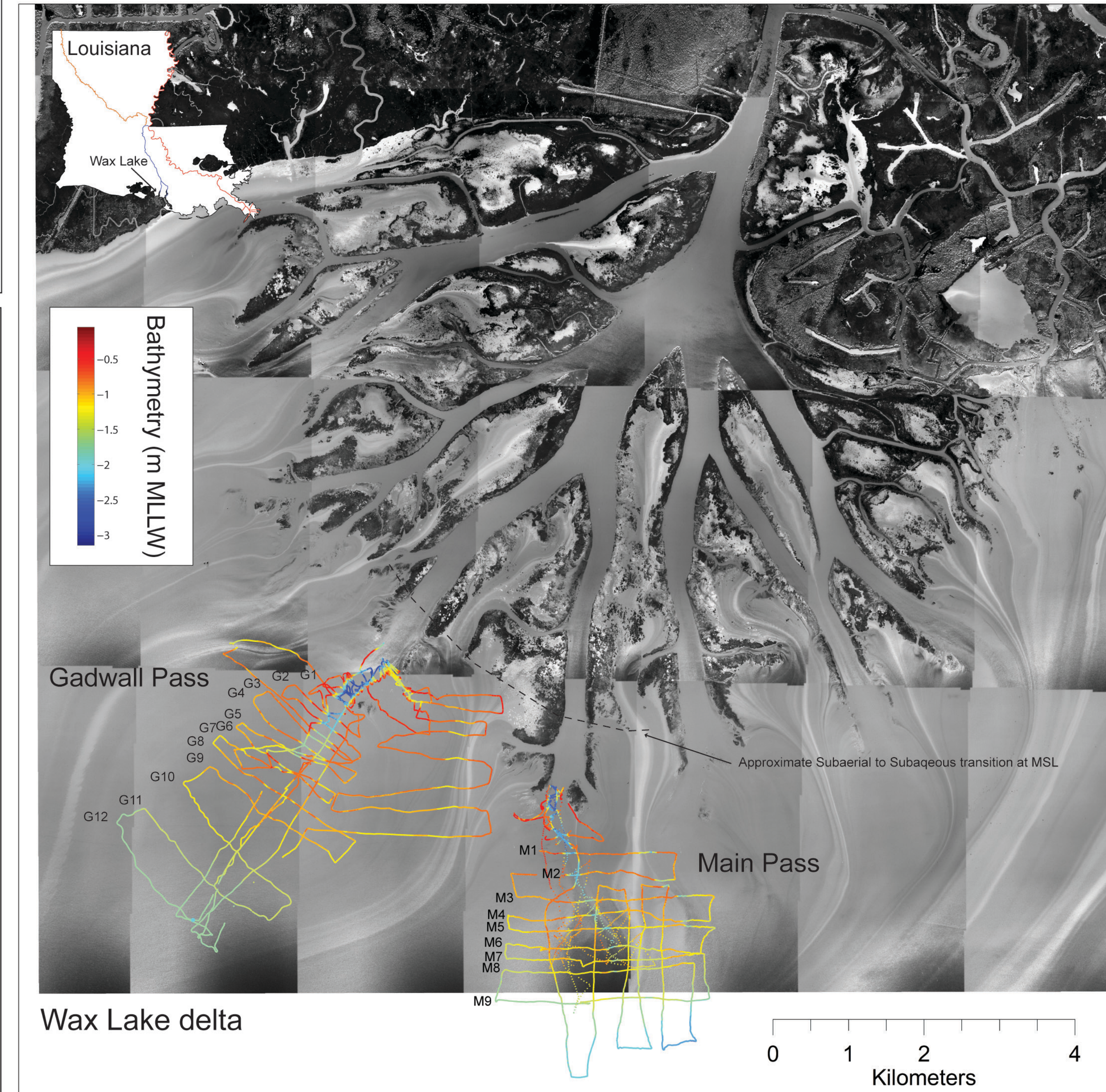


We investigate delta-front bathymetry to determine the extent and character of distributary channels beyond their region of sub-aerial definition. Our field site is the Wax Lake Delta in Louisiana, USA; a river delta prograding quickly (~100 m/yr) into a shallow (~3 m) basin. The delta-front is the zone where delta bathymetry transitions from proximal islands bordering distributary channels to a distal, non-channelized surface. We have mapped 40 km² of delta front bathymetry immediately seaward of two sub-aerial distributary channels at the Wax Lake Delta; Gadwall Pass and Main Pass. The subaqueous channel that is Gadwall Pass extends 2.0 km seaward of its subaerial portion before bifurcating into at least 4 channels of equal depth over a streamwise distance of 0.8 km. Over this distance, channel depths shoal from -3 m to -1.2 m (all elevations relative to MLLW). Beyond these bifurcations, bathymetry transitions from channelized to flat over the next 1.0 km and begins to gradually dip seaward with a bed slope of 7E-4 until the tapered deposit pinches out against the pre-existing floor of the bay. The subaqueous channel that is Main Pass extends 2.8 km beyond its subaerial extent before losing definition. The bed of this channel begins at -3 m as well, but never shoals above -1.8 m. There is a single bifurcation at 1.5 km beyond the subaerial exposure and the two channels are not of similar depth. The deeper channel remains defined even as regional, delta-front bathymetry dips towards the bay floor. Distributary channels on the Wax Lake Delta extend well beyond their subaerial definition before terminating. The channels tend to shoal and bifurcate in the subaqueous zone, although different channels exhibit different bifurcation character and frequency. We will compare field data against predictions of channel growth from models describing delta progradation and discuss the implications of long subaqueous channels defining the leading edge of a delta distributary network.



Tracking the distal extent and character of distributary channels on the Wax Lake Delta, Louisiana, USA

John Shaw and David Mohrig



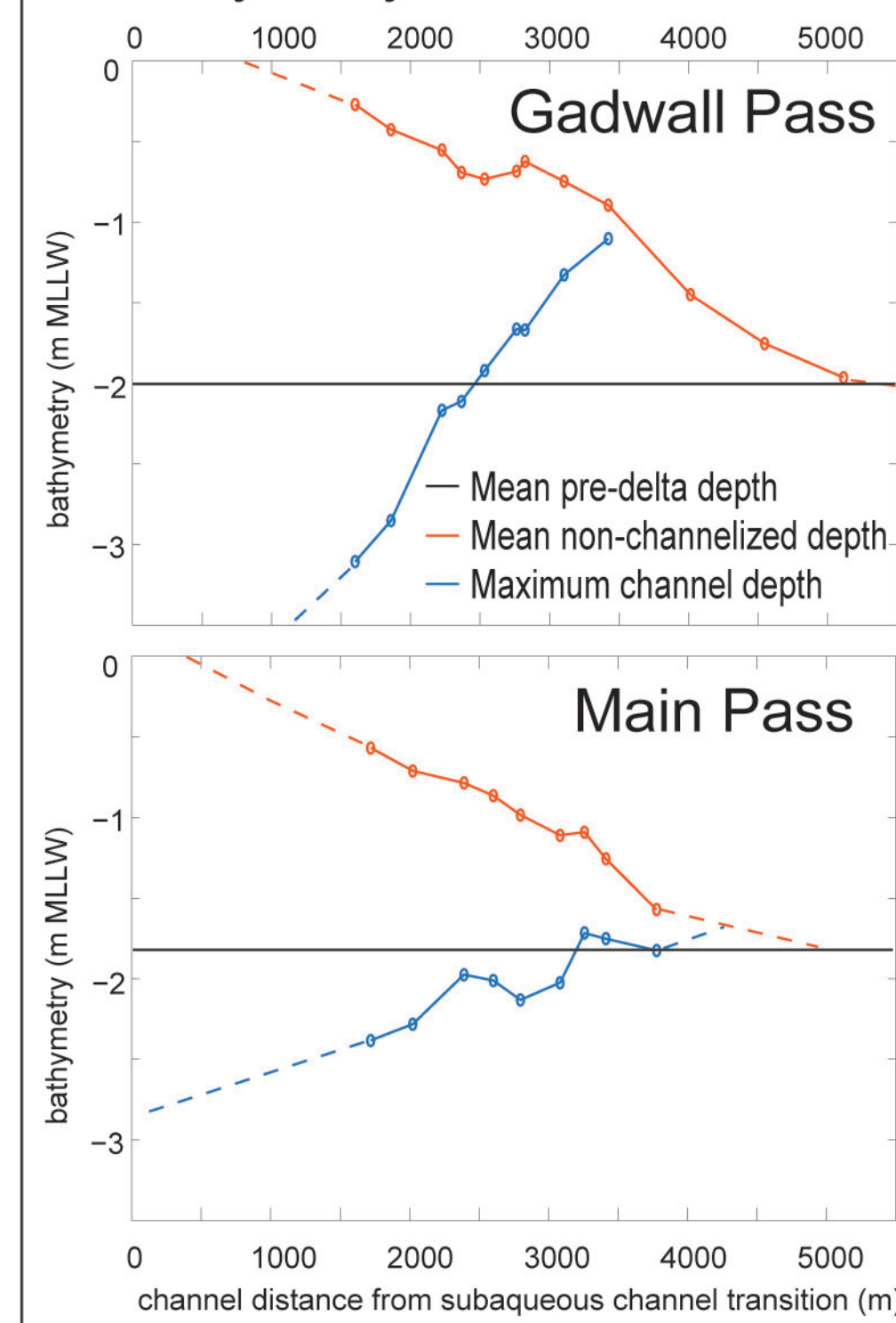
Conclusions Wax Lake delta bathymetry

- 1) Subaqueous distributary channels extend >2 km beyond their subaerial expression.
- 2) Channel definition is lost by the combination of channel-bottom shoaling and plunging of the non-channelized surface.
- 3) After channels lose definition, the non-channelized surface slopes uniformly to the pre-delta bay floor.
- 4) The degree of bifurcation is variable for different distributary channels. For the two channels surveyed on the Wax Lake delta, one channel bifurcated 4 times and one channel bifurcated once.

Connecting river progradation with delta front topography

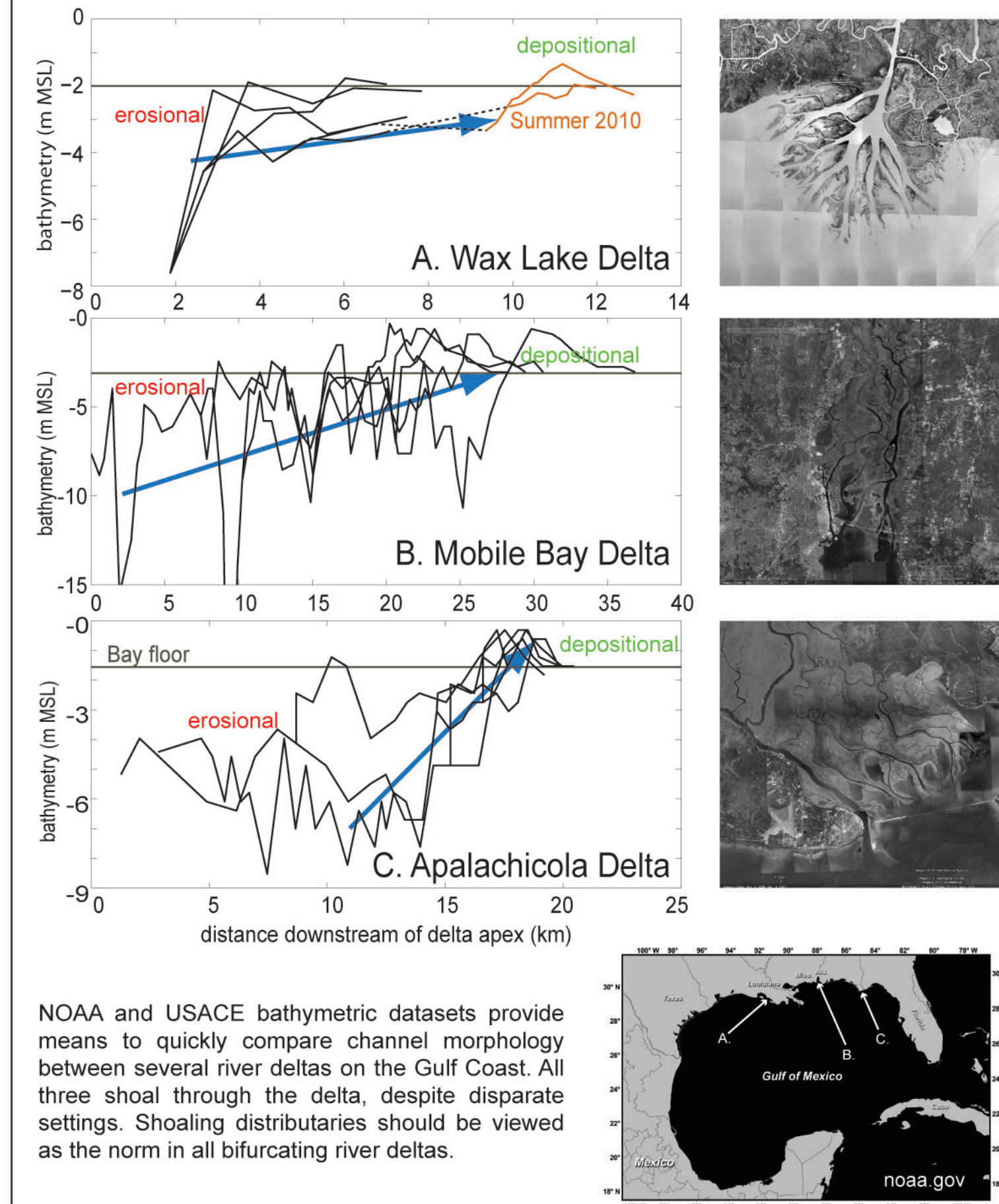
- 1) The tip of a distributary channel has a set geometry: a shoaling channel and a plunging non-channelized surface.
- 2) A delta channel lengthens via translating this set geometry seaward.
 - a. Non-channelized surface must aggrade.
 - b. Channels must incise.
- 3) The unchannelized surface to the sides and in front of a channel tip constitutes a single topographic element that is not easily separated into levee and mouth-bar components.
- 4) The distributary channel lengthens by the translation of a similar form.
- 5) Bifurcations are initiated around the subaqueous channels, and arise from the dynamic and transient nature of this region.

Dowstream trends in bathymetry

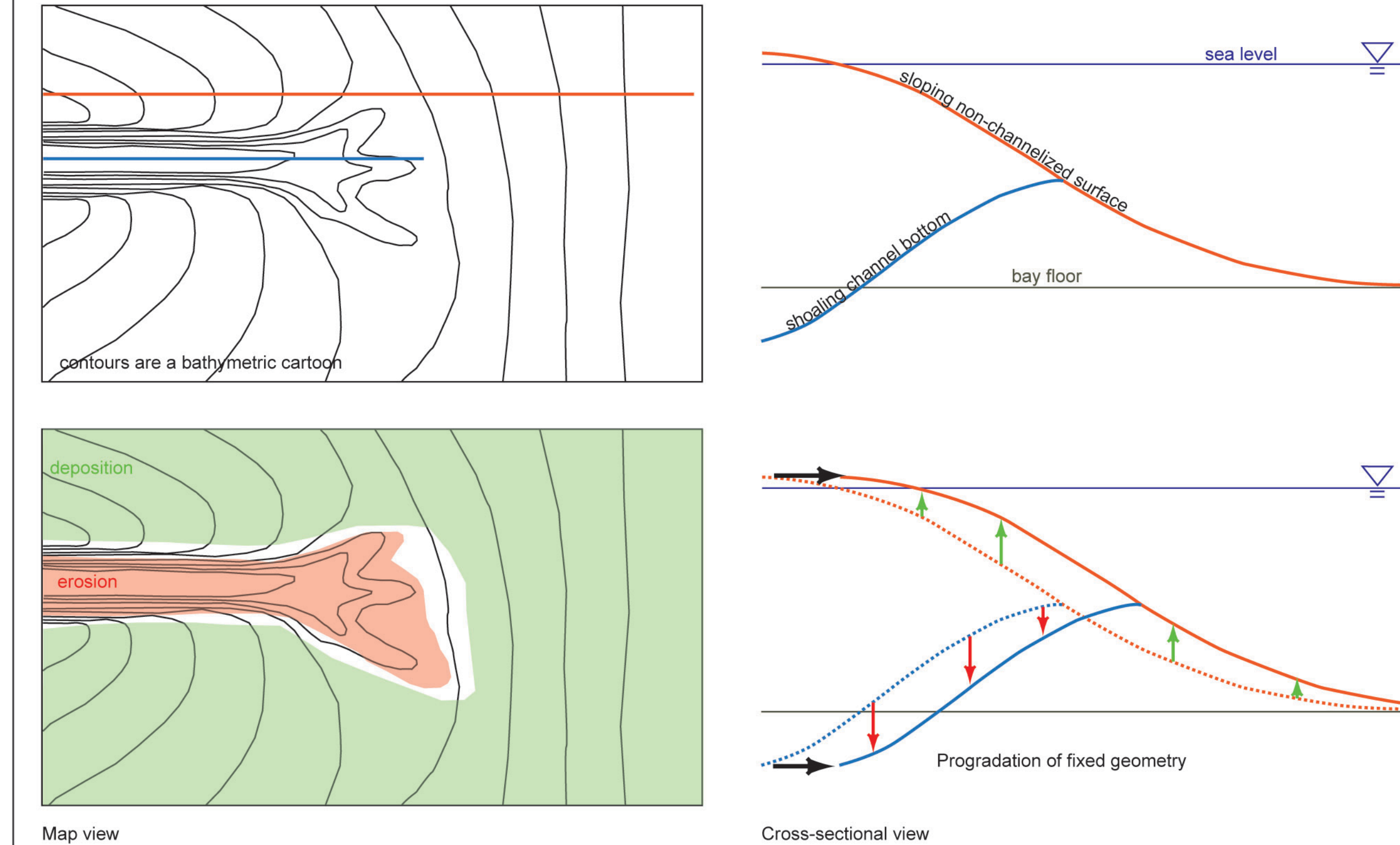


These plots show the change in channelized and non-channelized bathymetry at each transect of Gadwall and Main passes. Notice that both channel bottoms shoal and both non-channelized elevations plunge. Dotted lines are extrapolations upstream and downstream of measured data.

Channel shoaling is the rule in Gulf of Mexico deltas



Geometric and Kinematic constraints on river delta progradation



In our conceptual model, the geometry of the channel bottom and banks remain fixed as progradation occurs causing aggradation of the channel banks and delta front, while channel beds incise.