Using River Diversions to Maximize Elevation Capital

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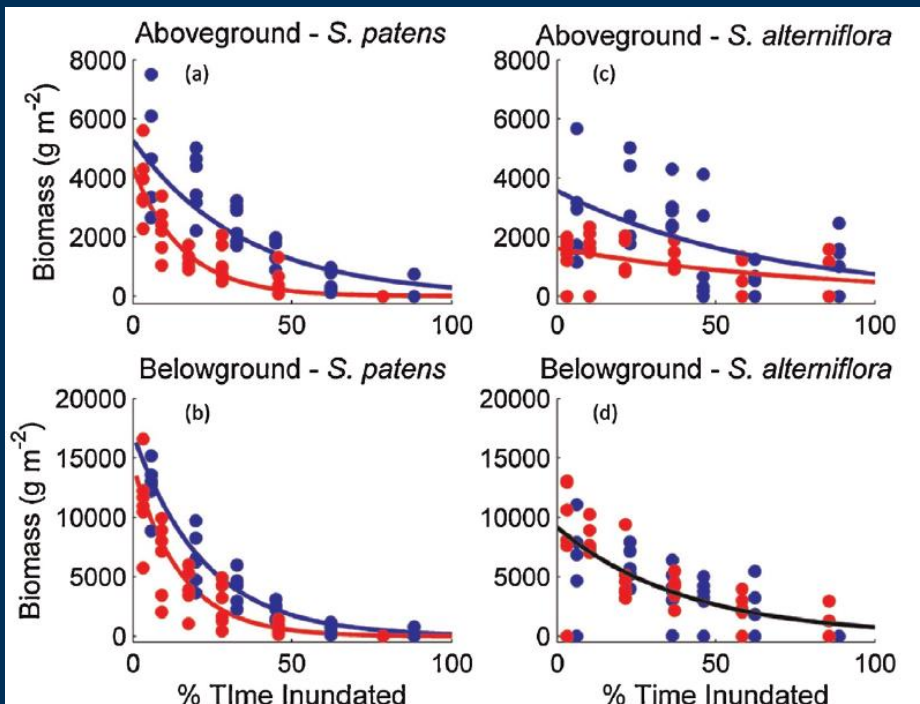
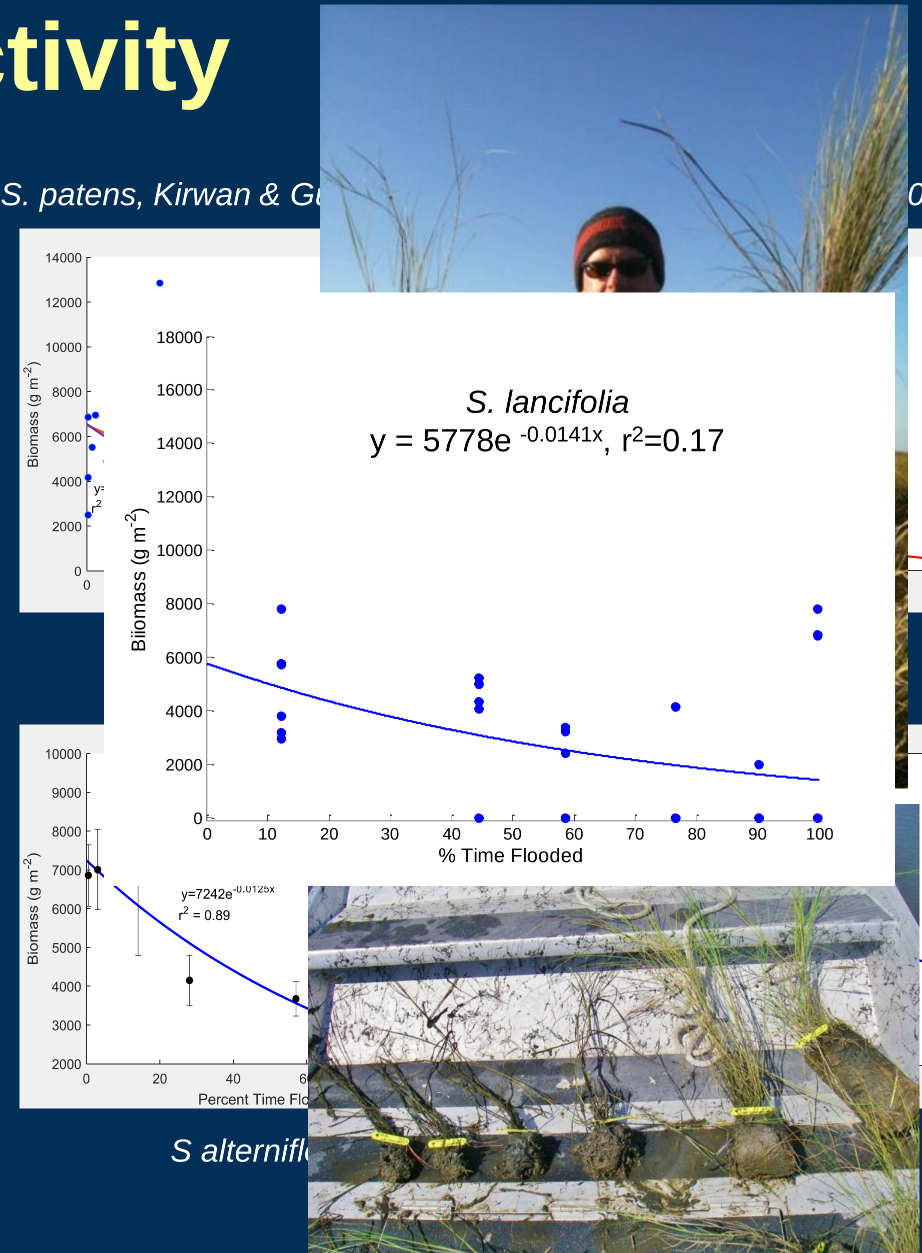
Hydroperiod Influences on Vegetation Productivity





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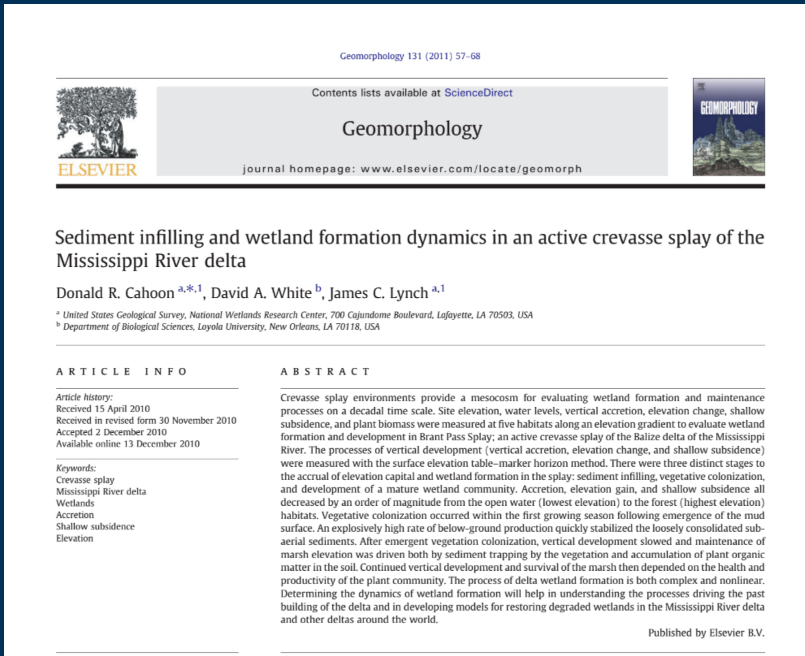

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Sediment infilling and wetland formation dynamics in an active crevasse splay of the Mississippi River delta

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ABSTRACT

Crevasse splay environments provide a mesocosm for evaluating wetland formation and maintenance processes on a decadal time scale. Site elevation, water levels, vertical accretion, elevation change, shallow subsidence, and plant biomass were measured at five habitats along an elevation gradient to evaluate wetland formation and development in Brant Pass Splay; an active crevasse splay of the Balize delta of the Mississippi River. The processes of vertical development (vertical accretion, elevation change, and shallow subsidence) were measured with the surface elevation table–marker horizon method. There were three distinct stages to the accrual of elevation capital and wetland formation in the splay: sediment infilling, vegetative colonization, and development of a mature wetland community. Accretion, elevation gain, and shallow subsidence all decreased by an order of magnitude from the open water (lowest elevation) to the forest (highest elevation) habitats. Vegetative colonization occurred within the first growing season following emergence of the mud surface. An explosively high rate of below-ground production quickly stabilized the loosely consolidated sub-aerial sediments. After emergent vegetation colonization, vertical development slowed and maintenance of marsh elevation was driven both by sediment trapping by the vegetation and accumulation of plant organic matter in the soil. Continued vertical development and survival of the marsh then depended on the health and productivity of the plant community. The process of delta wetland formation is both complex and nonlinear. Determining the dynamics of wetland formation will help in understanding the processes driving the past building of the delta and in developing models for restoring degraded wetlands in the Mississippi River delta and other deltas around the world.

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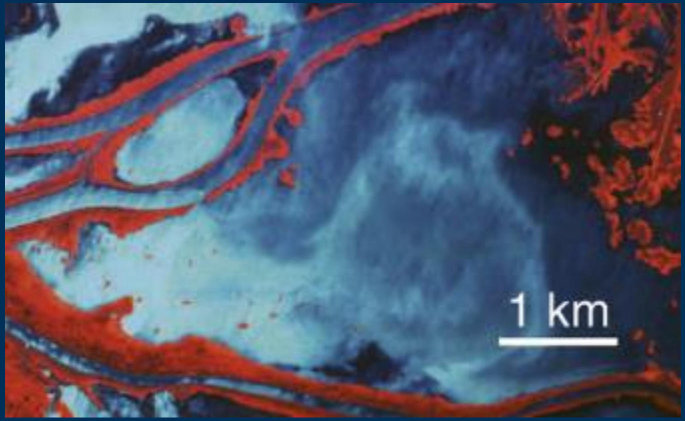
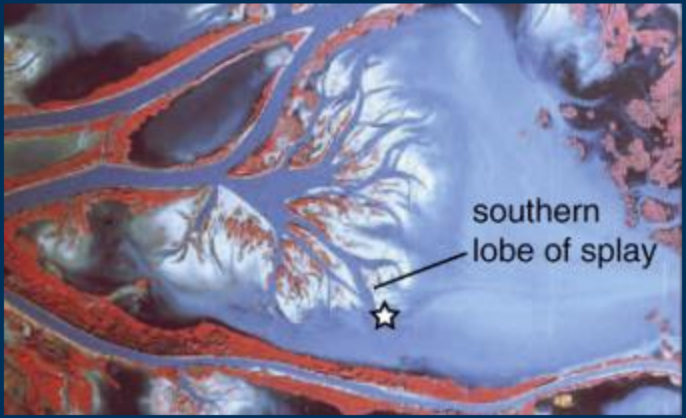
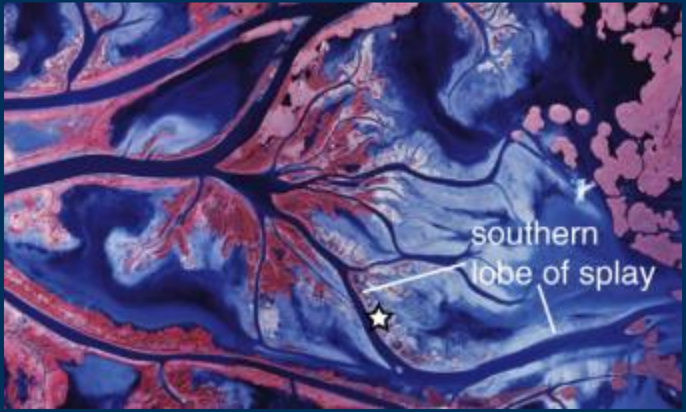
- Examined the wetland formation and elevation dynamics on an individual lobe of a developing crevasse splay within the Cubits Gap sub-delta complex
- Transitioned to subaerial in 1985, and was high marsh by 1988



1978

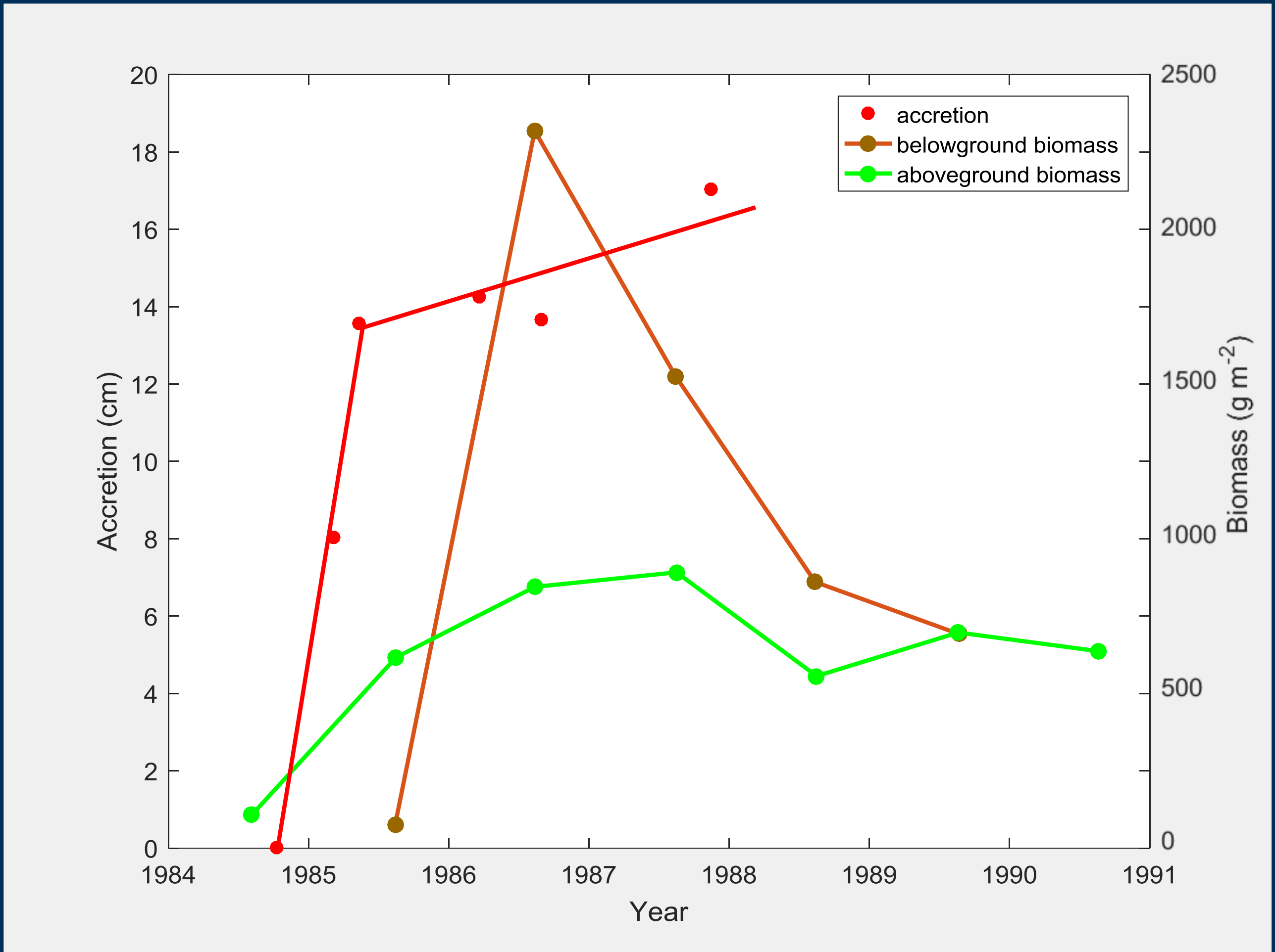


1983



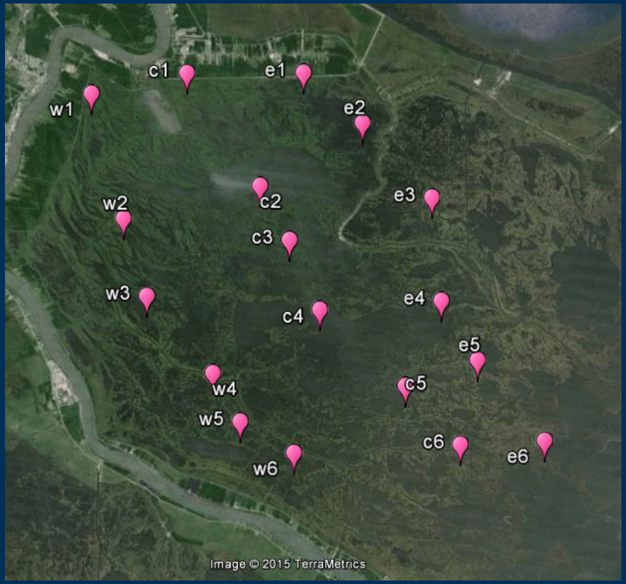
1991

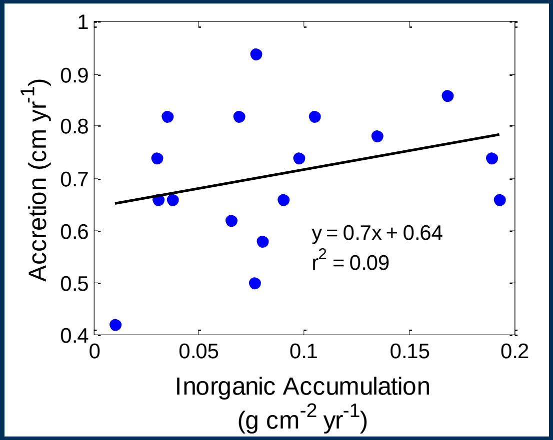
Accrual of Elevation Capital in Delta Splays



reproduced from Cahoon et al., Geomorphology 131:57-68 (2011)

Drivers of Vertical Accretion in the Inactive Delta Marshes





Location	n	r^2	slope		accretion rate (cm/yr)
			organic	mineral	
Terrebonne (Nyman et al 1993)	15	0.81	12.9	ns	0.55-1.78
Louisiana (Delaune et al. 1989)	47	0.49	13.7	ns	0.22-1.17
LA/TX (Turner 2000)	55	0.66	8.0	ns	0.28-1.14
Barataria (DeLaune et al. 2013)	12	0.56	10.9	ns	0.59-1.03
Breton Sound 2008	18	0.63	9.0	ns	0.49-0.94

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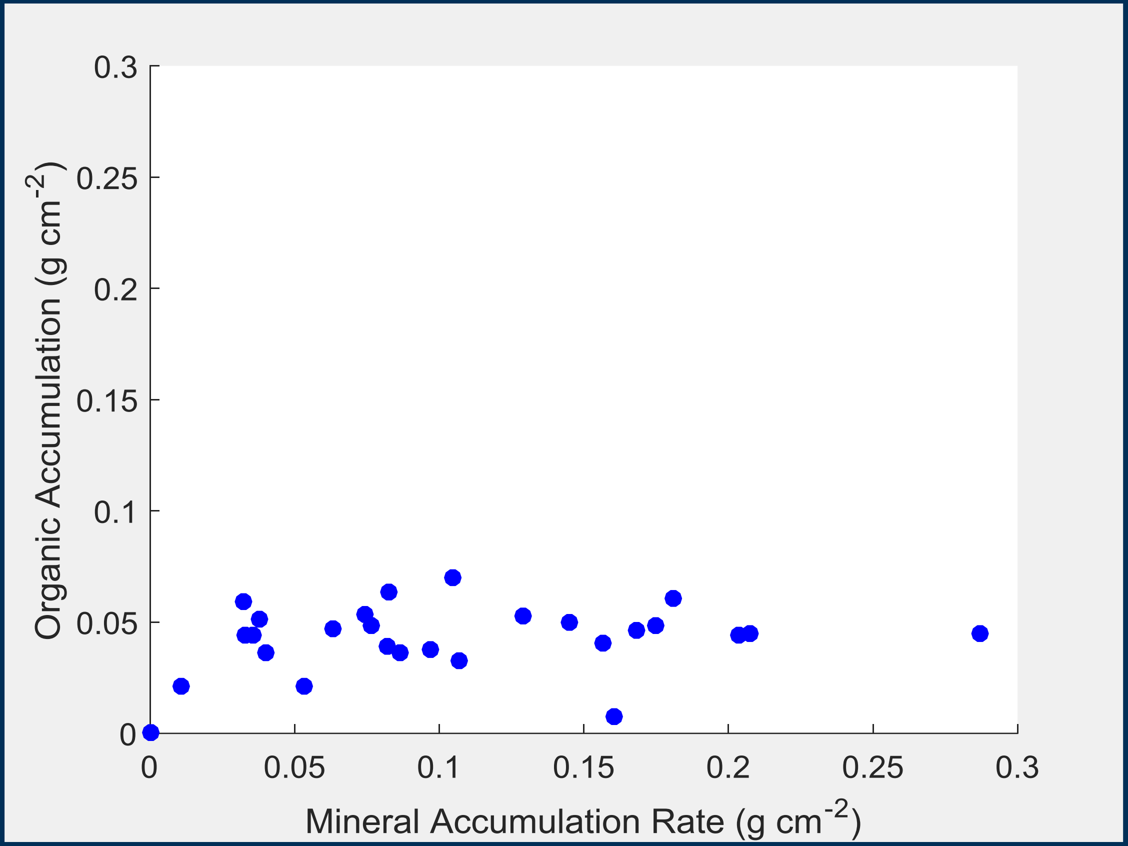
Mineral Effects on Organic Matter Production



Components of Soil Volume in the Delta Plain

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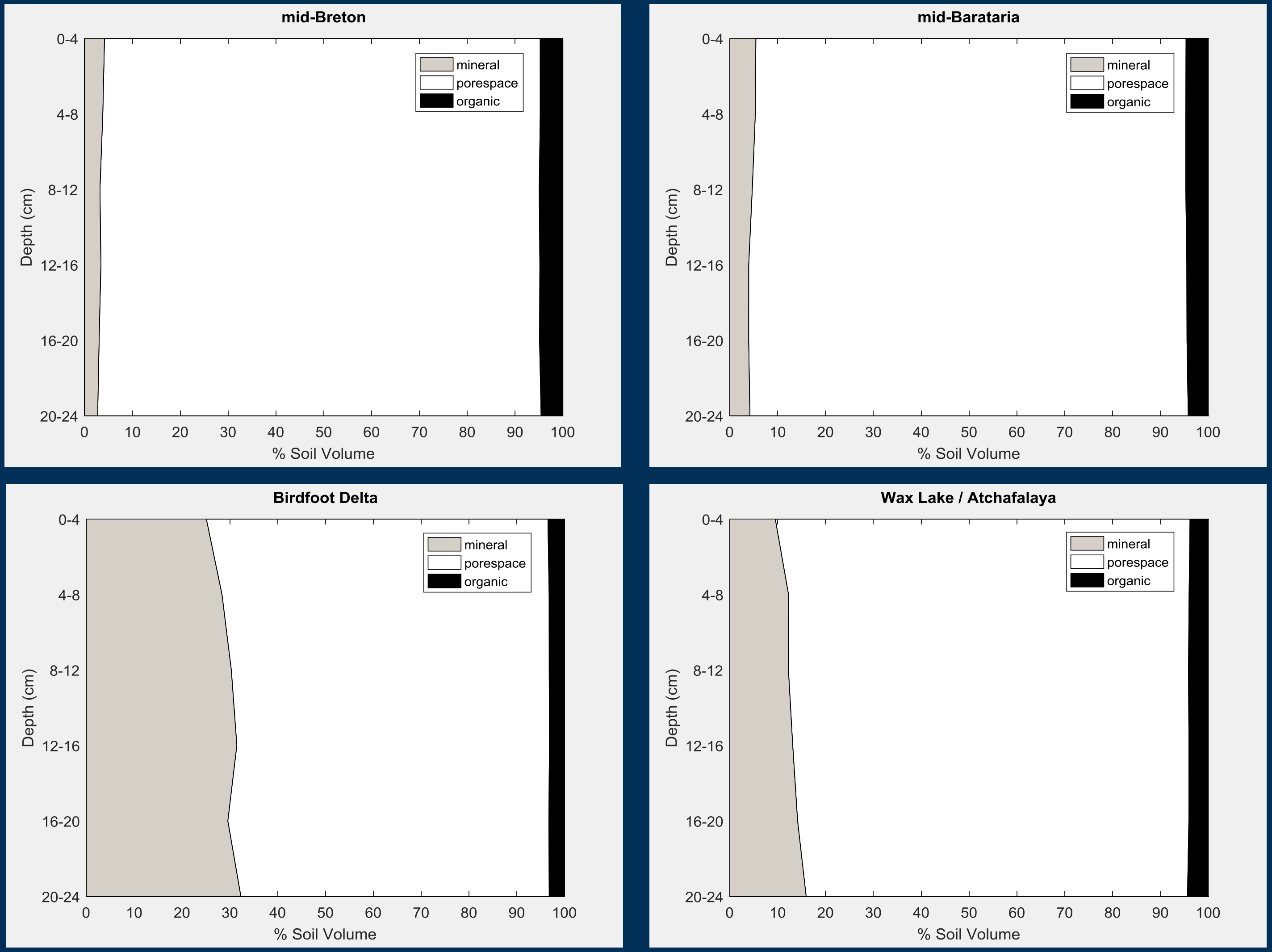
Mineral and Organic Contributions to Soil Volume



Mineral Sediment as a Driver of Bulk Density