

Variation in carbon storage and nutrients in mangrove peats across a climatic and geomorphic gradient in Puerto Rico

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Objective: Extend the assessment of mangrove sediment carbon and nutrient storage to forests of the Caribbean islands

Methods and Study Sites

We collected two 40cm cores from 3 mangrove forests across Puerto Rico (Figure 1). 1-cm sections (2-cm for top 10 cm) (Figures 2 & 3) were analyzed for % organic matter from LOI, inorganic & organic carbon (IC & OC), nitrogen (N), phosphorus (P), & dry bulk density (DBD). ²¹⁰Pb isotopic dating will generate carbon accretion rates (mm/year).

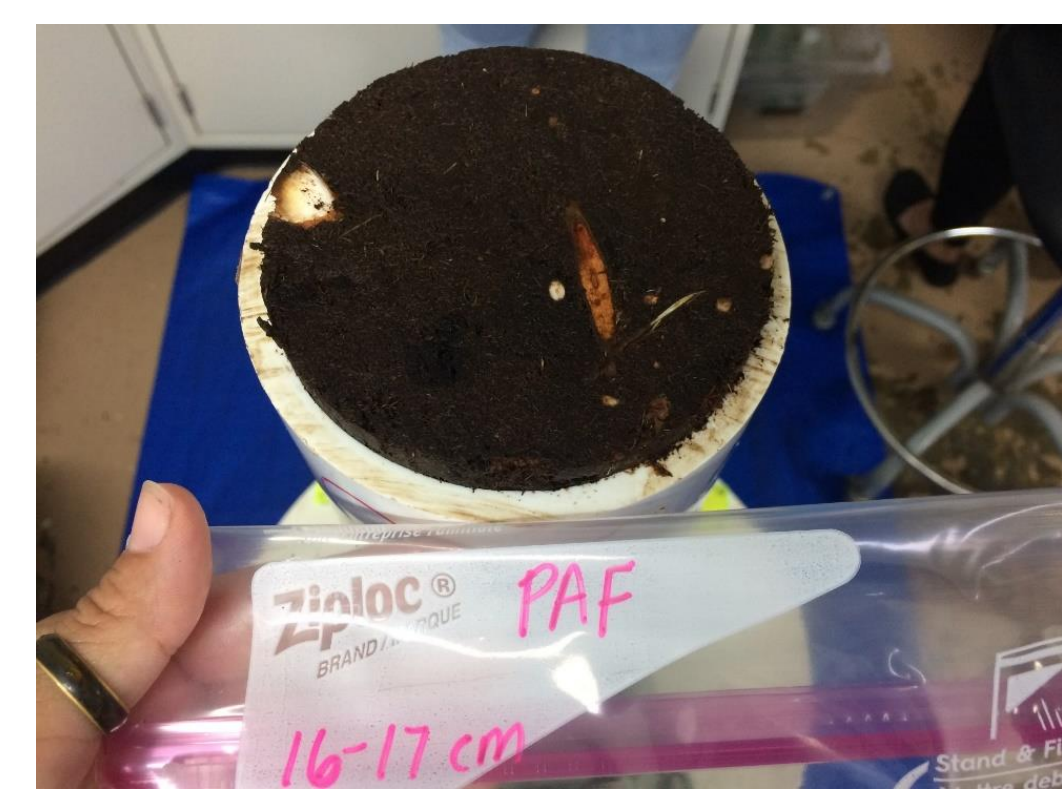
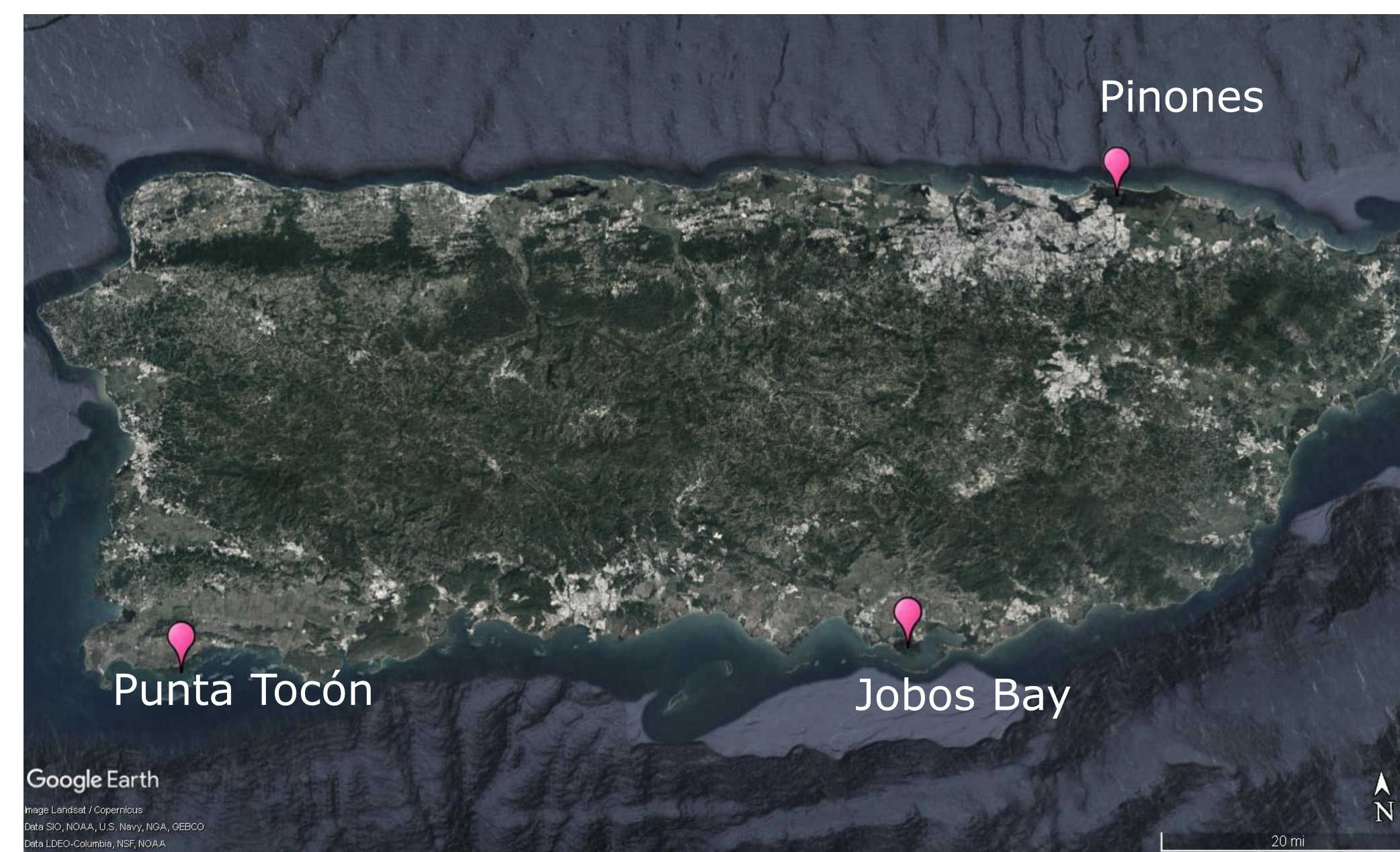


Figure 3. Punta Tocón core interval 16-17 cm.

Pinones Wettest site (~1300 mm/year) with average porewater salinity = 31 ppt

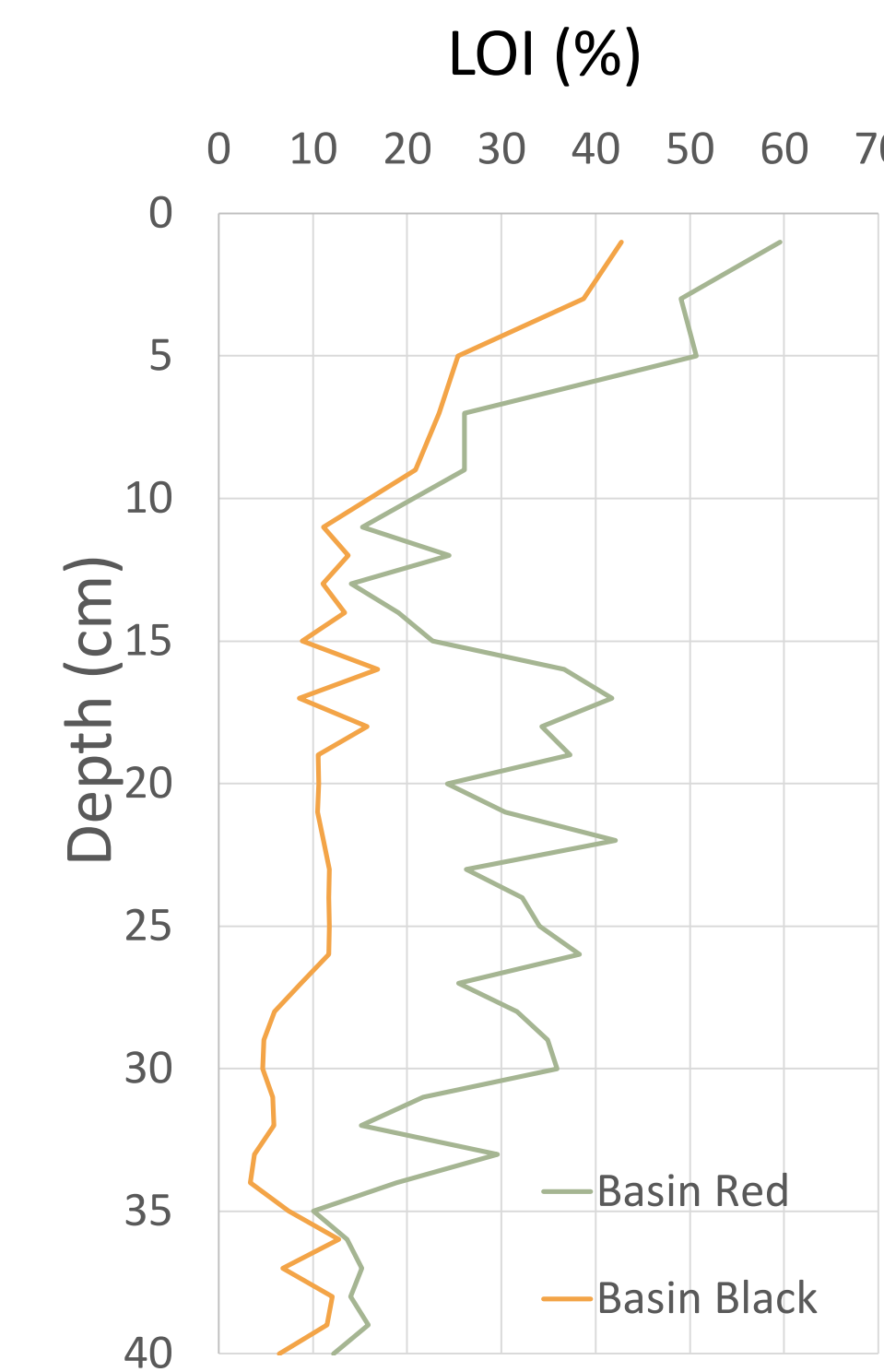


Figure 5 Basin forest in Pinones is located in close proximity to human disturbance. However, the nearby road is now a trail used for recreation. Small DBH black mangroves dominate the site nearest the trail (photo).

Punta Tocón

Driest location (~760 mm/yr) porewater salinity = 56 ppt

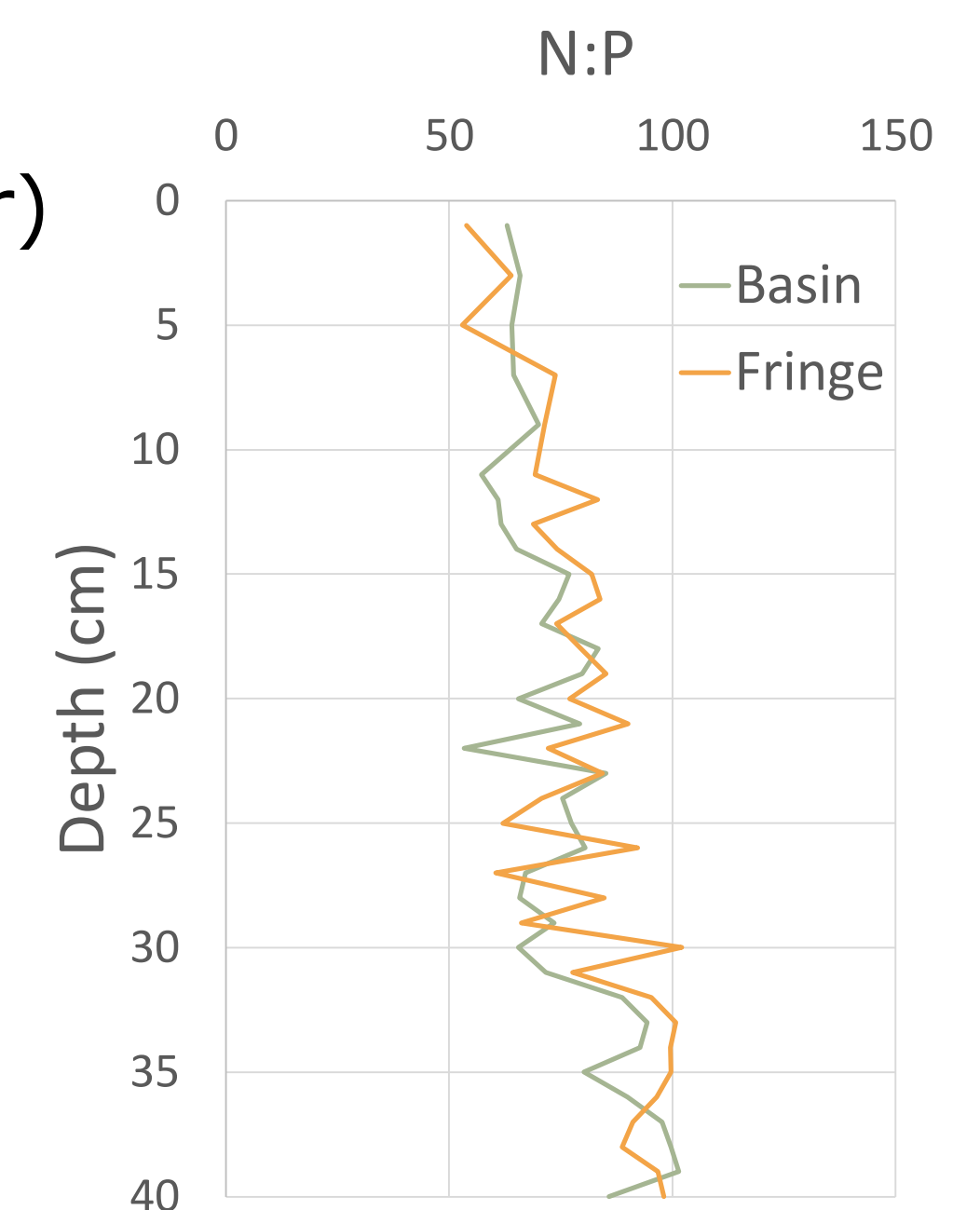


Figure 4. Low OM (above) indicates large amount of terrigenous sediment input to forest until very recently.

Figure 6 (left). The extent of mangrove forest at Punta Tocón has changed little since 1975. *R. mangle* seedlings carpet the ground (photo). Figure 7 (right). Trend in N:P ratio suggests increasing availability of P, which was also observed at Jobos Bay. Legacy of intense farming on the south side of the island is implicated.

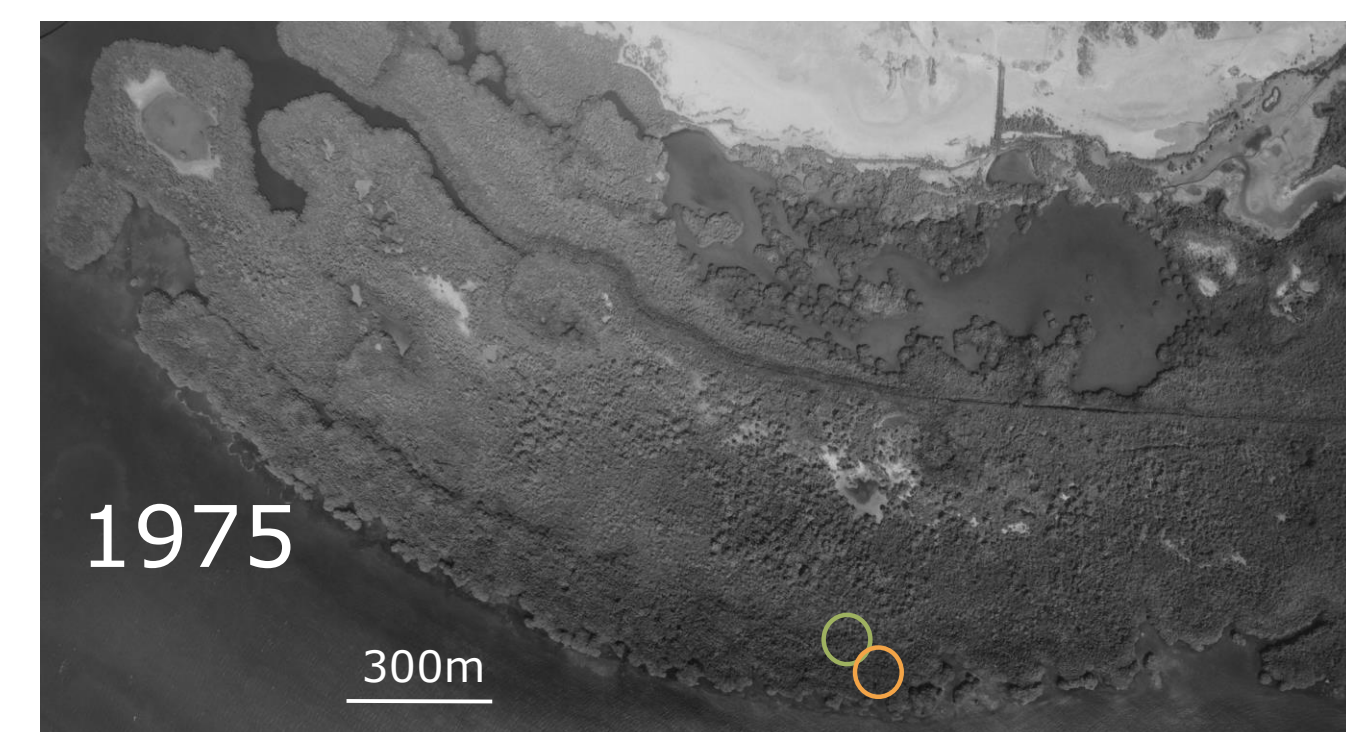
Figure 1 (above). Sediment core collection locations in Puerto Rico (June 2017). Figure 2 (above right). REU student, Tatiana Barreto, extrudes and sections a core at the International Institute for Tropical Forestry.

Results: Site and Core Characteristics

Table 1. Mean ± SE of sediment physical and chemical characteristics for each core (n = 35). Range of tree height (Ht) and diameter at breast height (DBH) for each site. Dominant mangrove species is indicated*.

	Pinones		Punta Tocon		Jobos Bay	
	Basin (Red)	Basin (Black)	Basin (Red)	Fringe (Red)	Basin (Red)	Fringe (Red)
Tree Ht (m)	7 - 8	6 - 9	5 - 7	7 - 9	1 - 2	2 - 6
Tree DBH (cm)	3 - 11	2 - 9	5 - 25	5 - 25	1 - 3	1 - 3
DBD (g cm ⁻³)	0.49 ± 0.03	0.92 ± 0.05	0.14 ± 0.005	0.16 ± 0.004	0.21 ± 0.01	0.13 ± 0.003
LOI (%)	28.0 ± 2.0	12.6 ± 1.5	64.4 ± 0.8	64.5 ± 0.3	65.5 ± 0.5	69.1 ± 0.7
OC (mg g ⁻¹)	139.4 ± 10.7	50.4 ± 8.2	317.3 ± 4.4	323.2 ± 3.1	326.3 ± 3.5	353.3 ± 4.6
IC (mg g ⁻¹)	bdl	bdl	1.25 ± 0.04	1.27 ± 0.04	1.17 ± 0.06	0.85 ± 0.13
N (mg g ⁻¹)	5.9 ± 0.5	2.8 ± 0.4	16.5 ± 0.5	17.7 ± 0.3	11.4 ± 0.2	10.9 ± 0.2
P (mg g ⁻¹)	0.21 ± 0.02	0.15 ± 0.02	0.50 ± 0.02	0.50 ± 0.02	0.39 ± 0.04	0.36 ± 0.02
OC:N	28 ± 0.7	21 ± 0.3	23 ± 0.9	21 ± 0.3	34 ± 0.8	38 ± 0.9
N:P	63 ± 2.0	39 ± 1.9	76 ± 2.1	81 ± 2.3	85 ± 6.2	78 ± 5.4

* Red = *Rhizophora mangle*, Black = *Avicennia germinans* bdl = below detection limit



Jobos Bay Ave rainfall: 990 mm/yr; salinity of standing water = 86 ppt



Above. Loss of mangrove forest cover in Jobos Bay is evident over a 60-year period (earthexplorer.usgs.gov). Increases in phosphorus availability (Figure 8) can lead to decreased root biomass, which combined with SLR and dry conditions could explain forest decline.

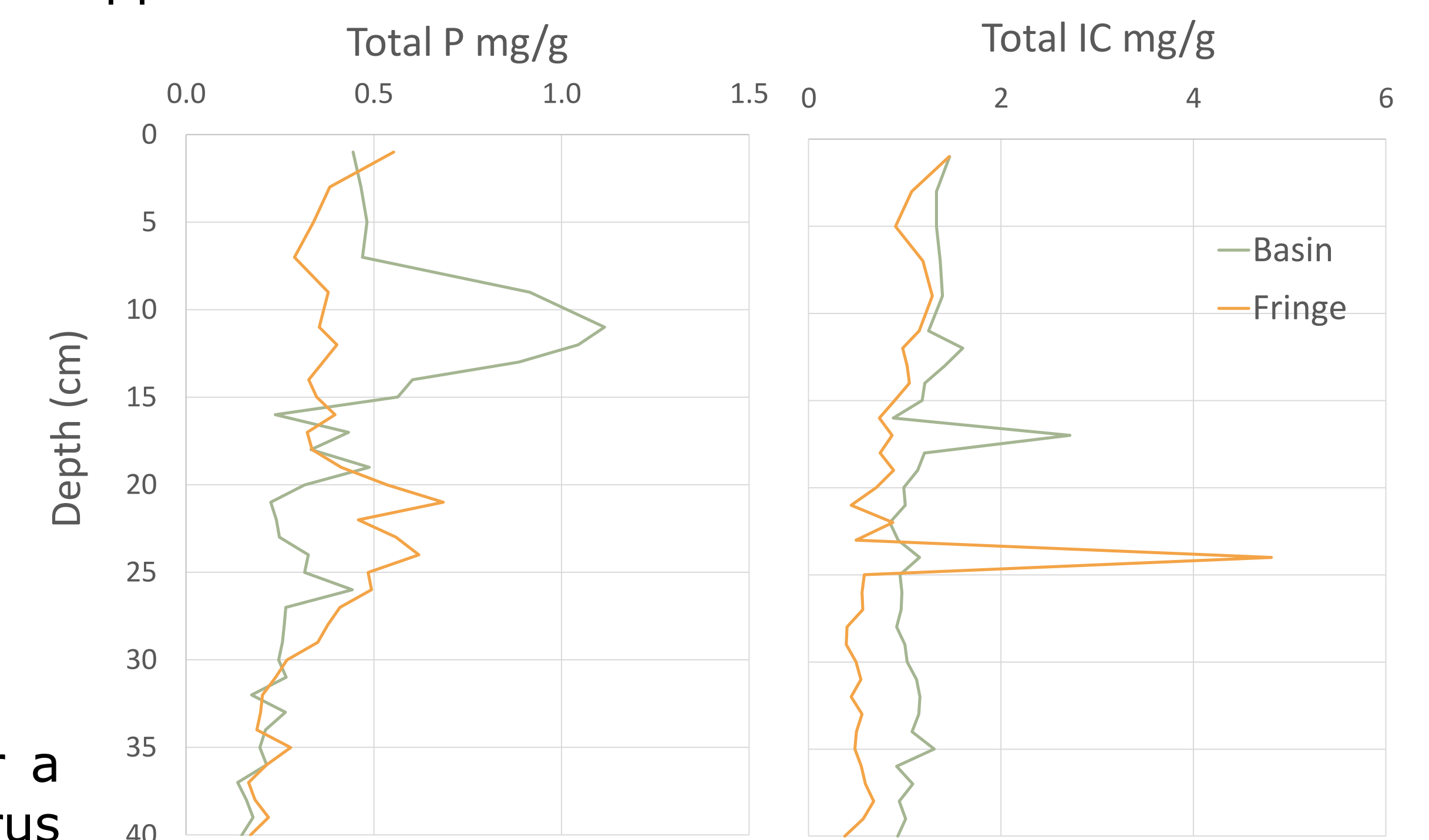


Figure 8. Peaks in IC are associated with TP peaks. Ca-bound P from bay can be moved during storms.



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