Evolução morfológica dos sapais do estuário do Tejo face à subida do nível médio do mar

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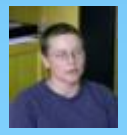
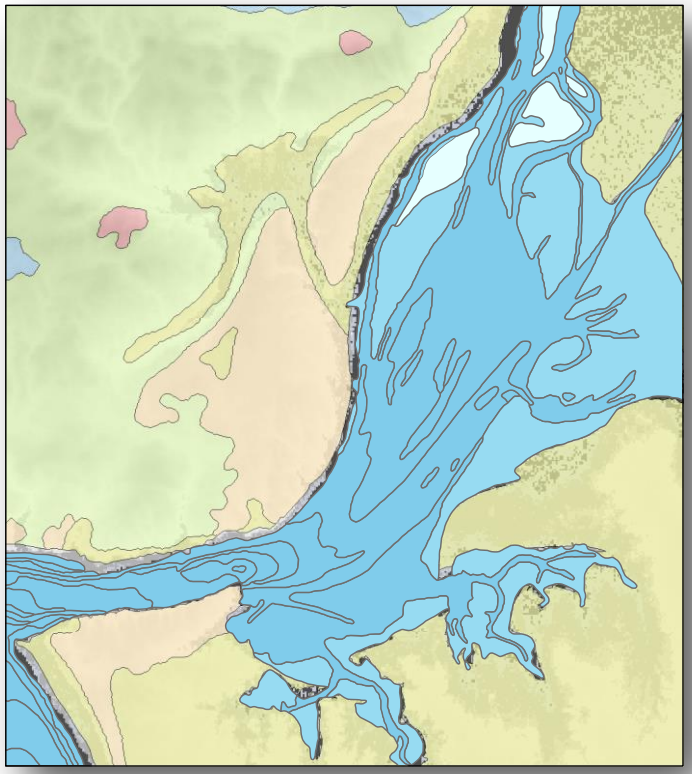
Sabine Schmidt; Rui Taborda; Carlos Antunes



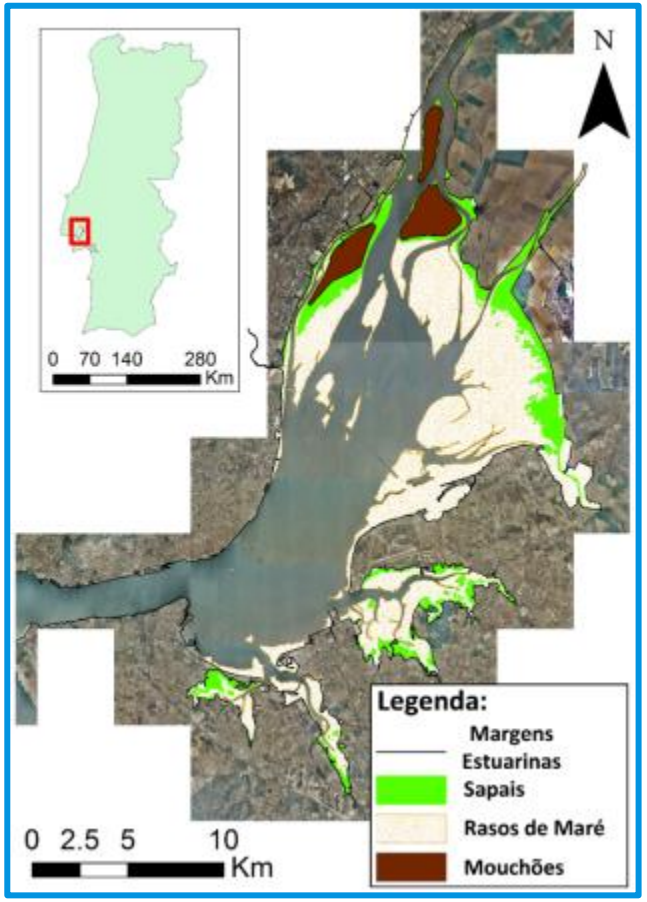
Departamento e Centro de Geologia
Faculdade de Ciências da Universidade de Lisboa
Instituto D. Luís
Laboratório Nacional de Engenharia Civil
Université Bordeaux 1

O estuário do Tejo…



Área - 320 km²
Bacia hidrográfica – 81 000 km²
Profundidade média – 11 m (canal 40 m)
Maré dinâmica – 80 km
Maré salina ~ 50 km
Prisma de maré – 6-8 x 10^8 m^3

Área intertidal – 130 km²
Rasos de maré ~110 km²
Sapais ~ 20 km²
Praias estuarinas



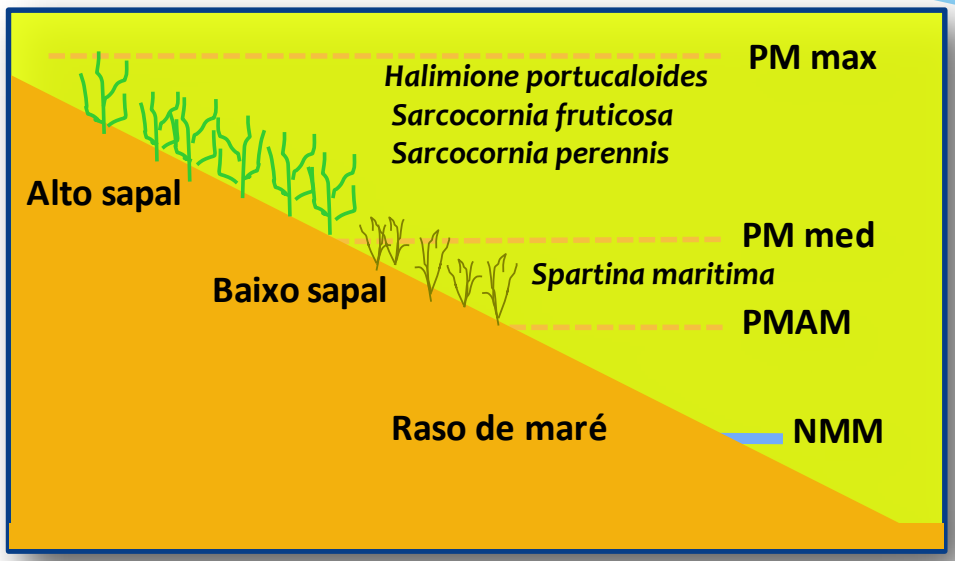
Mendes *et al.*, 2012

O estuário do Tejo...

SAPAIS NÍVEL DO MAR EVOLUÇÃO MORFOLÓGICA

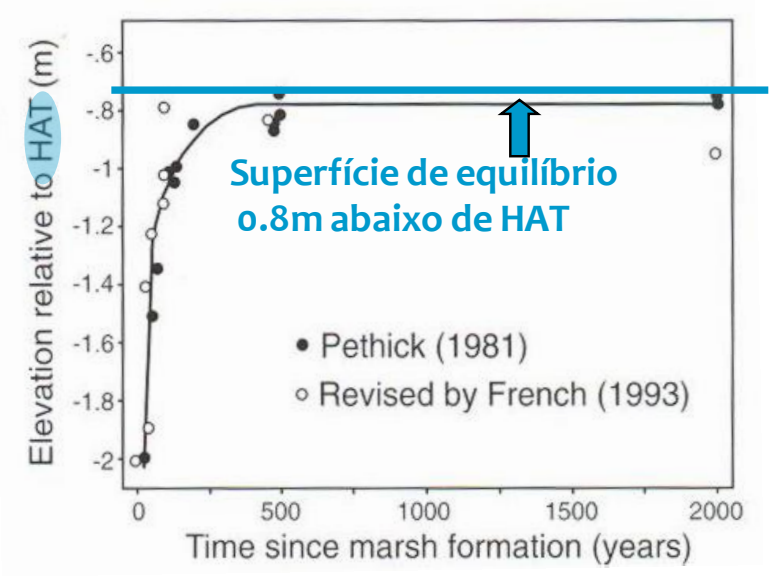
Qual vai ser a resposta das margens estuarinas aos efeitos das alterações climáticas?

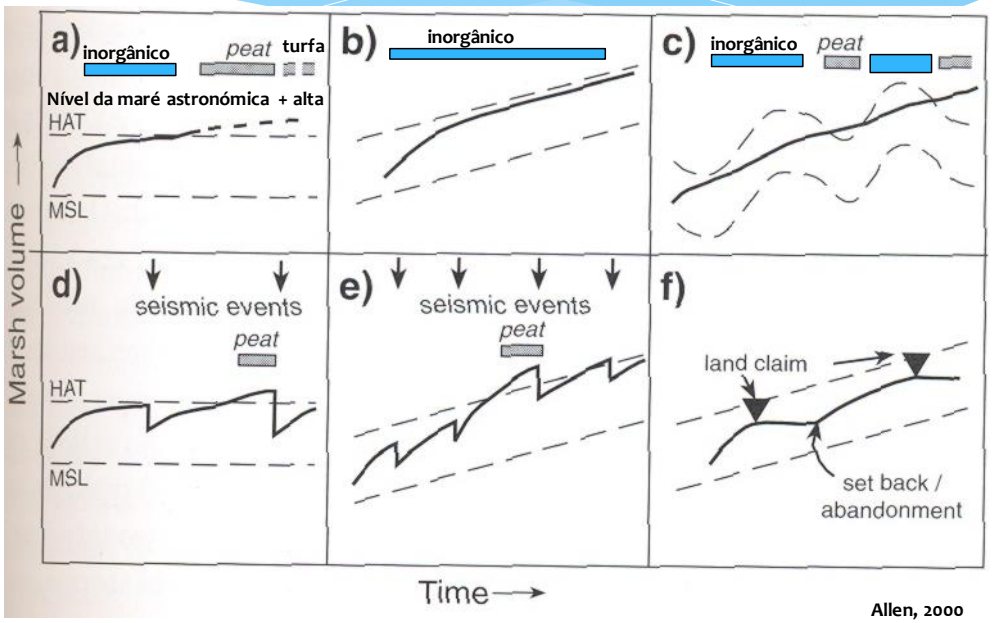
MORFEED


PM max
Halimione portucaloides
Sarcocornia fruticosa
Sarcocornia perennis
Alto sapal
PM med
Spartina maritima
Baixo sapal
PMAM
Raso de maré
NMM

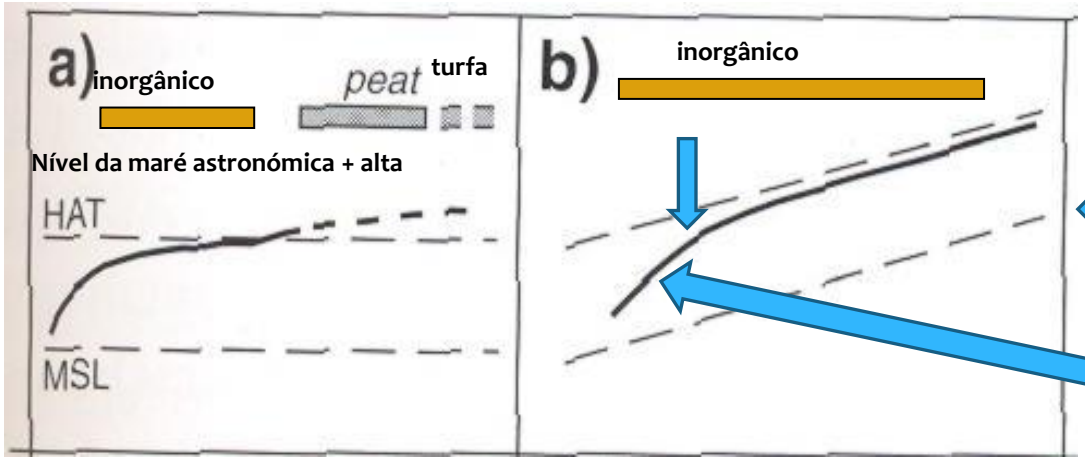
Qual vai ser a resposta dos sapais à subida do NMM (alterações climáticas)?

Nível da maré astronómica + alta

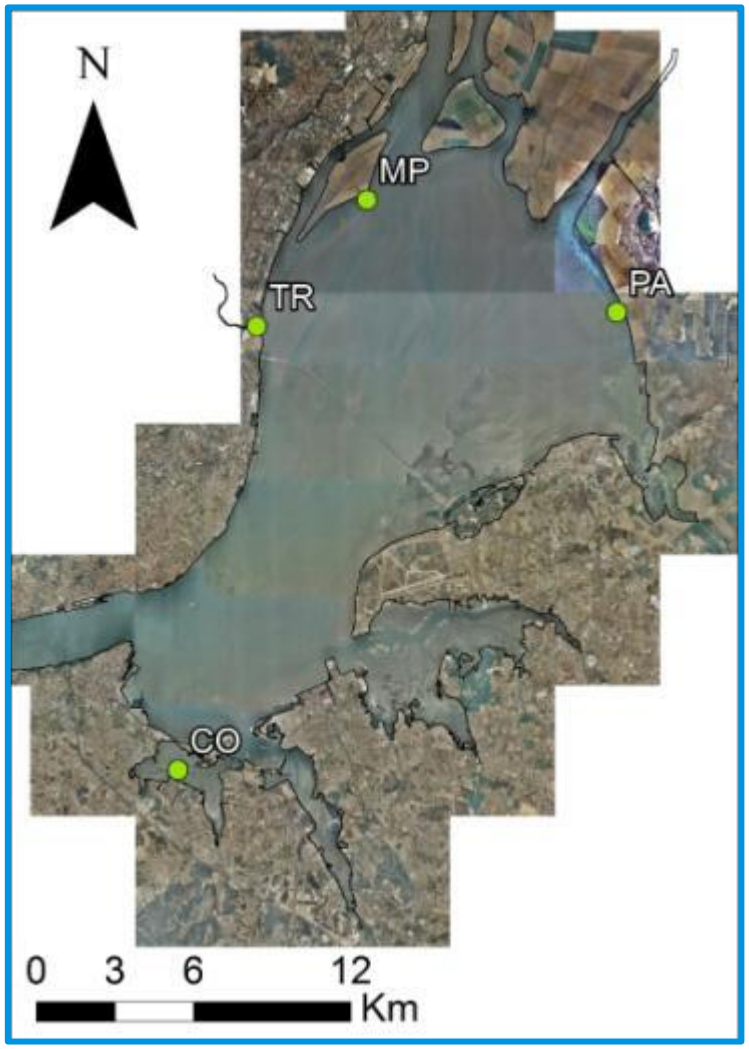




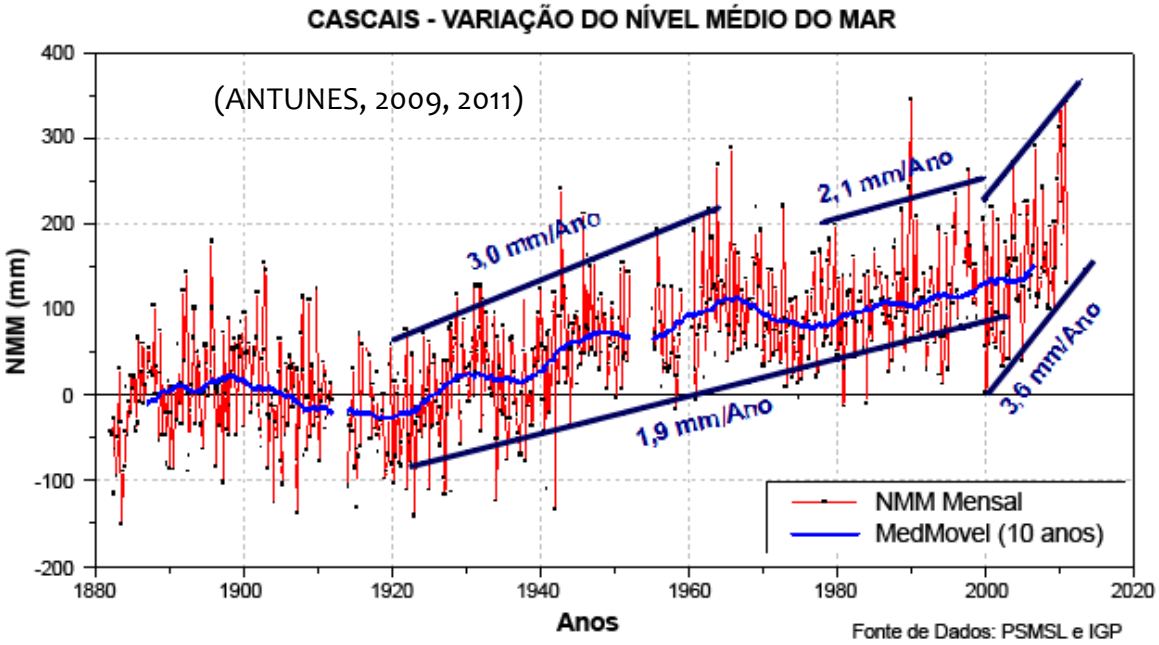
Allen, 2000



- Cronologia (projectada)
- Taxa de elevação do NMM
- Taxa de sedimentação no sapal

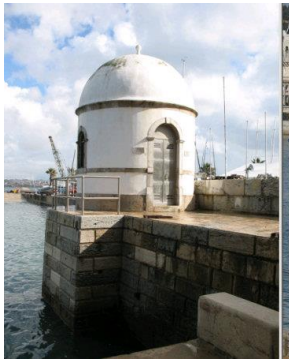


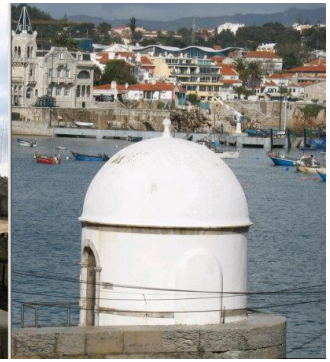
- Margem esquerda/margem direita
- Marginais/ao abrigo de restingas

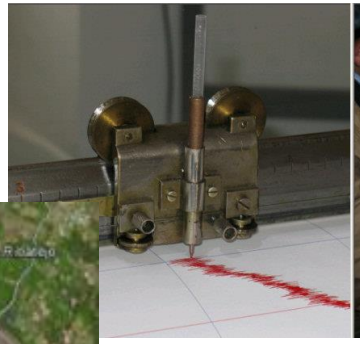


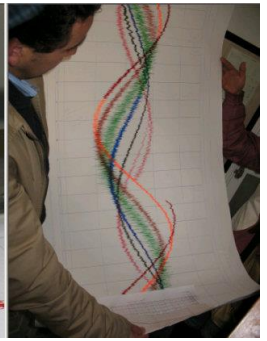
Marégrafo de Cascais

Um dos mais antigos da Europa - 1882



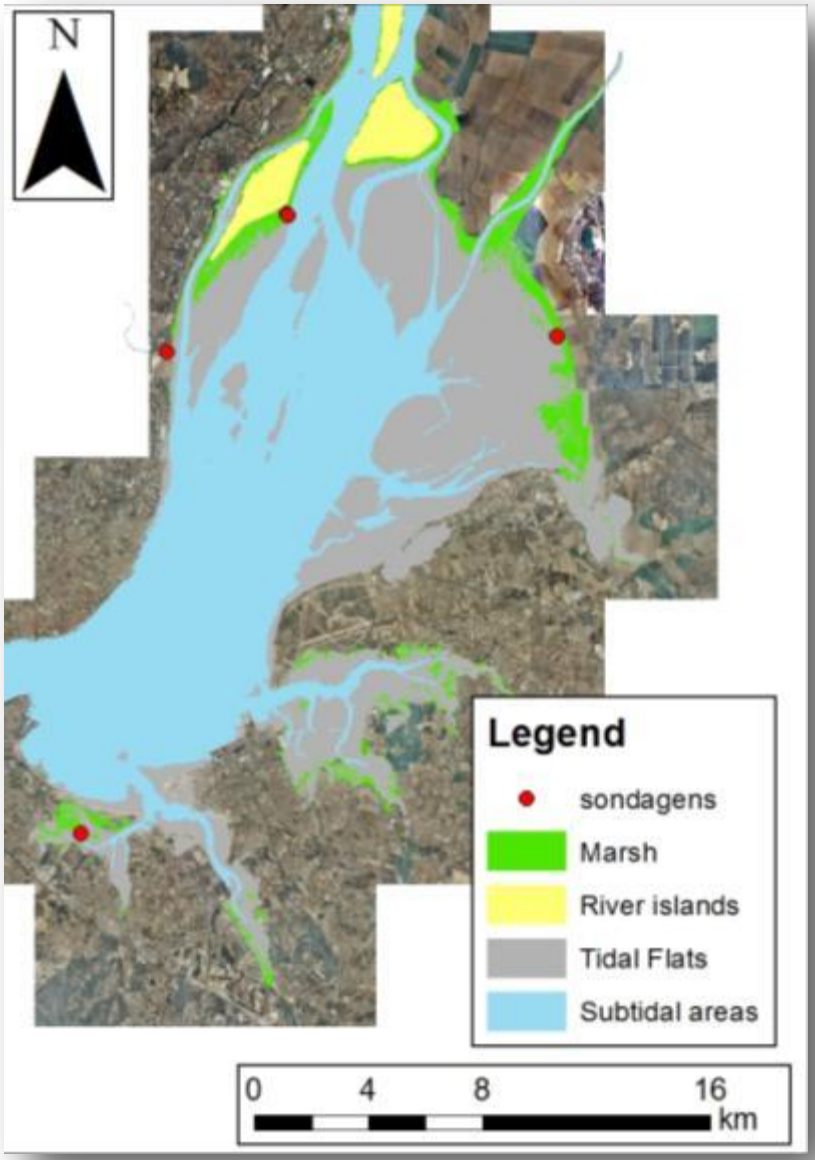




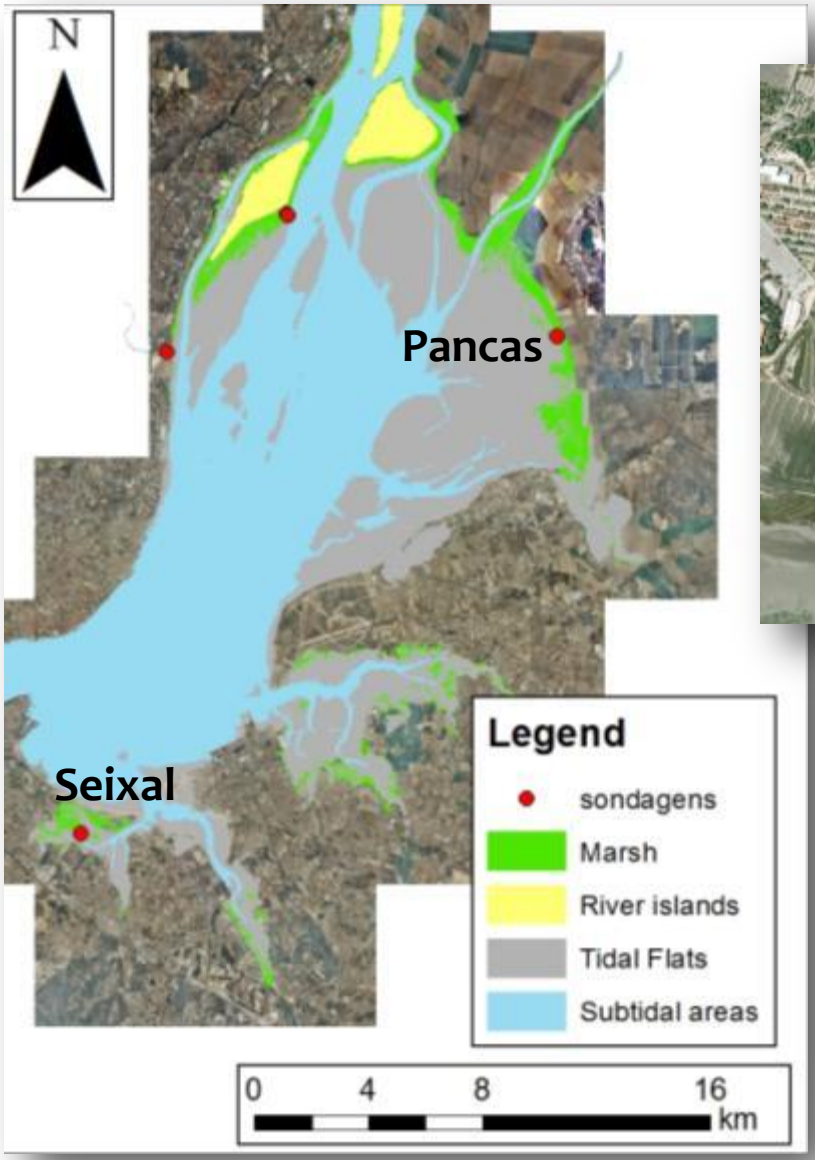


1.9 mm/ano (1920 - 2000)
2.1 mm/ano (1990 – 1999)
3.6 mm/ano (2000 - 2010) - NAO

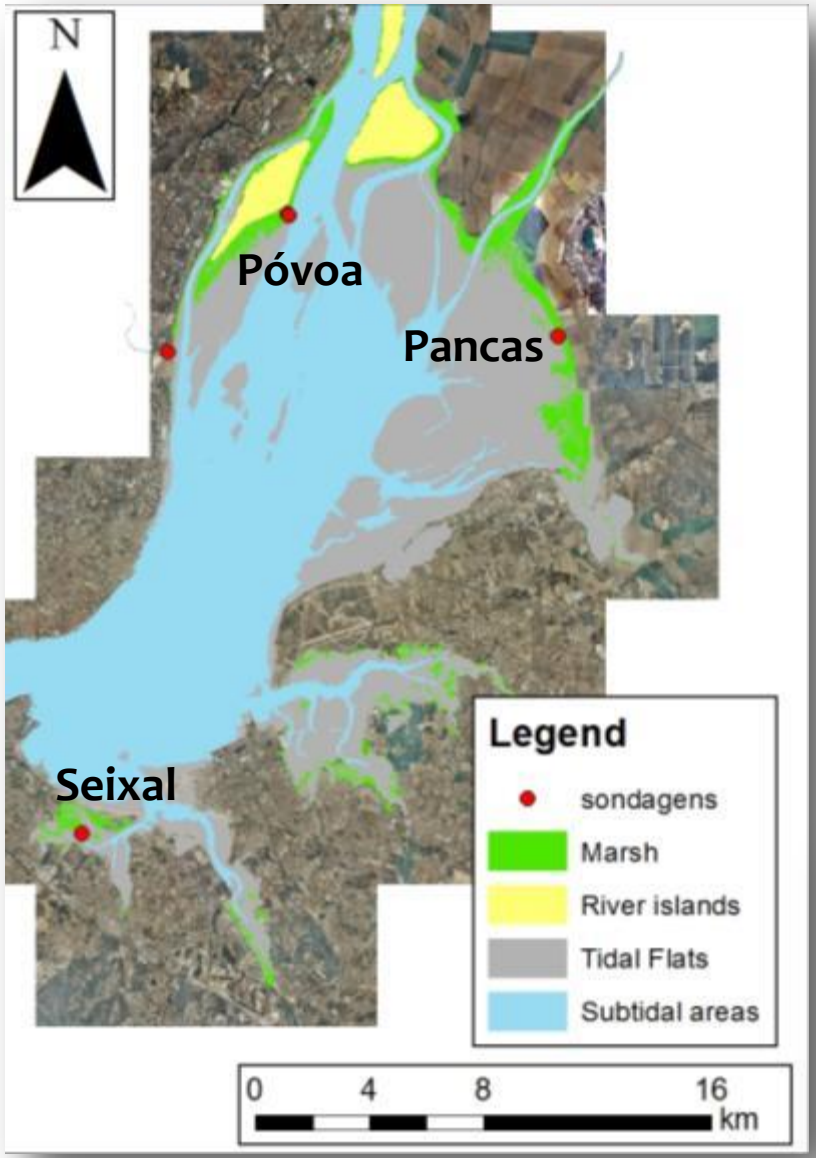
CONGRUÊNCIA com "OCEANO GLOBAL"

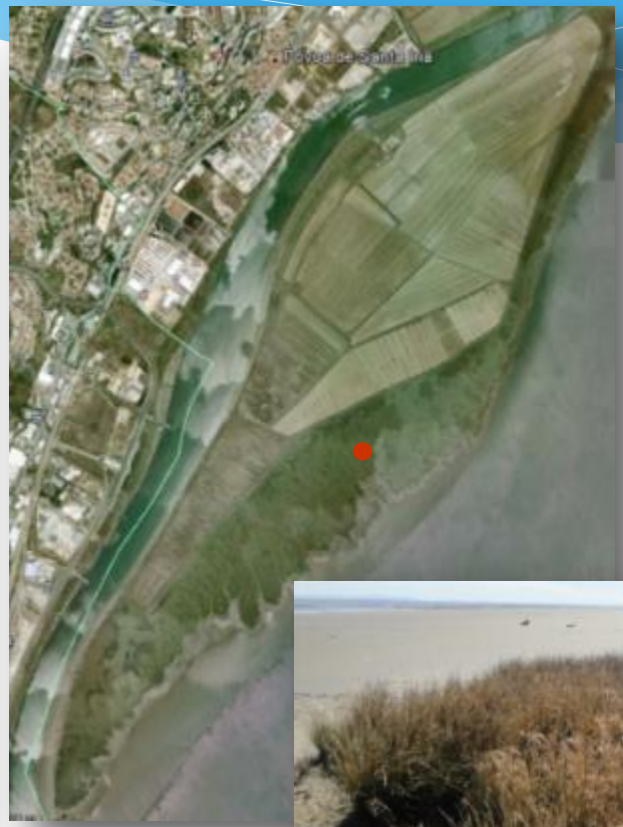

N
Legend
sondagens
Marsh
River islands
Tidal Flats
Subtidal areas
0
4
8
16
km

EVOLUÇÃO MORFOLÓGICA

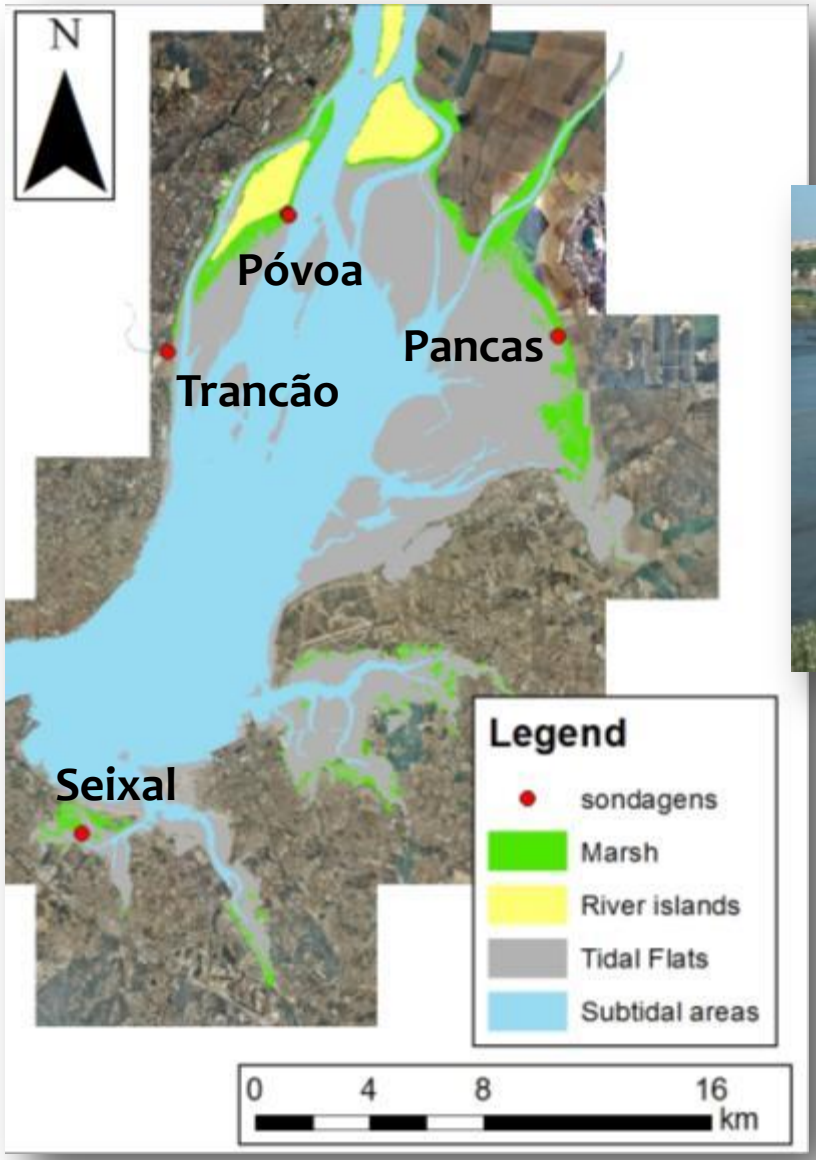


EVOLUÇÃO MORFOLÓGICA





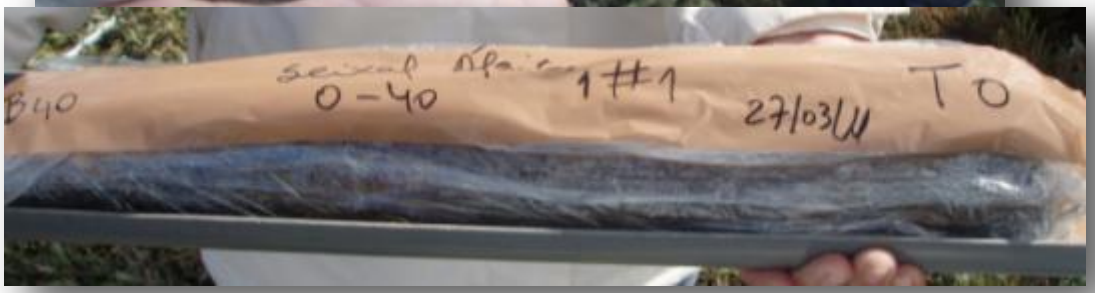
EVOLUÇÃO MORFOLÓGICA




ALDEGALENSE


Van der
Horst

EVOLUÇÃO MORFOLÓGICA



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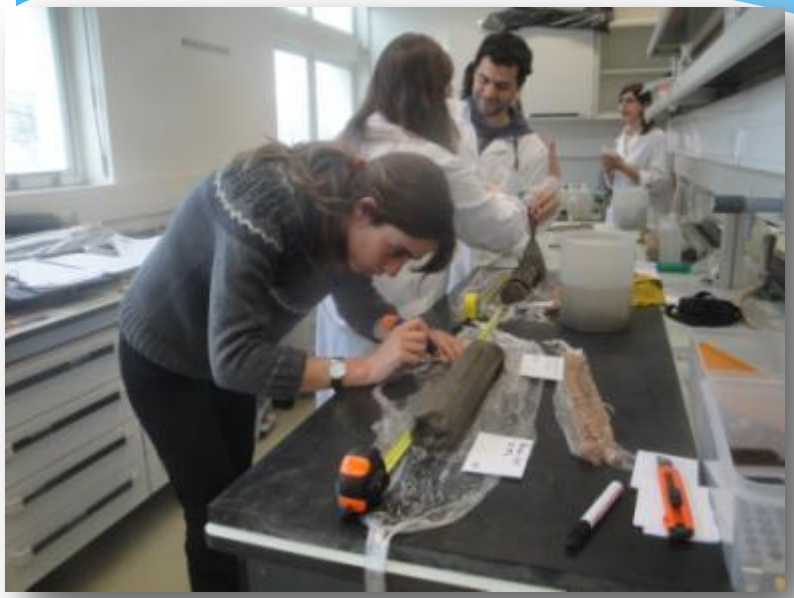

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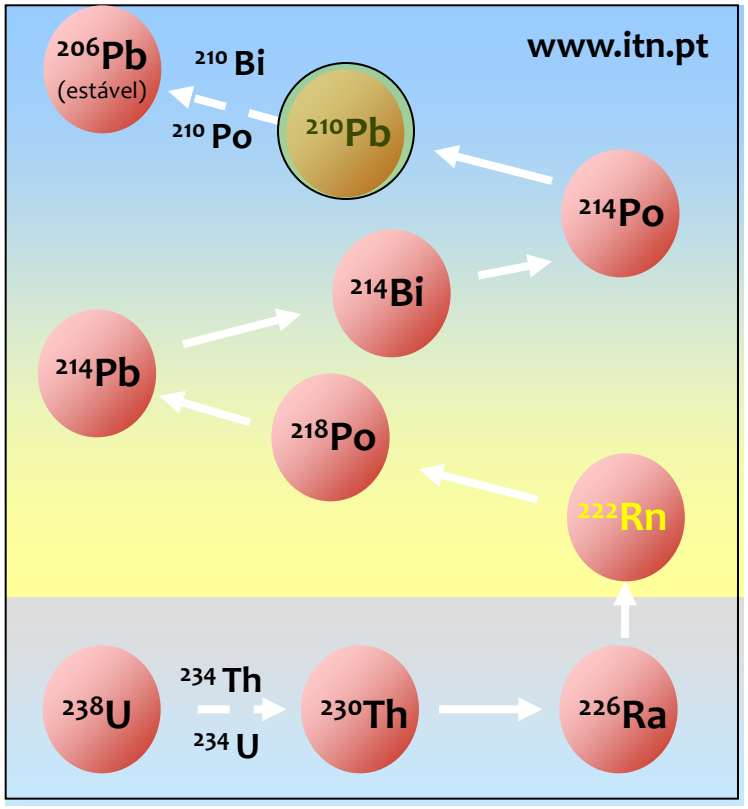


descendentes

Sedimentos/rochas com ^{238}U

↓

Supported ^{210}Pb

↓

Constante em profundidade

Atmosfera
sub-produto do ^{222}Rn (gás)
Desintegração rápida

↓

Unsupported ^{210}Pb

↓

Excesso

↓

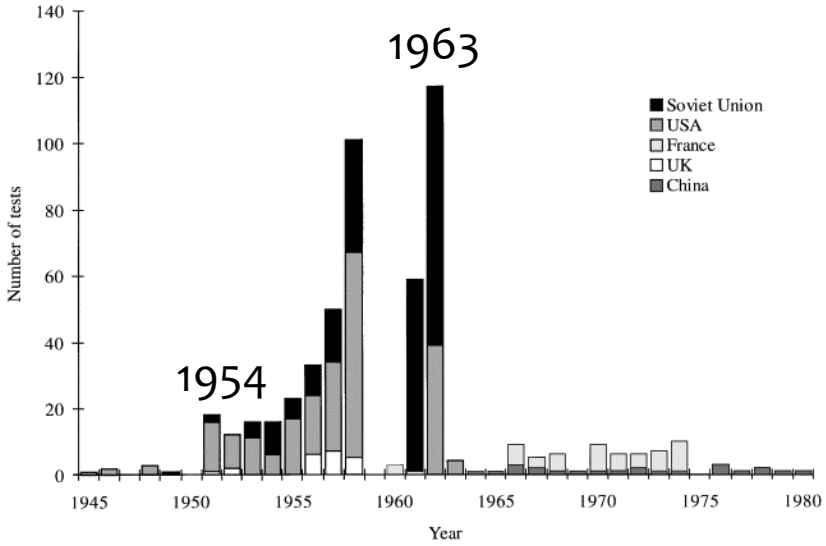
Função da quantidade inicial
Período de semi-vida (22,3 anos)

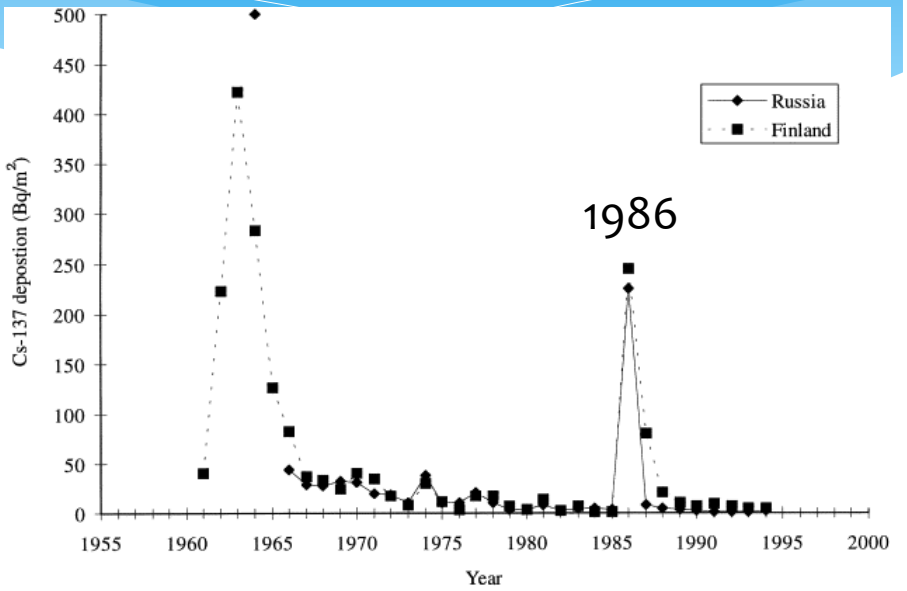
Actividade do ^{210}Pb em excesso em cada profundidade
Comparada
Actividade medida no topo da sondagem

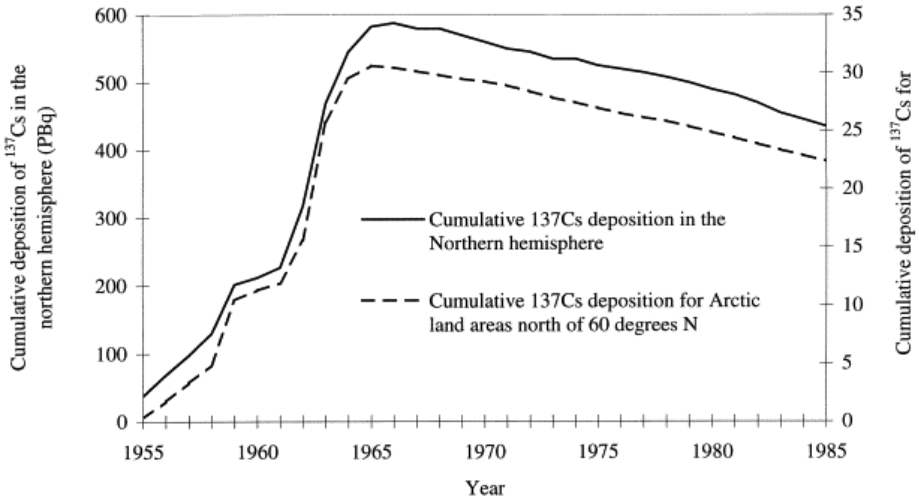
↓

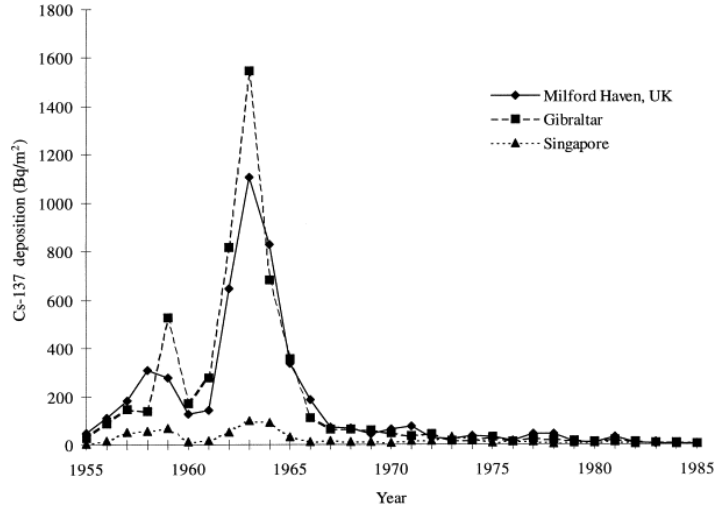
Fluxos de sedimentos e de Pb constantes

^{137}Cs T1/2 ~30 yr

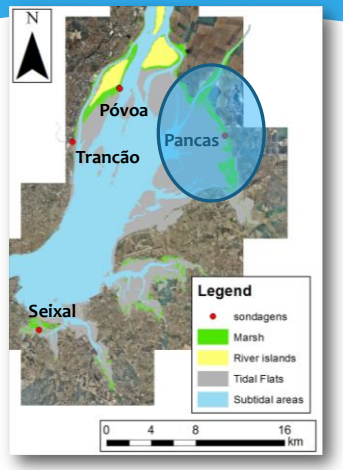




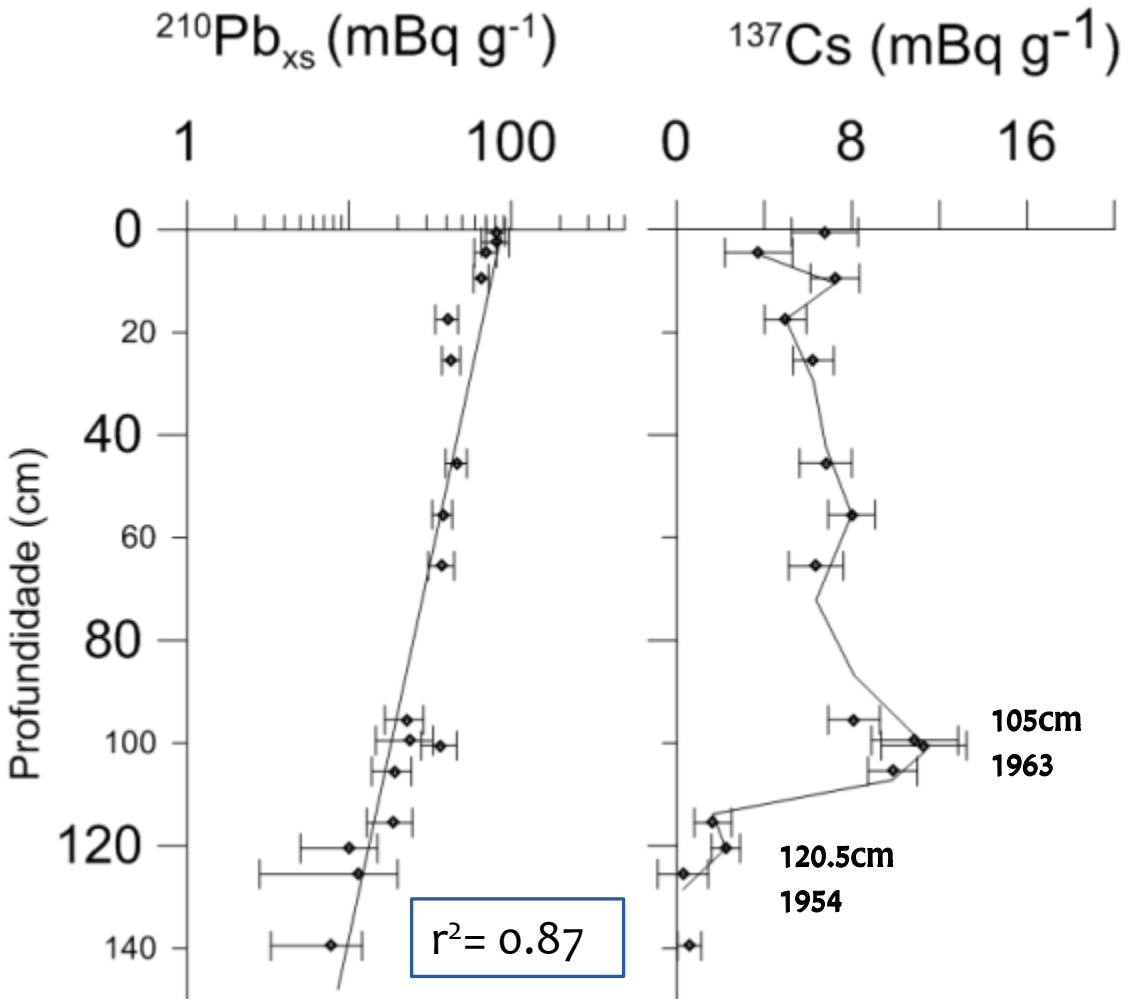




Wright et al. ,1999



Taxa de sedimentação
~ 2.2cm/ano

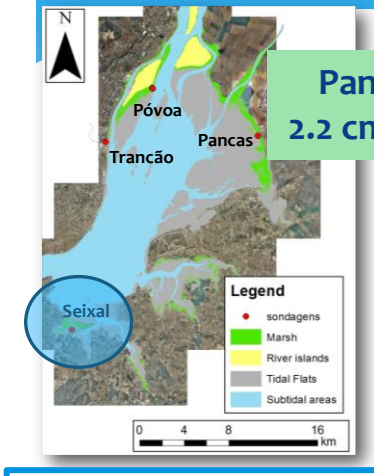


Vasa Sacos High Marsh, Sediment traps, 9 months, 4 cm/yr

Salgueiro & Caçador (2007)

O estuário do Tejo SAPAIS NÍVEL DO MAR

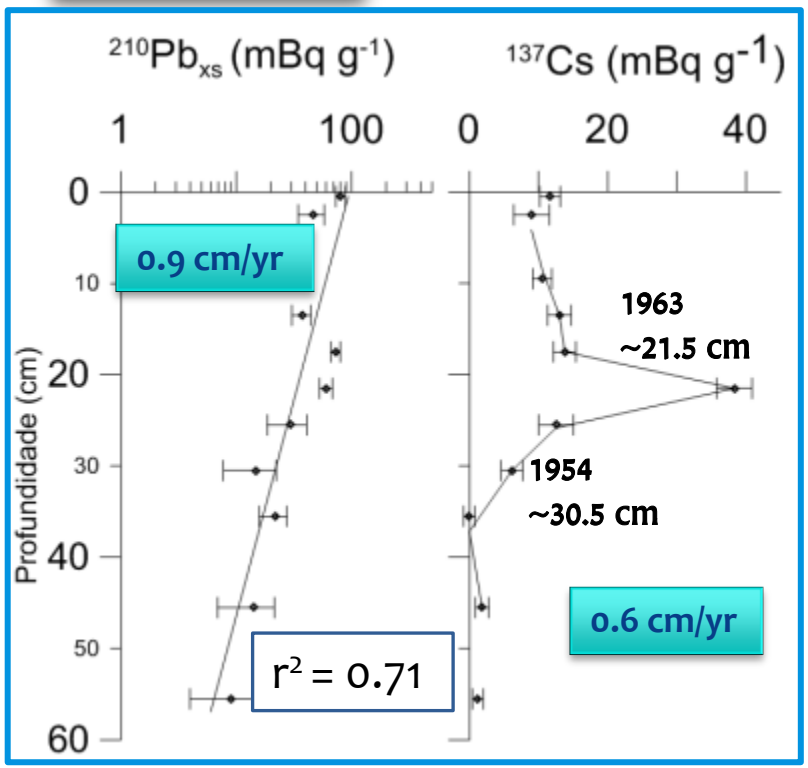
EVOLUÇÃO MORFOLÓGICA

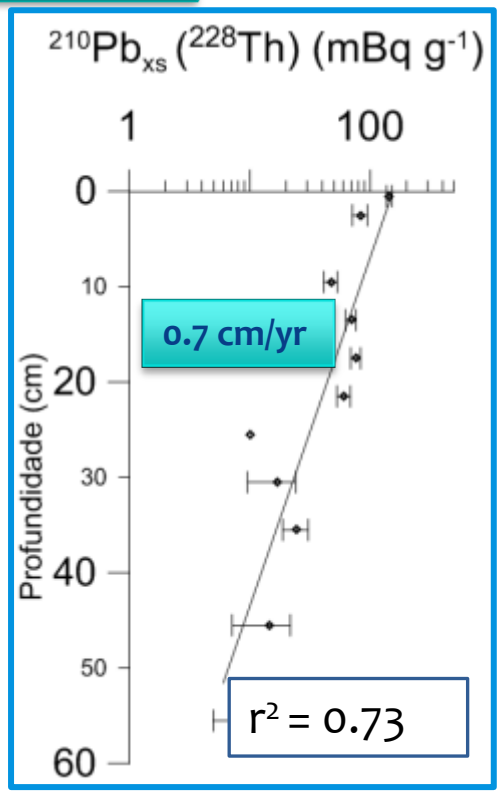


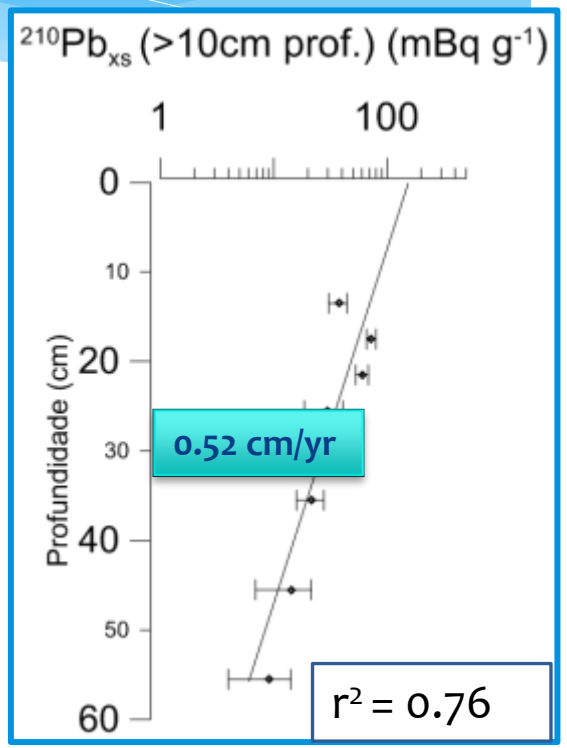
Pancas
2.2 cm/ano

Taxa de sedimentação ~0.5 – 0.9cm/ano

Seixal





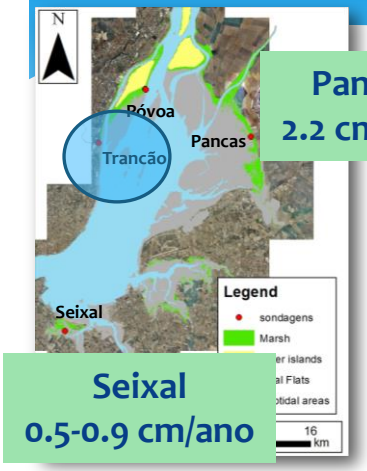


Sediment traps
9 months **0.47 cm/yr**

Salgueiro & Caçador (2007)

Geochemical criteria
Core interpolation, metals, ^{14}C AMS shell w/ R~400 yrs
0.7 cm/yr
0.4-0.6 cm/yr

Freitas *et al.* (1999)



Pancas
2.2 cm/ano

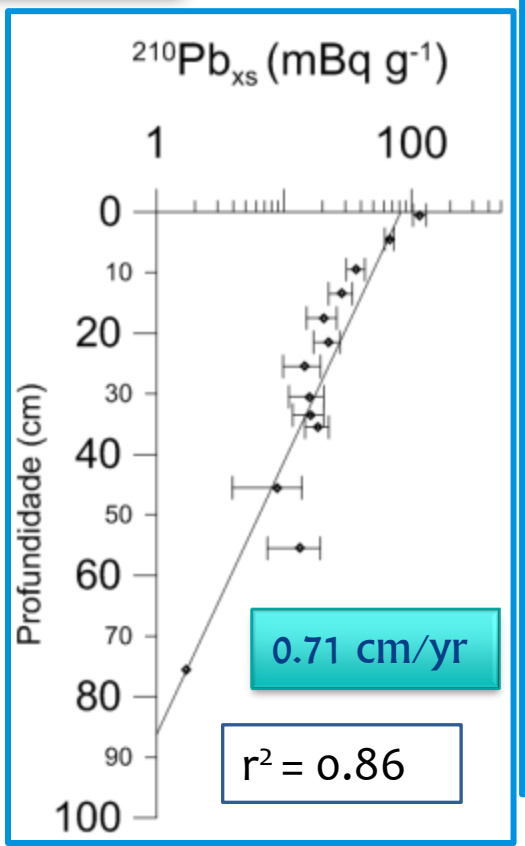
Seixal
0.5-0.9 cm/ano

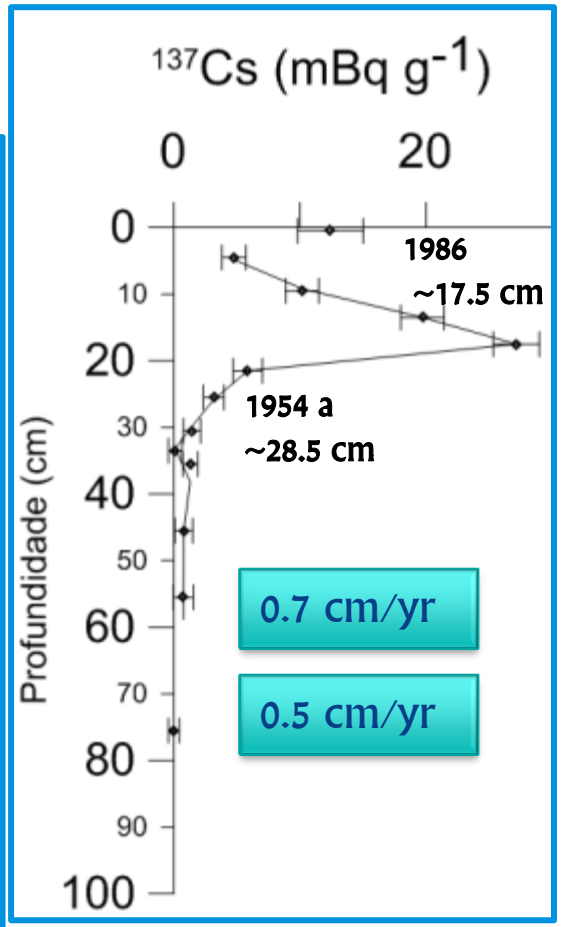
Trancão

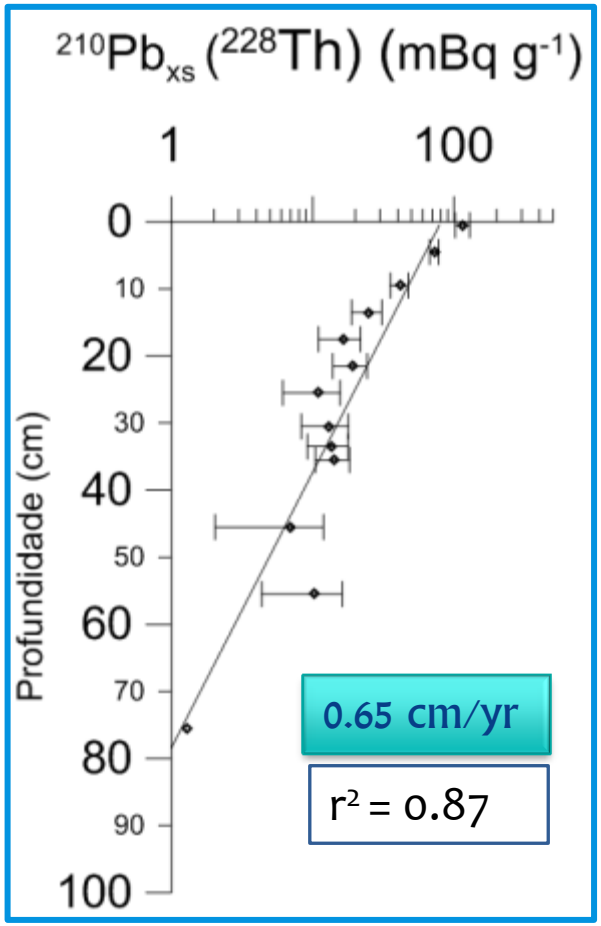
Taxa de sedimentação ~ 0.7cm/ano

Sediment traps
S. João da Talha High Marsh
9 months **1.8 cm/yr**

Salgueiro & Caçador (2007)

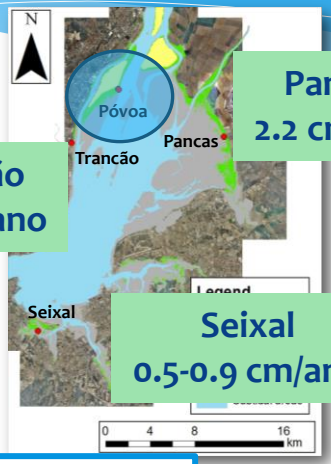






EVOLUÇÃO MORFOLÓGICA

Póvoa

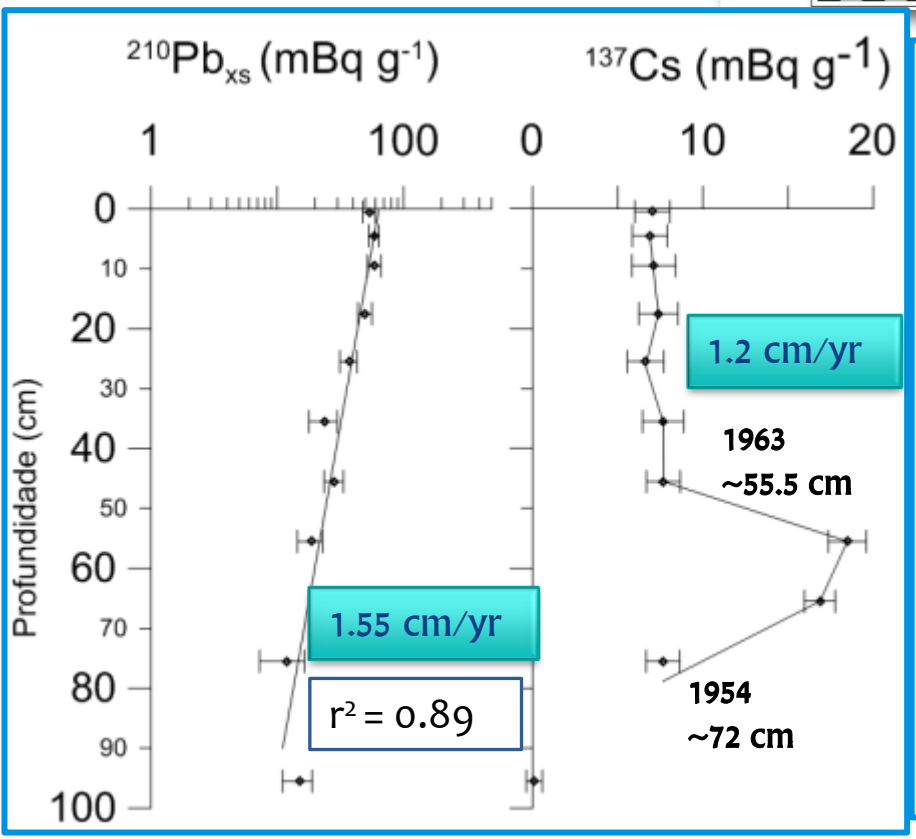


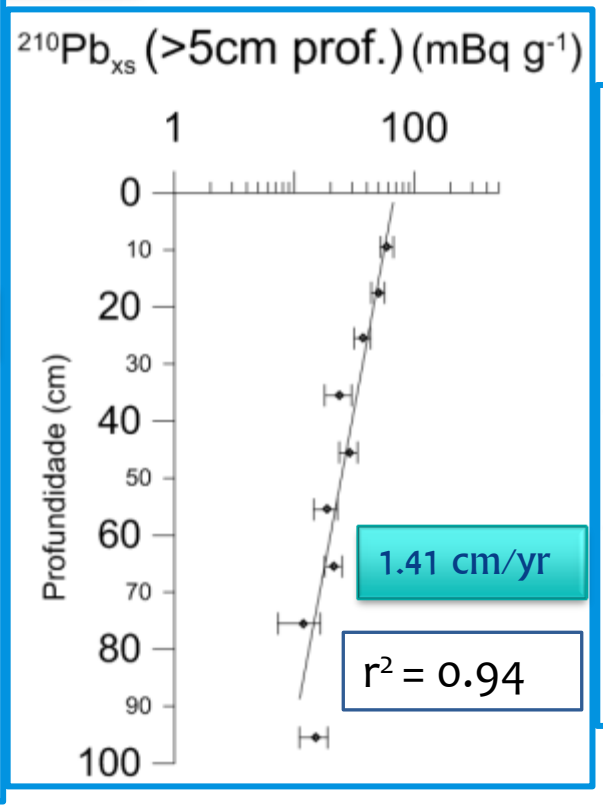
Pancas
2.2 cm/ano

Trancão
0.7 cm/ano

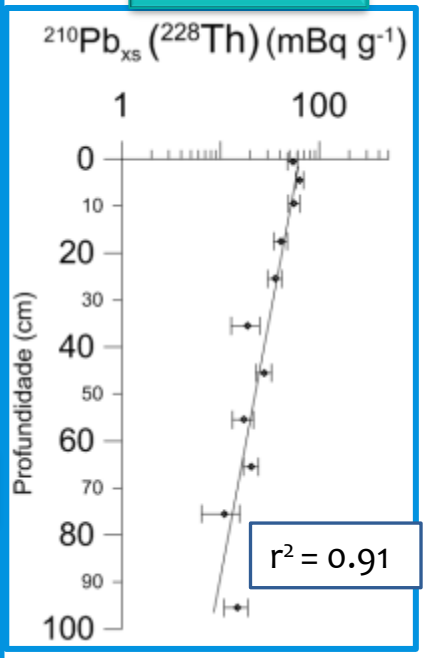
Seixal
0.5-0.9 cm/ano

Taxa de sedimentação
~1.2 – 1.6 cm/ano





1.48 cm/yr



EVOLUÇÃO SECULAR DA SUPERFÍCIE

Futuro

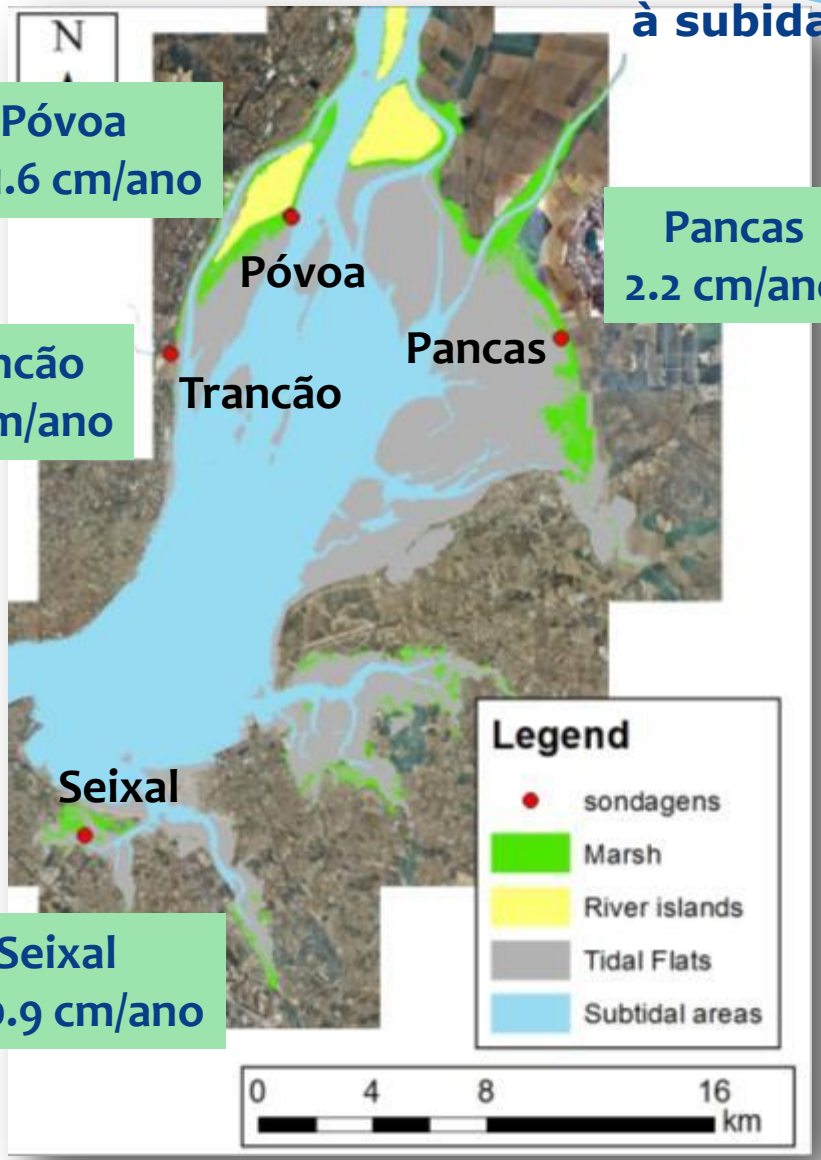
Qual vai ser a resposta dos sapais à subida do NMM (alterações climáticas)?

Póvoa
1.2-1.6 cm/ano

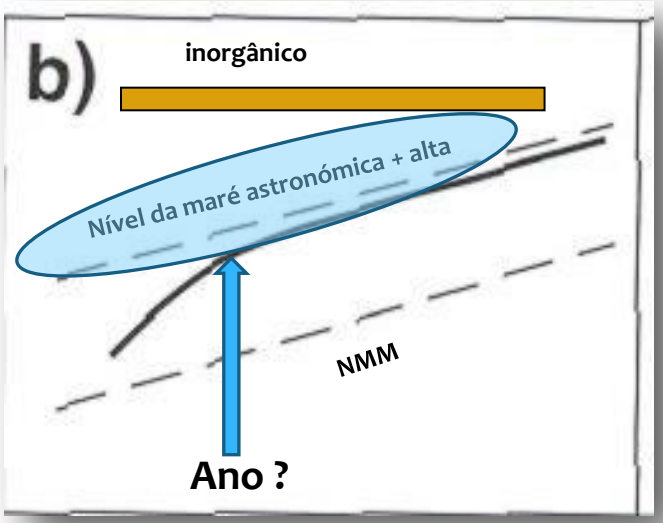
Pancas
2.2 cm/ano

Trancão
0.7 cm/ano

Seixal
0.5-0.9 cm/ano

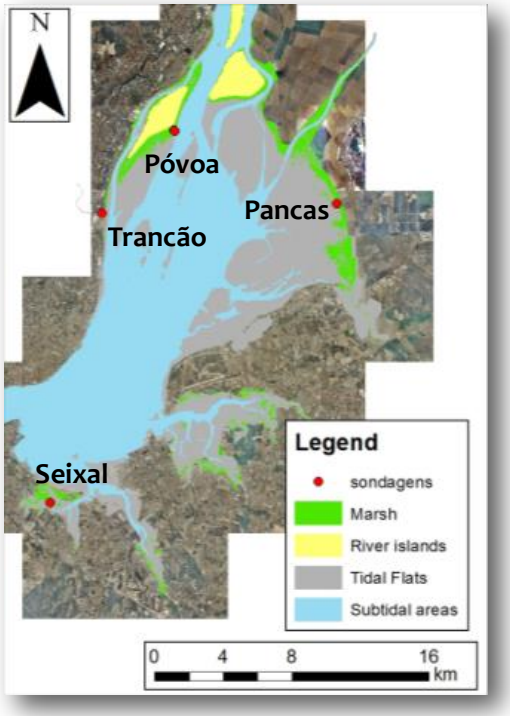


Taxa de subida do NMM
2.1 mm/ano

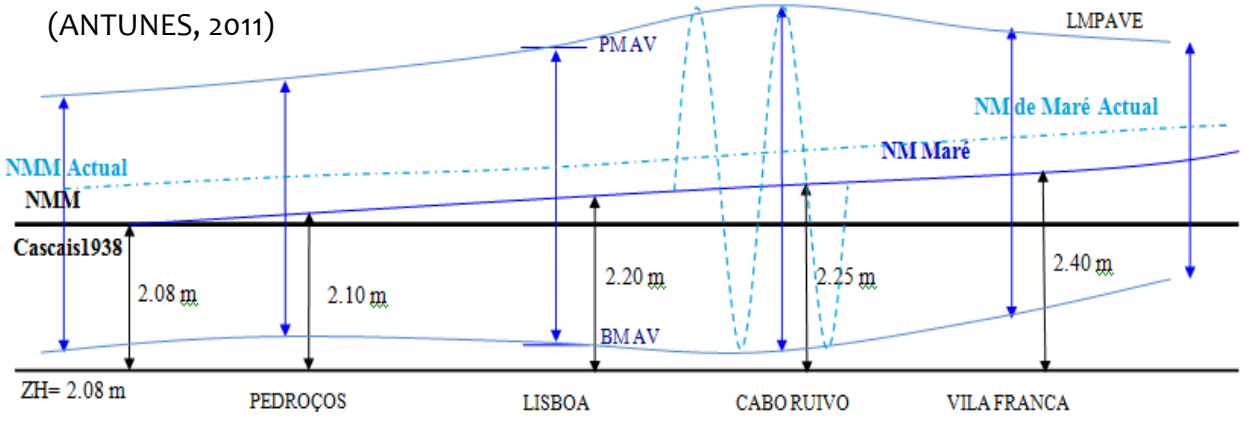


Tempo →

Qual vai ser a resposta dos sapais à subida do NMM (alterações climáticas)?



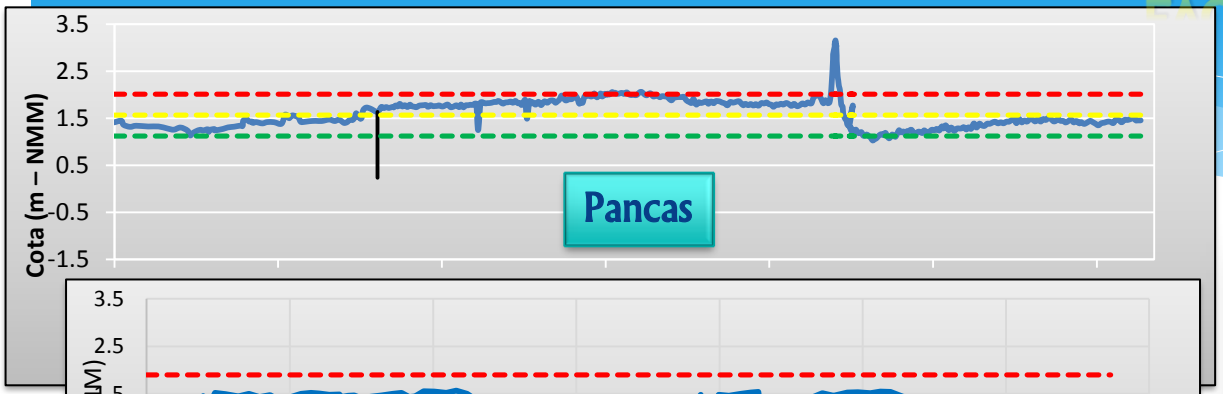
(ANTUNES, 2011)

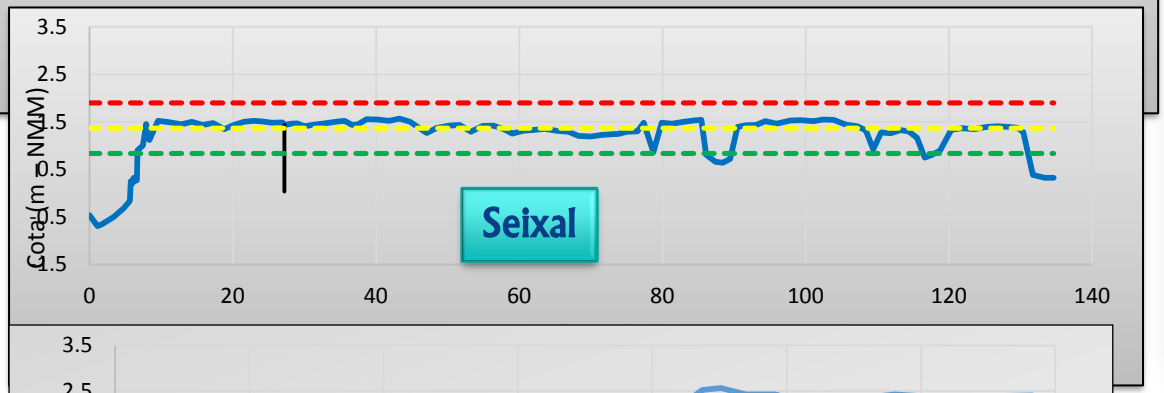


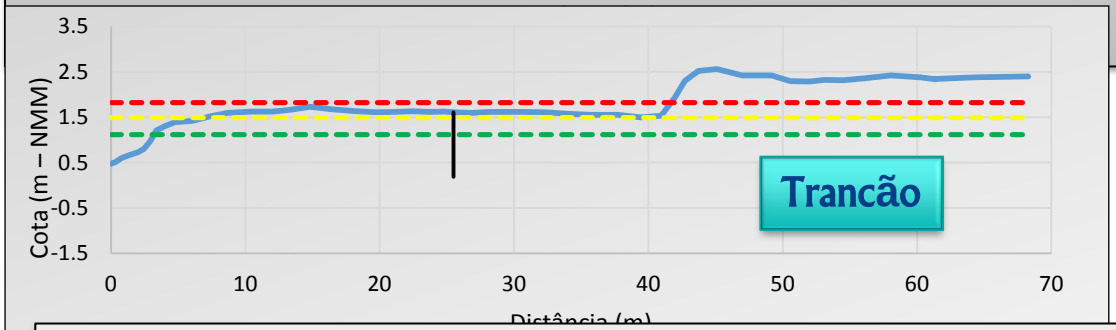
- Marégrafos oficiais*
- Transdutor de pressão por nós instalado**

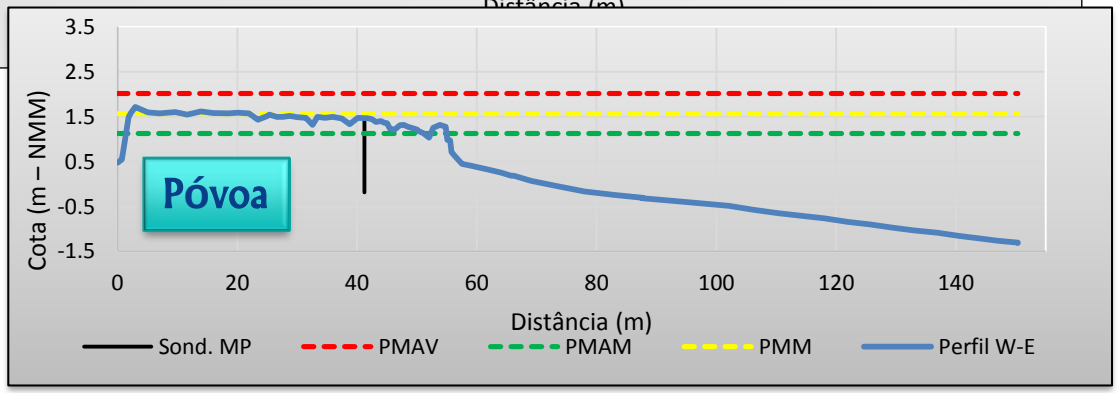
ZH	PM máx.	PMAV	PM média	PMAM
Pancas/Póvoa (marégrafo Ponta da Erva)*	4.70	4.09	3.65	3.20
Seixal (marégrafo Alfeite)**	4.45	3.91	3.52	3.08
Trancão (marégrafo Lisboa)*	4.41	3.88	3.51	3.09

EVOLUÇÃO MORFOLÓGICA

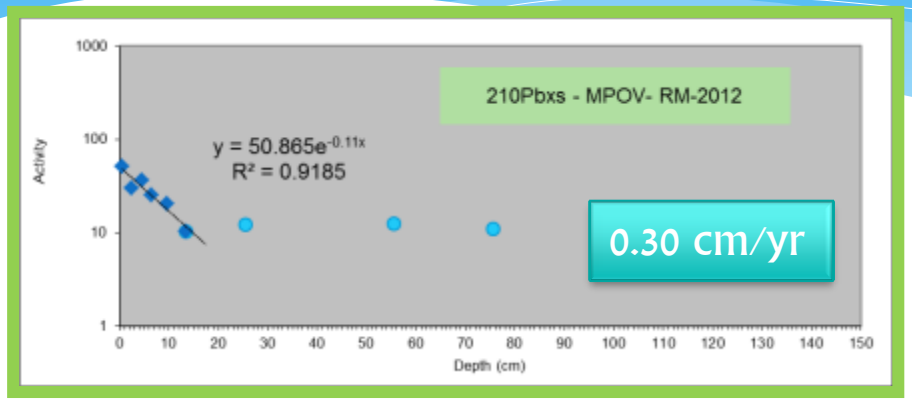


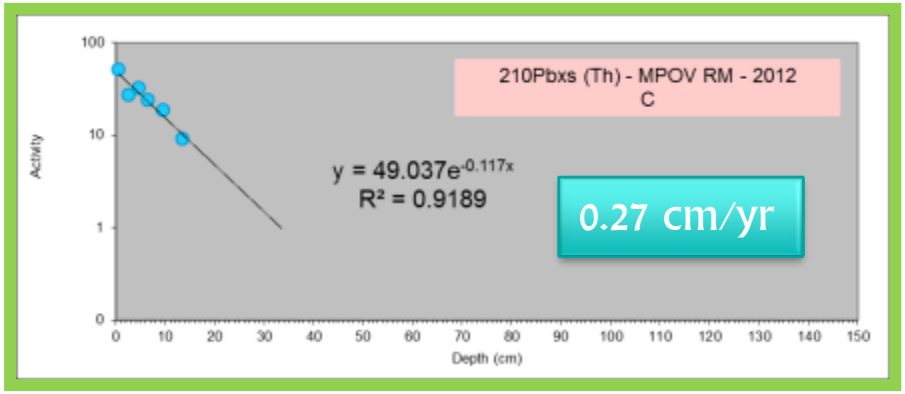


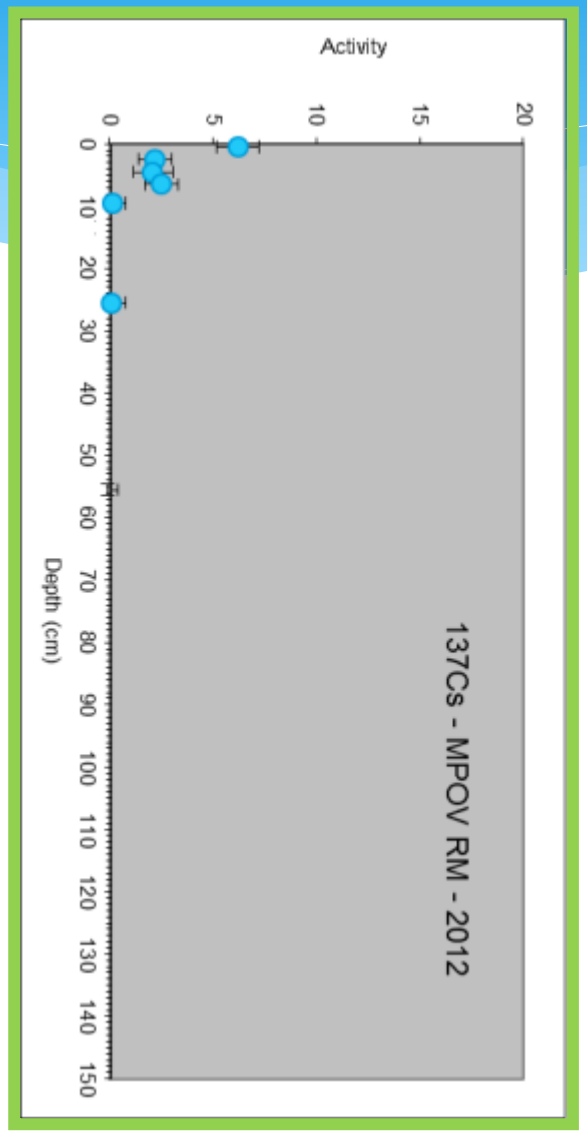




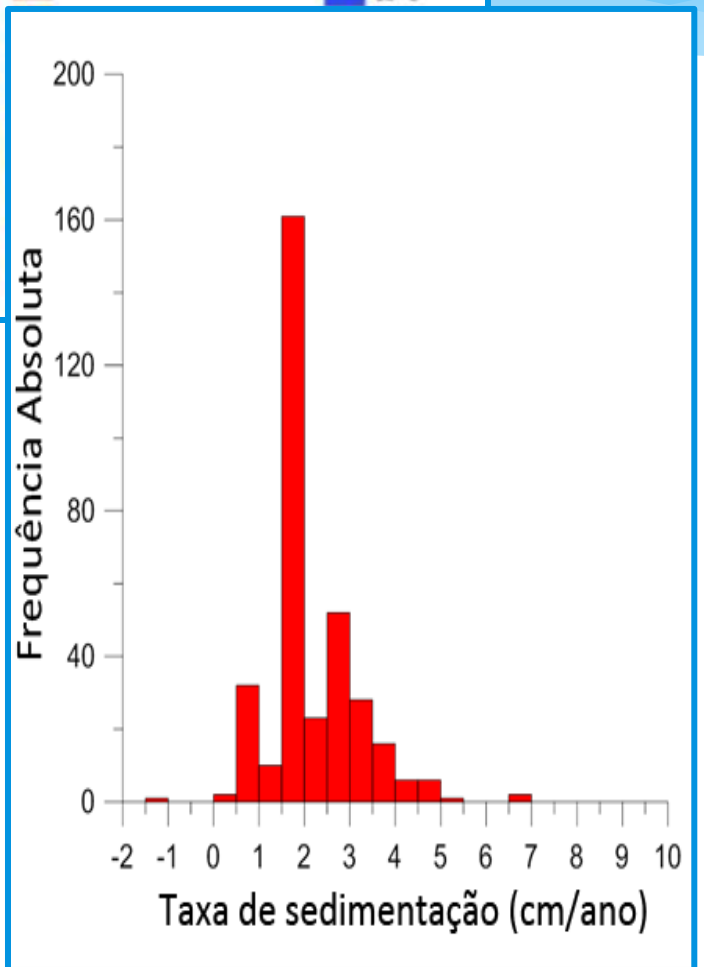
Tidal Flat - M. Póvoa area







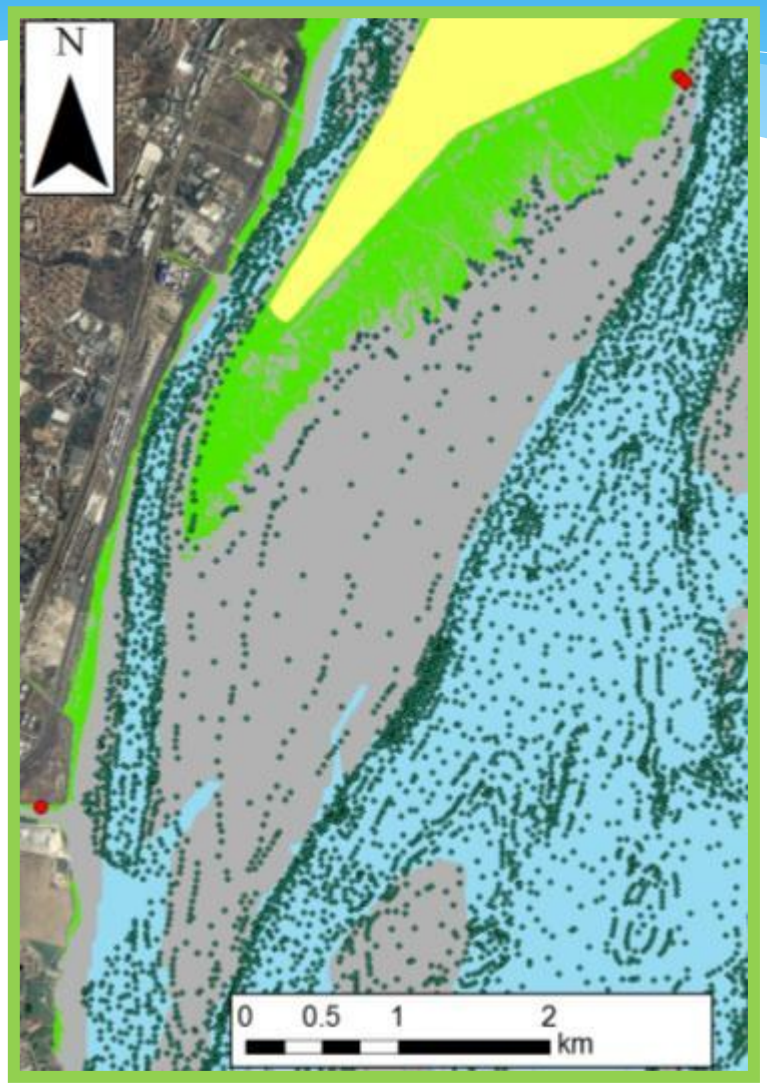
Comparações batimétricas



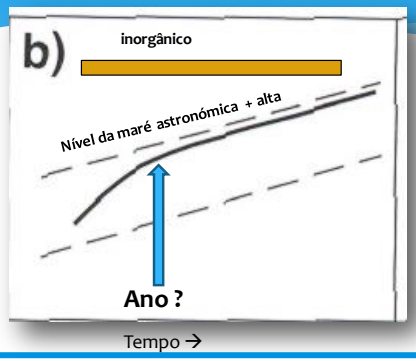
* Levantamentos batimétricos realizados em 1928/30 e 1964.

1.5 e 2cm/ano

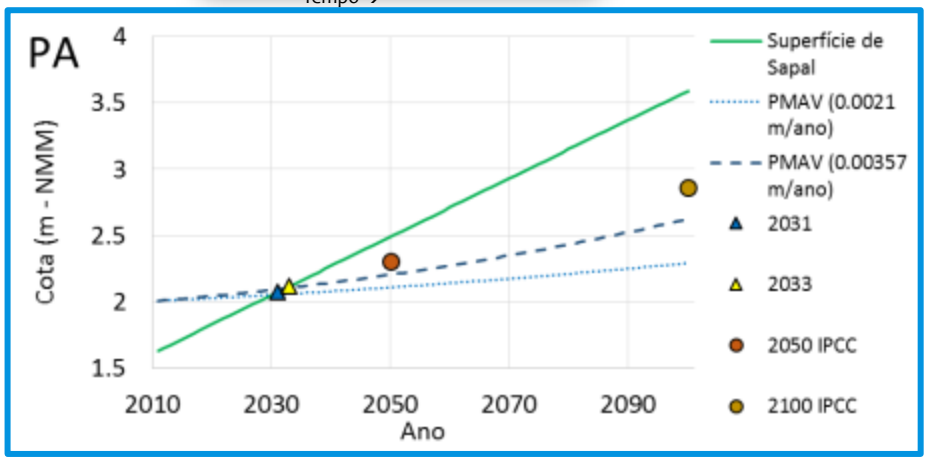
Tidal Flat - M. Póvoa area

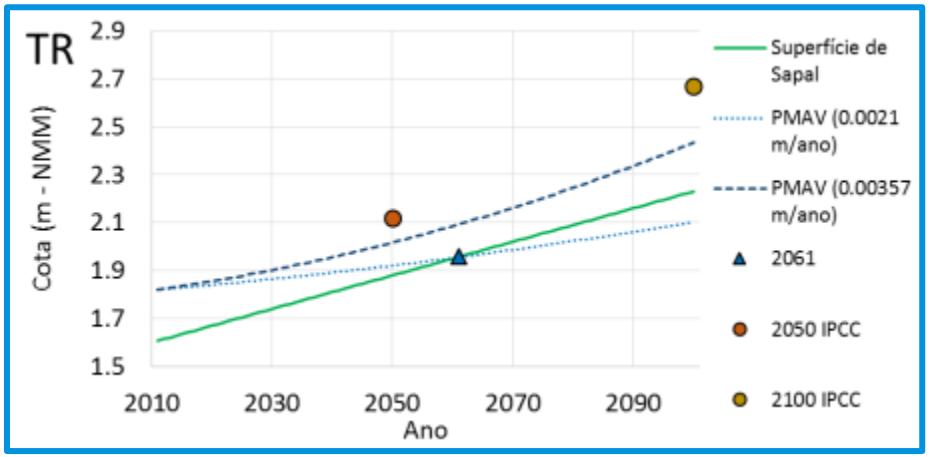


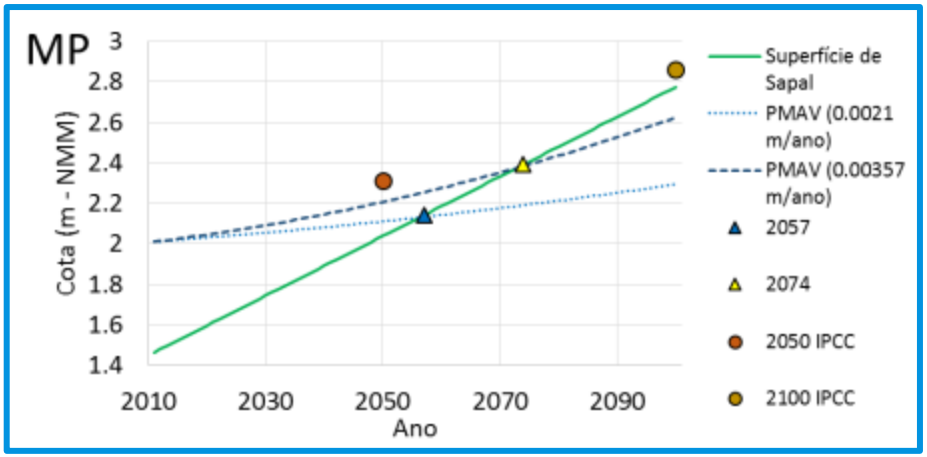
Sedimentation rate ~3-4 cm/yr

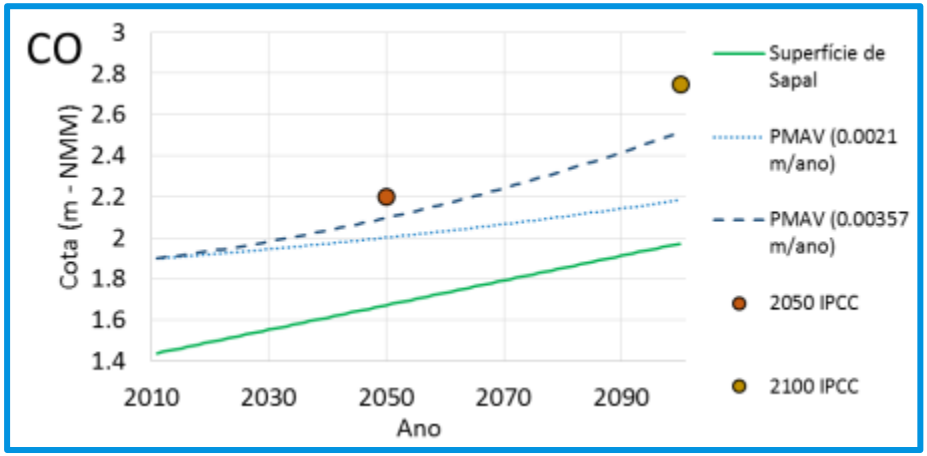


Qual vai ser a resposta dos sapais à subida do NMM (alterações climáticas)?









IPCC - 30cm e 85cm para 2050 e 2100

Qual vai ser a resposta dos sapais à subida do NMM (alterações climáticas)?

- Taxas de acrecção dos sapais > Taxa de subida do NMM

0.5 cm/ano – 2 cm/ano

Não serão submersos

0.21 cm/ano

- Vão continuar a agradar à mesma taxa até atingir o nível de PMAV

20 – 45 anos
Corroios > 2100

- Passarão a agradar a taxa igual à da subida do NMM

Qual vai ser a resposta dos sapais à subida do NMM (alterações climáticas)?

- Taxas de acrecção dos sapais > Taxa de subida do NMM

0.5 cm/ano – 2 cm/ano

Pancas+ M. Póvoa
Não serão submersos

0.36 cm/ano

- Vão continuar a agradar à mesma taxa até atingir o nível de PMAV

20 – 60 anos

- Passarão a agradar a taxa igual à da subida do NMM

Corroios+ Trancão

>2100

Substituído por ambientes intertidais + baixos

Obrigada...

* FCT/FEDER
* Instituto de Conservação da Natureza e Biodiversidade – ICNB
* Bombeiros Montijo