

Evaluarea potentialului vegetatiei in atenuarea valurilor de vant in Delta Dunarii

D3MN - Analiza potentialului de utilizare durabila a vegetatiei specifice sistemului Dunare-Delta Dunarii-Marea Neagra

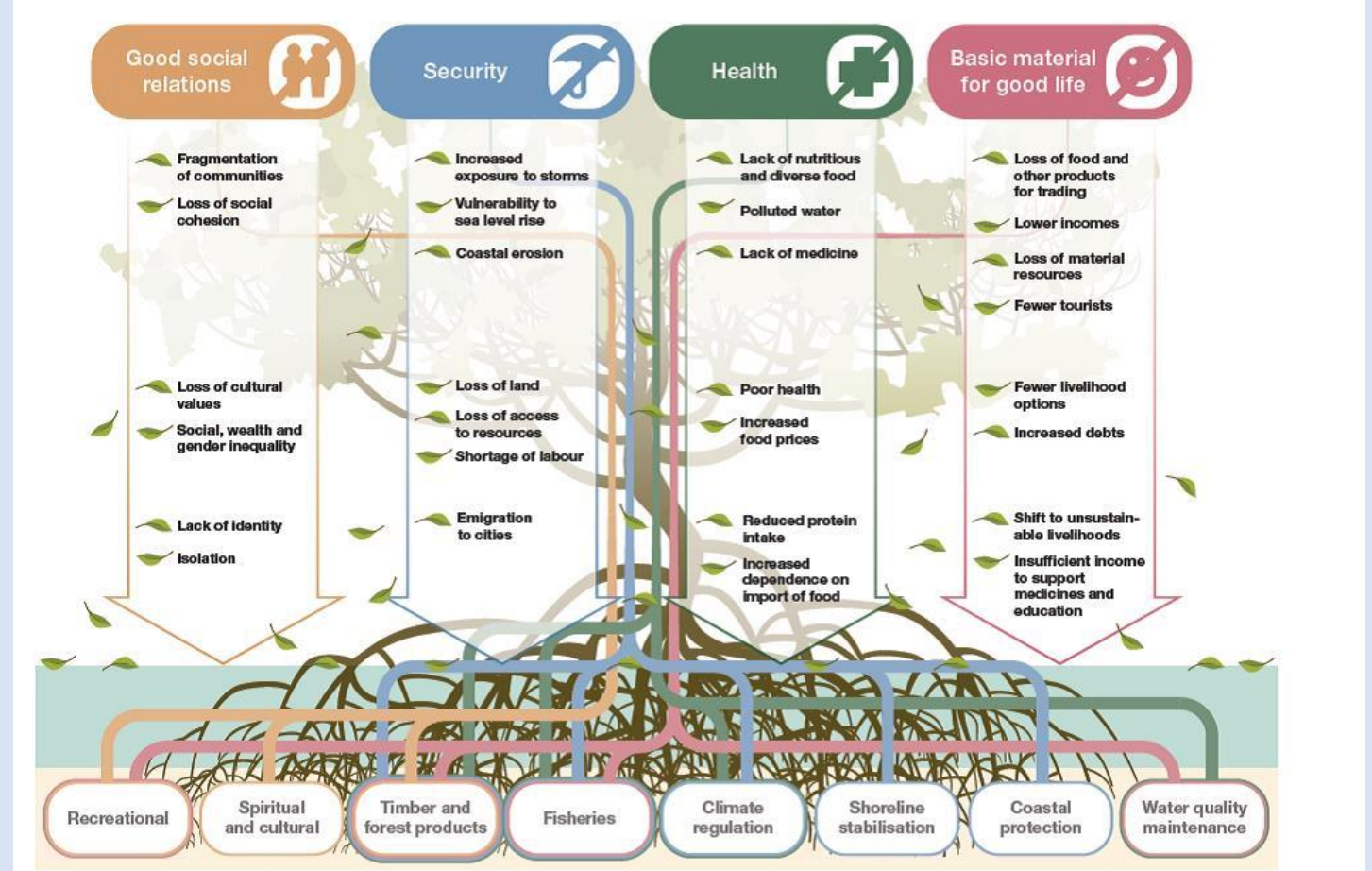


Eroziune costiera:

- degradarea habitatelor
- impact asupra activitatilor turistice
- inundatii cu pagube materiale

Solutii:

- 'dure' – constructii: diguri, palisade, gabioane, porti, etc
- 'soft' – lucrari de amenajare si stabilizare
- 'verzi' – vegetatie specifica



<http://www.sltcp.org/mangrove-restoration-tcp-sri-lanka/>

<https://www.climatecolab.org/>

<http://wildshores.blogspot.ro/2010/05/saving-singapores-last-best-mangroves>

Rolul stufului (*Phragmites australis*) in atenuarea valurilor de vant a fost demonstrat in Marea Baltica (Moeller et al., 1996, 2001) si testat si n Delta Dunarii in cadrul proiectului FP 7 FAST .

Moeller et al. (2011) au investigat transformarea valurilor de vant in doua locatii de la Marea Baltica cu stuf dezvoltat pe o distanta de min 100 m

Au observant ca:

- La limita stufului valurile sunt atenuate
- Inaltimea valului descreste la inaintarea in stuf
- Disiparea energiei valurilor creste cu inaltimea valului pentru ca stuful este destul de rigid la inaintarea valurilor

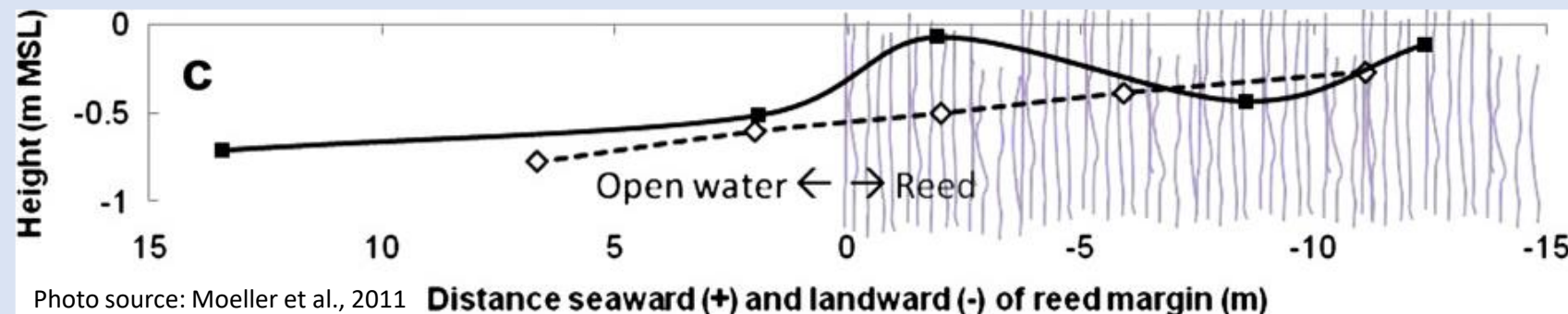
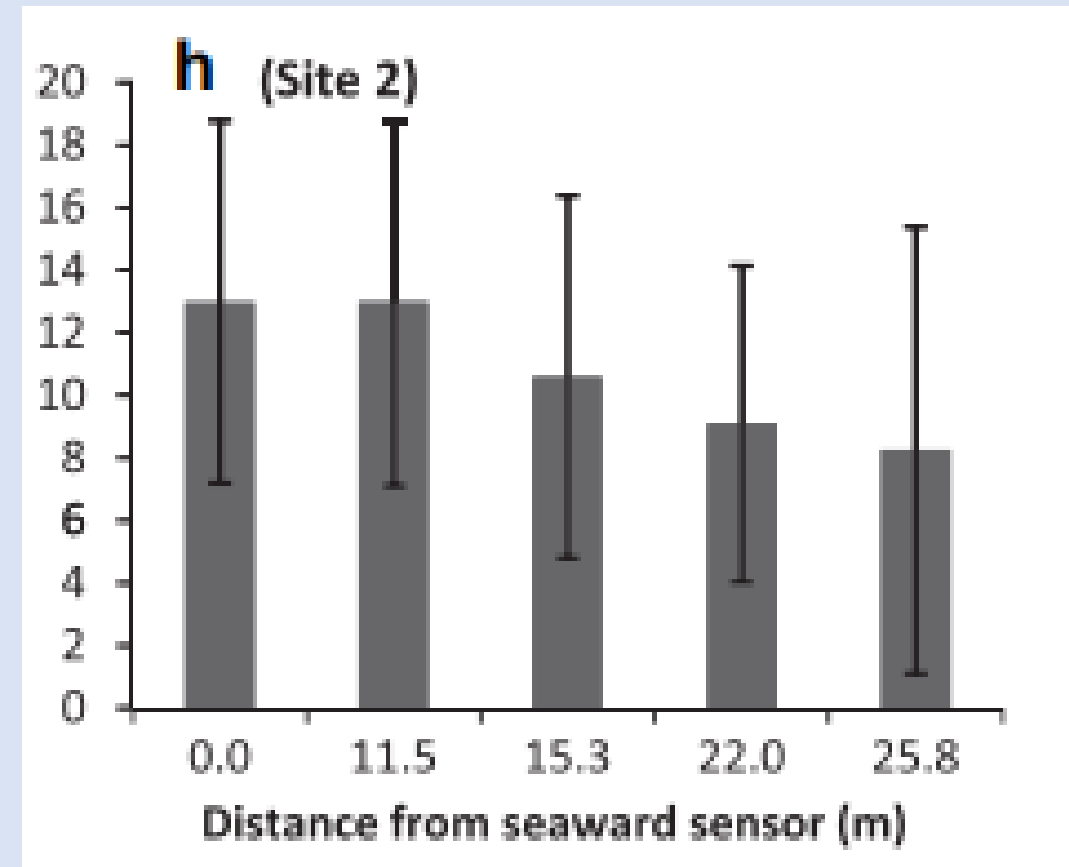


Photo source: Moeller et al., 2011

- Rolul vegetatiei in general si al stufului (*Phragmites australis*) in particular, in atenuarea energiei valurilor a fost observat in Delta Dunarii inca din anii 50-60 (Rudescu et al., 1965).
- Foarte putine studii au studiat mecanismele de atenuare – Proiectul FP 7 FAST – Foreshore Assessment using Space Technology

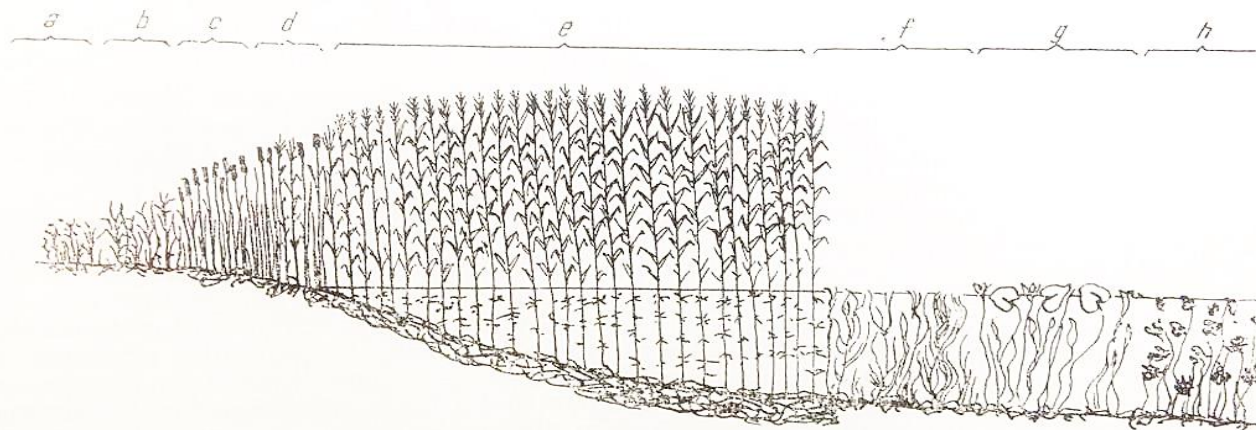


Fig. 39. — Repartizarea fitocenozelor în Delta Dunării.
 a, *Carecetum*; b, *Scirpetum*; c, *Typhaetum*; d, *Typhaetum-Phragmitetum*; e, *Phragmitetum*; f, *Potamogetonetum*;
 g, *Nupharectum*; h, *Characetum*.

Rudescu et al., 1965



Bio-Physical Controls on Wave Transformation in Coastal Reed Beds: Insights From the Razelm-Sinoe Lagoon System, Romania

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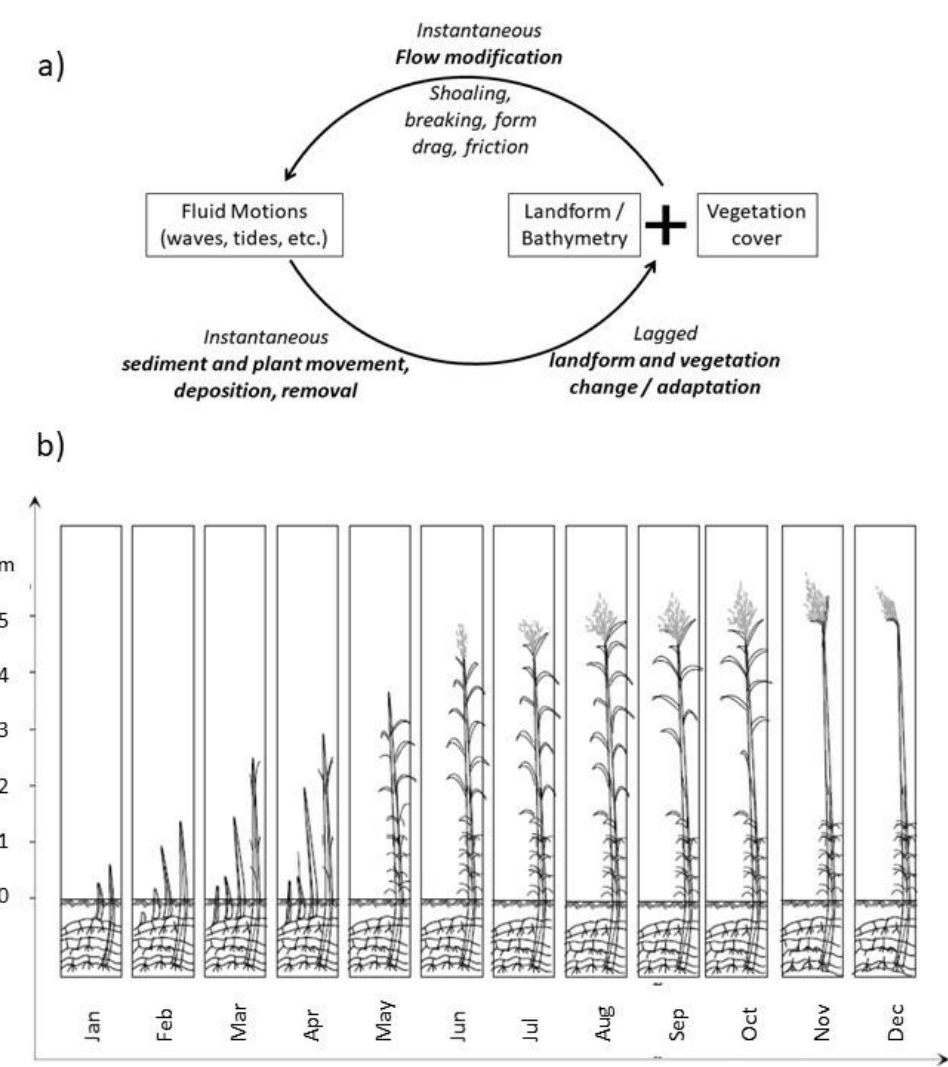
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Front. Mar. Sci. 9:813474.

Coastal wetlands are dynamic bio-physical systems in which vegetation affects the movement of water and sediment, which in turn build and maintain the landform and ecosystem. Wetlands are an effective buffer against coastal erosion and flooding, enhance water quality and human health and wellbeing. Numerous field and laboratory experiments have quantified the reduction of waves by coastal ecosystems. Numerical models, however, are only able to capture observed reduction in wave energy when calibration coefficients are obtained by comparison with measured dissipation rates. A deeper understanding of how wave attenuation varies over time, with local flow conditions and ecosystem properties, is still lacking and should be acquired from a greater range of ecosystem types and geographical settings. Few studies have observed the detailed seasonal variations in how coastal wetlands function as wave buffers and how such seasonal variations might be explained. Equally, few studies have focused on the effect of coastal reed beds on wave dynamics. This study addresses both: i) seasonal variability in wave dissipation through reed vegetation and ii) intricate connections between reed vegetation and the physical context (meteorological and topographical) that might explain such variability. We present observations of wind generated wave transformation through two *Phragmites australis* reed beds in the Razelm-Sinoe Lagoon System, Danube Delta, Romania. We find that seasonal changes in vegetation density and biomass, as well as meteorological conditions, affect observed wave conditions within the first few meters of the reed beds. Our results also show a preferential reduction of higher frequency waves, irrespective of reed stem diameter or density and suggest the potential importance of seasonal vegetation debris to observed wave dissipation. Such complex and non-linear biogeomorphic effects on wave dissipation are not currently well understood or captured in the parameterisation of vegetation-induced wave dissipation. Our study highlights the importance of accurate and temporally granular quantification of nearshore bathymetry, wetland topography, and vegetation to fully understand, model, and

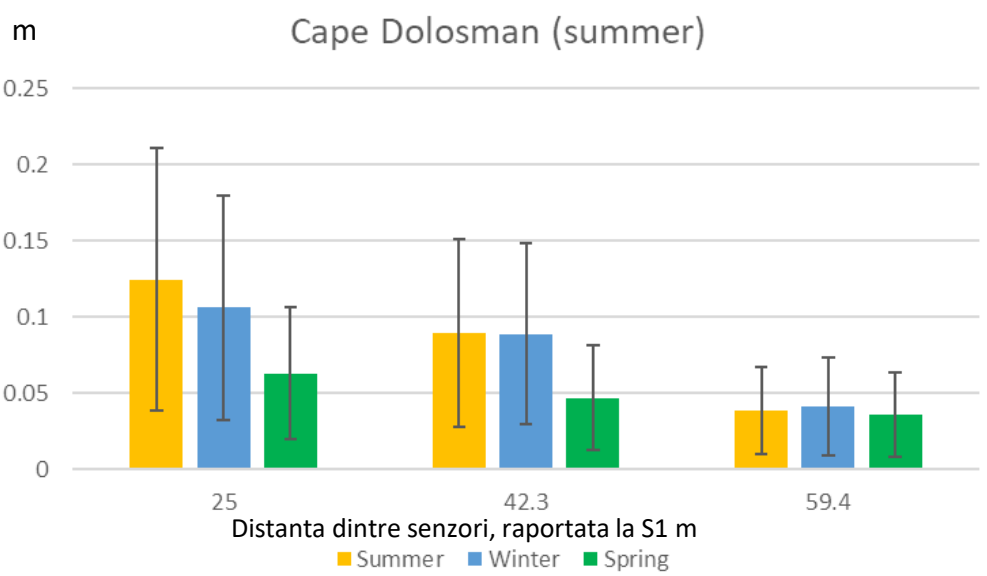
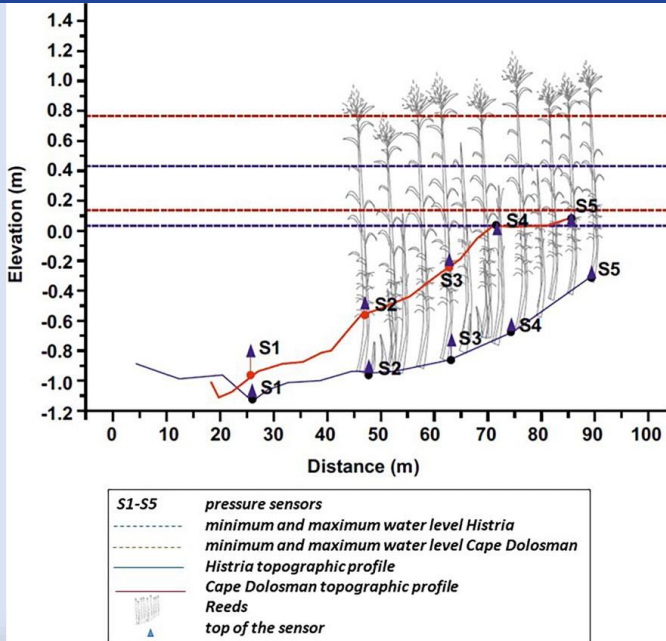
Möller et al., 2022 – rezultate din FP 7 FAST

FP 7 FAST: 2014-2015, Capul Dolosman – Moller et al., 2021: disiparea energiei valurilor depinde de caracteristicile sezoniere ale stufului



A. Interactiunea factorilor bio-morfodinamici in zonele costiere (adaptat din: Cowell and Thom, 1999; and Möller, 2012) si (B) Evolutia stufului in timpul unui an (din Rudescu et al. 1965), asa cum a fost observat in zona de studiu

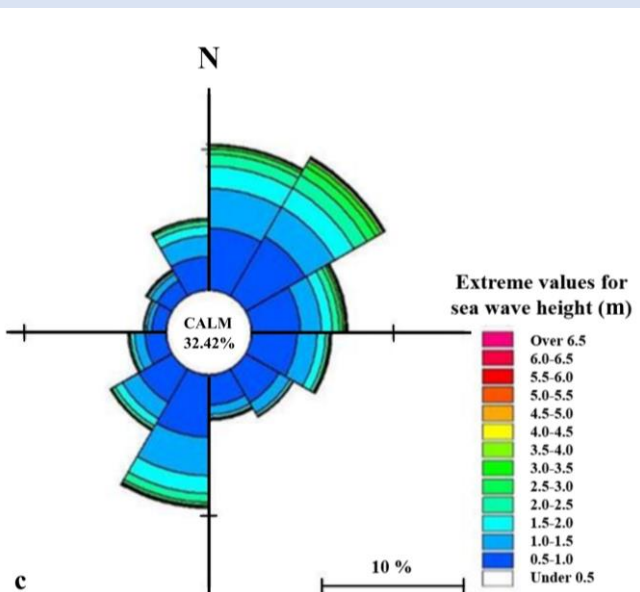
Profilul topografic la Capul Dolosman (rosu) cu pozitia senzorilor de presiune si zona cu stuf. Nivelul maxim si minim al apei (linia rosie punctata) in perioada iulie 2014-iunie 2015.



Scaderea inaltimii valului la inaintarea in stuf la senzorii S2, S3 si S4 in cele trei sezoane analizate – vara, iarna si primavara. Sezoanele sunt definite pe baza evolutiei anuale a stufului primavara (aprilie-iunie), vara (iulie-septembrie) si iarna (octombrie-martie).

Designul zonei de studiu

- Delta Dunarii, in complexul Lagunar Razelm Sinoe
- Expunerea la vanturile predominante
- Fetch (distanța pe care se formeaza valurile – valuri mai mari
- Zone cu vegetatie viabila pe cel puțin 100 m
- Colaborare cu comunitatea locala



Roza vanturilor pentru litoralul romanesc al Marii Negre (Halcrow 2012).



D3MN – valoare adaugata – continuarea muncii din FP7 FAST

2 ani de masuratori intr-un sit cu panta topografica semnificativa (>1 m), vegetatie aproape monospecie (geometrie), dezvoltata pe >100 m, asociatie de stuf comun si gigant, stuf de plaur

- Date obtinute de la senzori – date de presiune – nivelul apei la ‘0’ si inaltimea semnificativa valului
- Se calculeaza energia si atenuarea
- Se masoara la 08:00 16:00 si 24:00
- Datele se integreaza cu date meteo - directia vantului in timpul citirii, directia vantului in raport cu orientarea transectului, viteza medie a vantului km/h, vitaza vantului la rafala, cu cel mult 30’ inainte de masurare

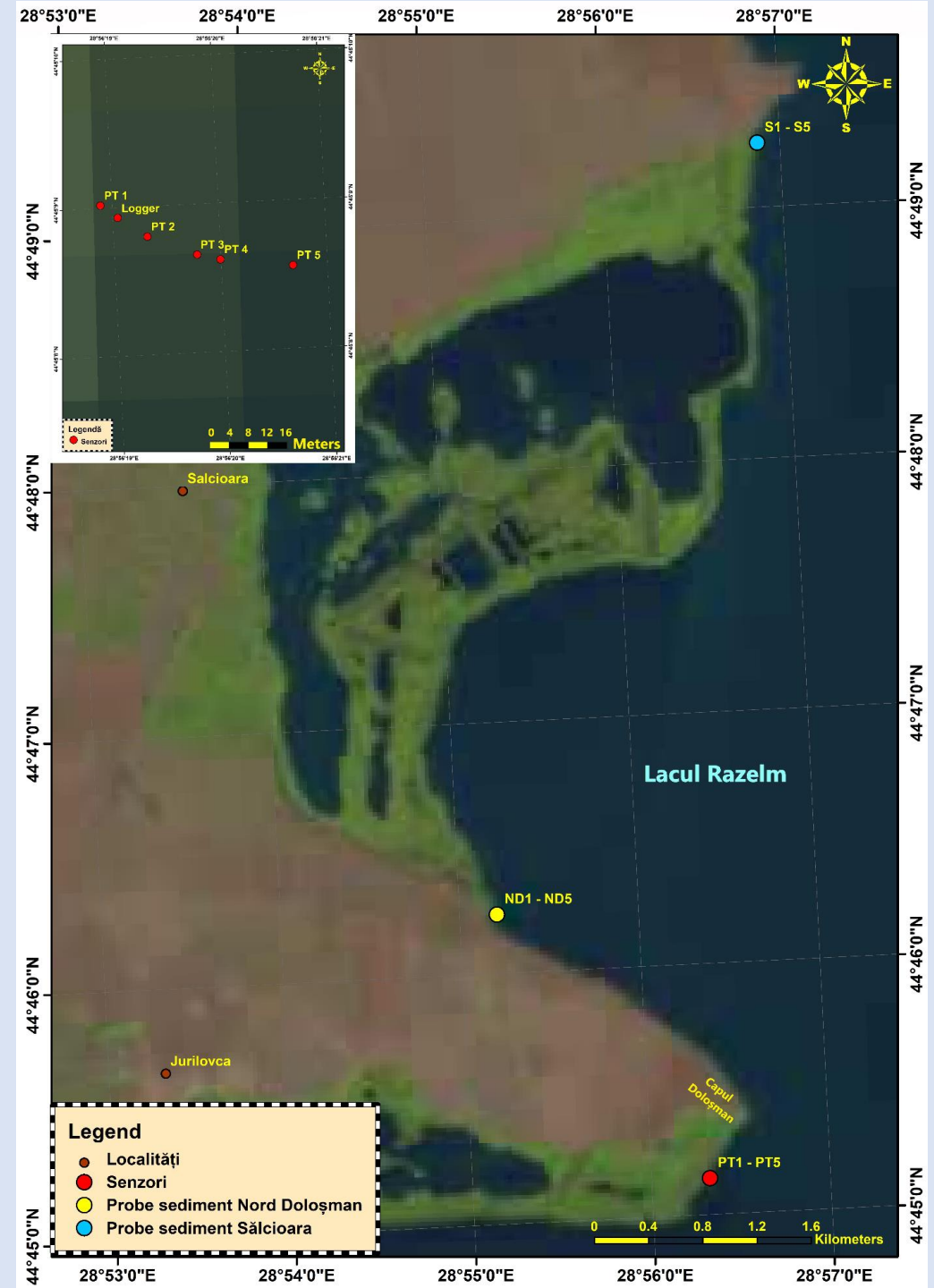
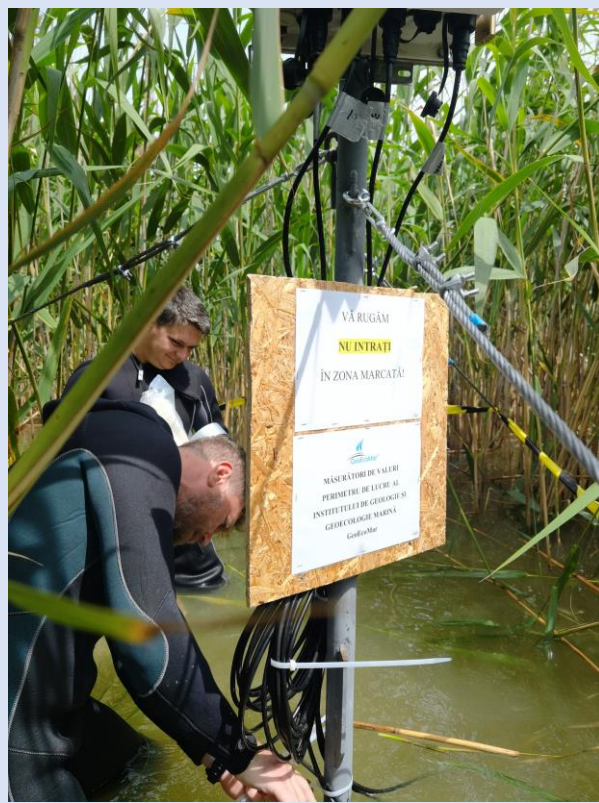


Topografie
Morfologie

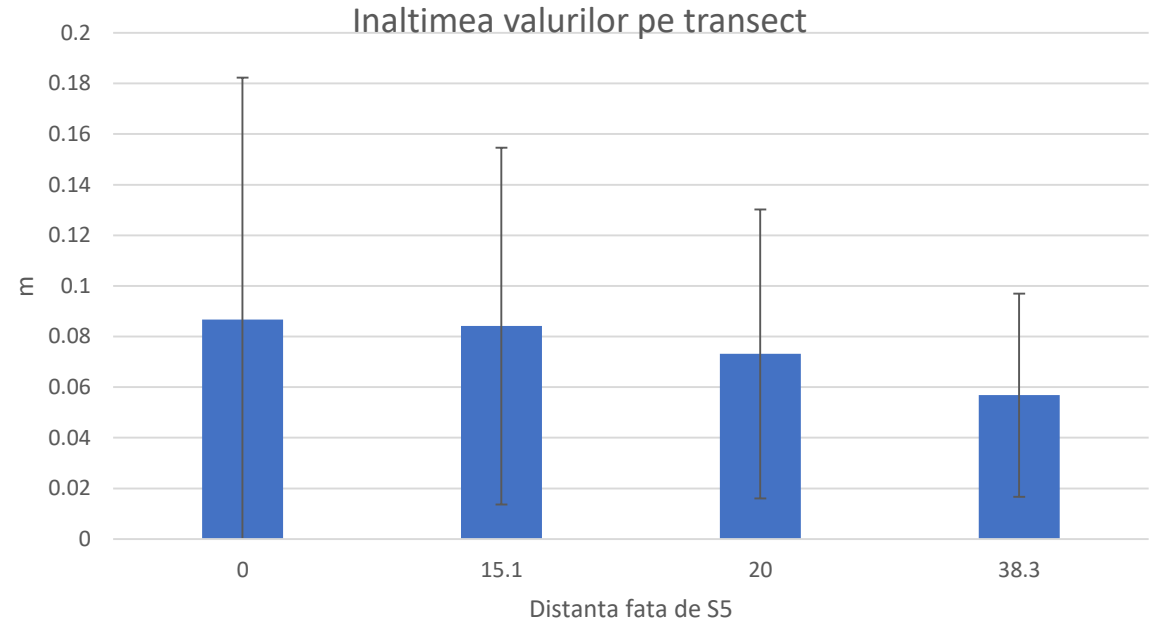
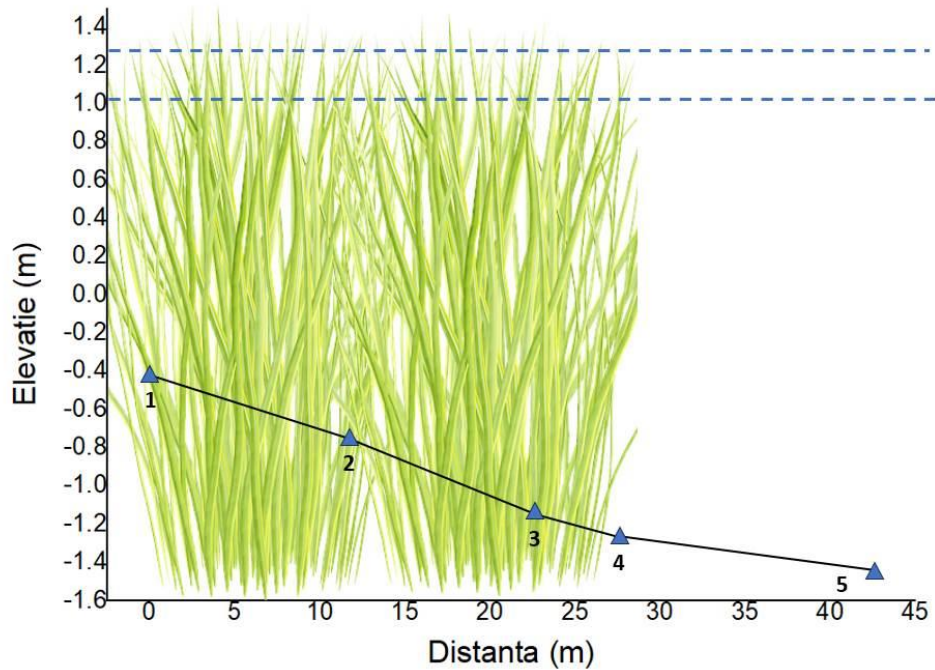
Acoperire cu
vegetatie

Sezonalitate si
continuitate in
masuratori

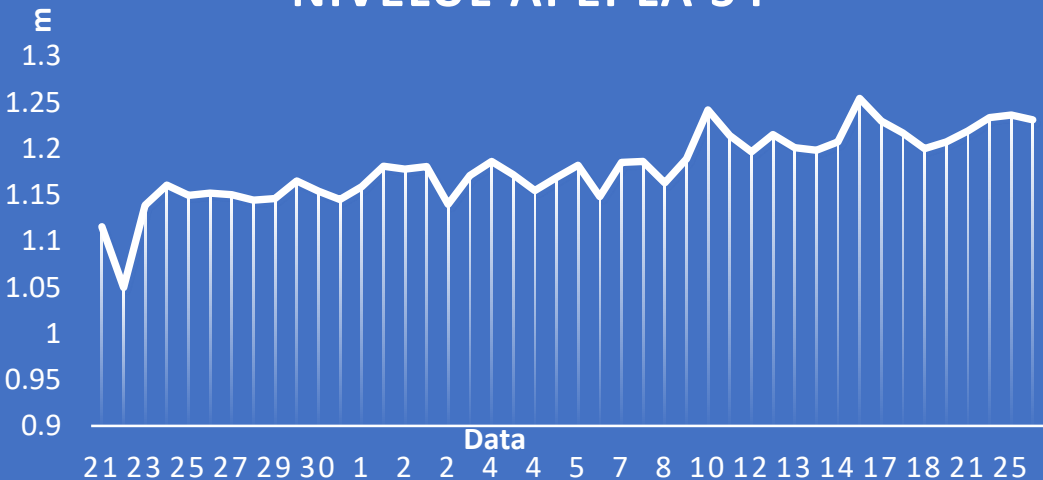
In iunie 2021 au fost instalati in sit cinci senzori pentru masuratori de presiune 'Druck' PDCR1830, de la Campbell Scientific si un turn pentru sustinerea cutiei etanse care contine aparatura de inregistrare si antena de internet (solar powered Campbell Scientific CR1000 data logging system), care permite transmiterea si descarcarea datelor pe orice computer. Senzorii au fost instalati pe un transect de 42 m (Fig. 1), pe directia E-V, la 10-11 cm deasupra fundului apei si fixati in substrat, de la adancimea de 1.8 m spre larg pana la 0.5 m spre tarm.



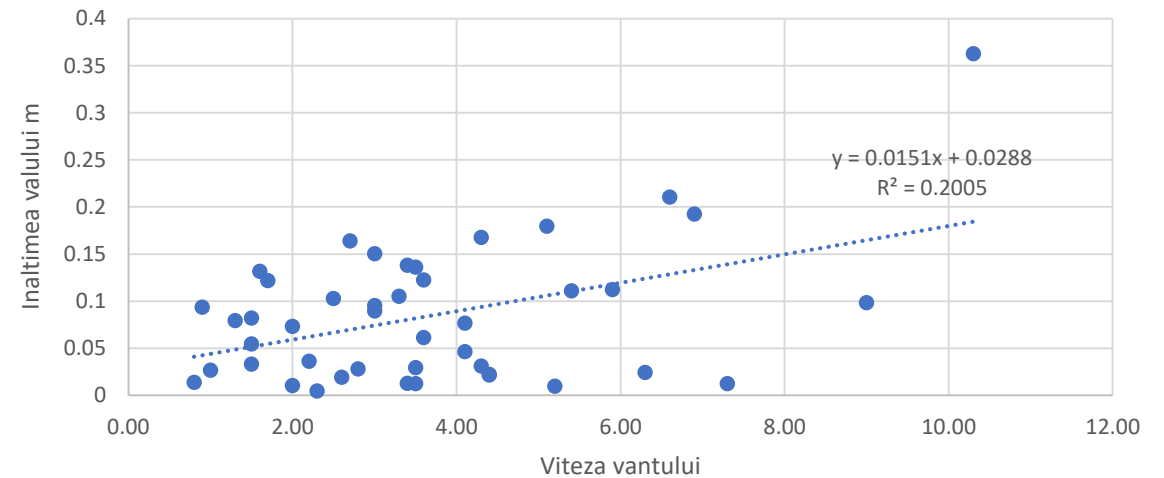
Rezultate - Atenuarea valurilor de vant la Capul Dolosman – iarna 2021 (21.10-25.11)



NIVELUL APEI LA S4



Corelarea inaltimei valurilor cu vantul la S4

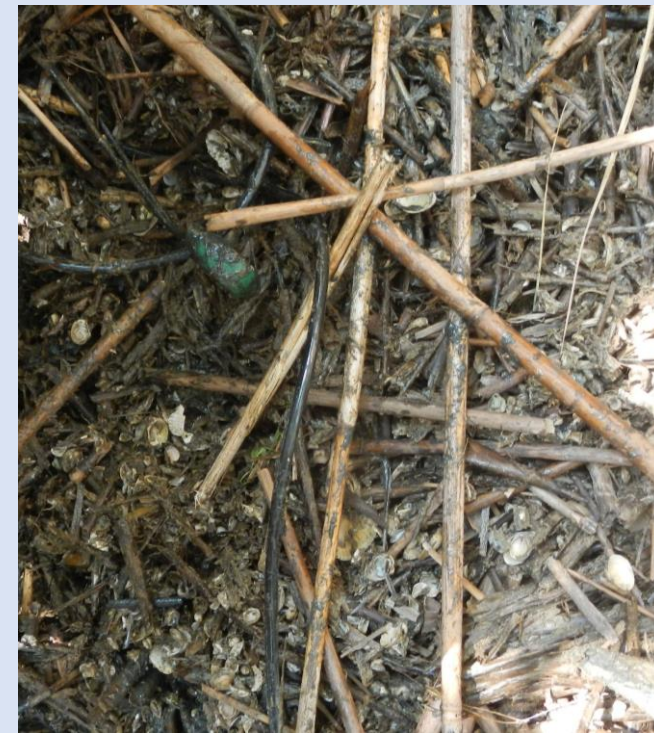


Date de vegetatie

- **Identificarea speciilor din sit:**
Specia dominanta: *Phragmites australis* – 98 %; Alte specii - *Typha latifolia* – 2 %
- **Masuratori si observatii sezoniere, in** **patrate de 0.5 x0.5 m, plasate la min** **2 m de senzori, despre:** densitate, inaltime, diamtru, biomasa si procent de stuf uscat



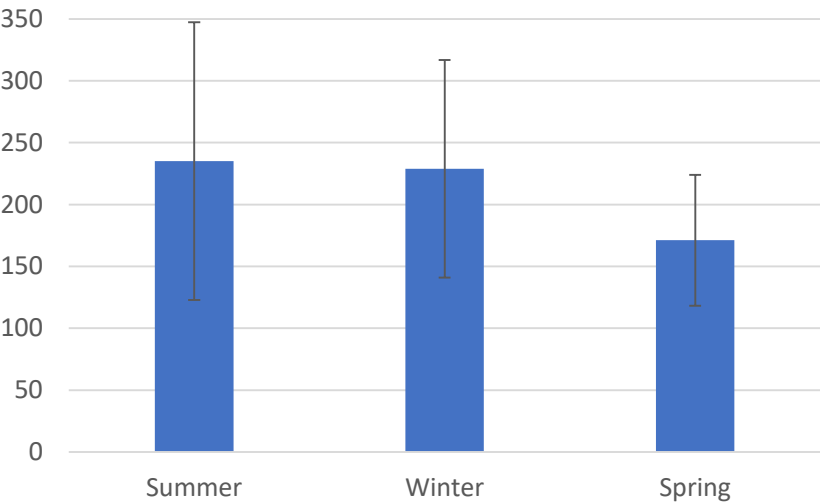
Masuratori sezoniere in pastrate de 0.5x 0.5 m



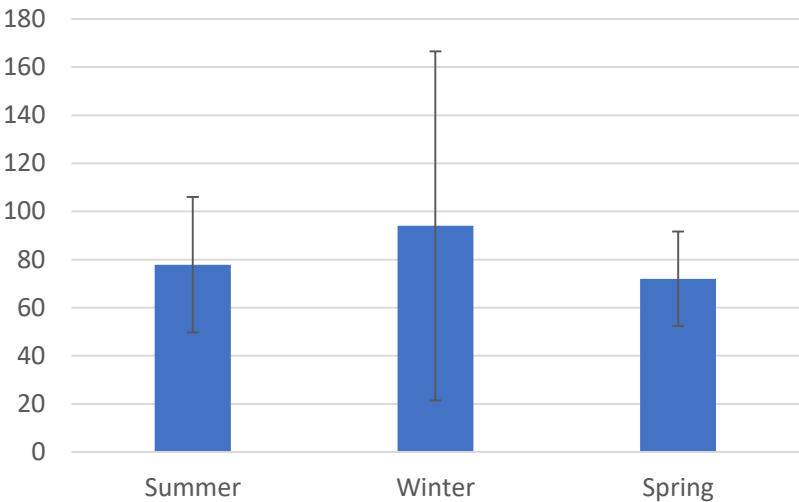
Acumularea de stuf uscat, nisip si cochilii dupa sezonul de iarna, iulie 2015

Discutie – evolutia sezoniera a vegetatiei

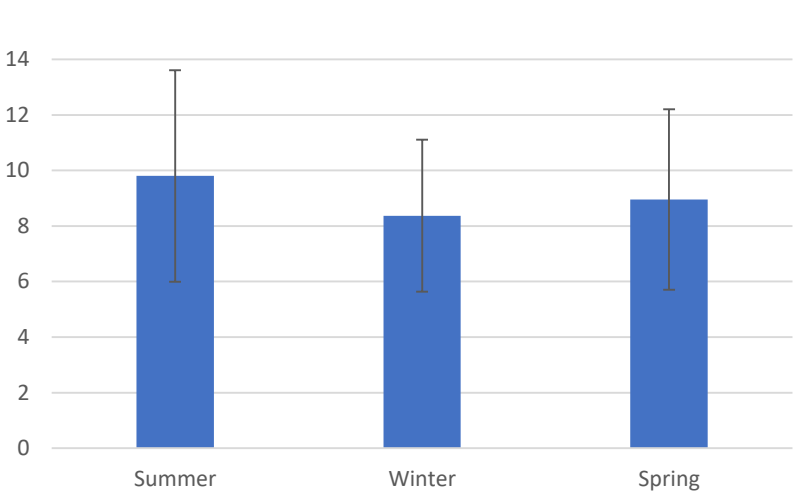
Inaltimea stufului cm



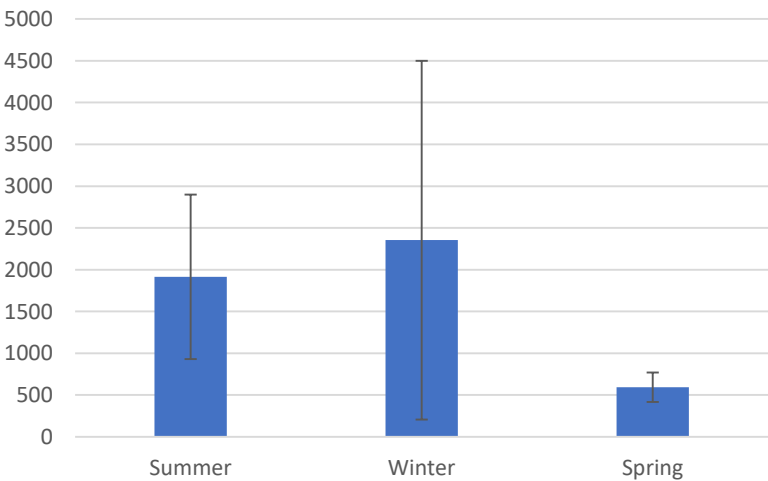
Densitate nr/m2



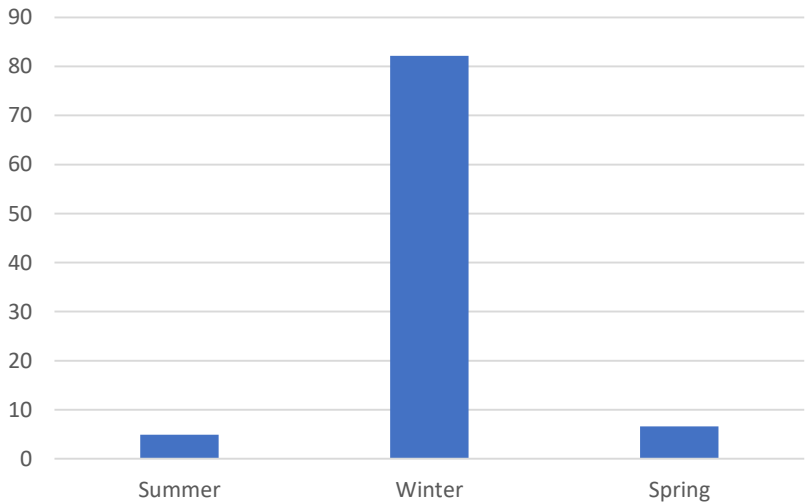
Diametru stufului mm



Biomasa g/m²



% stuf uscat



Concluzii si munca in desfasurare

- Au fost masurate date de valuri la Capul Dolosman din iunie 2021 pana in iulie 2023. Datele inregistrate in toate sezoanele sunt in procesare si integrare cu datele meteo.
- Provocari: mentenanta senzorilor; accesul la senzori si logger in sezonul rece variatia nivelului apei in lac (date lipsa); obtinerea datelor meteo detaliate (orare).
- Atat studiile anterioare cat si studiul de fata arata rolul vegetatiei in atenuarea valurilor de vant si potentialul ei in atenuarea eroziunii.
- Factori care contribuie la atenuarea energiei valurilor de vant: vegetatia (starea si densitatea), in cazul stufului de plaur – structura rizomilor, inclinarea pantei, rugozitatea pantei (granulometrie).





Va multumesc!

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