

University of St Andrews

St Andrews, Fife, KY16 9AJ, Scotland

SedNET 2011



Sediment Ecology Research Group :

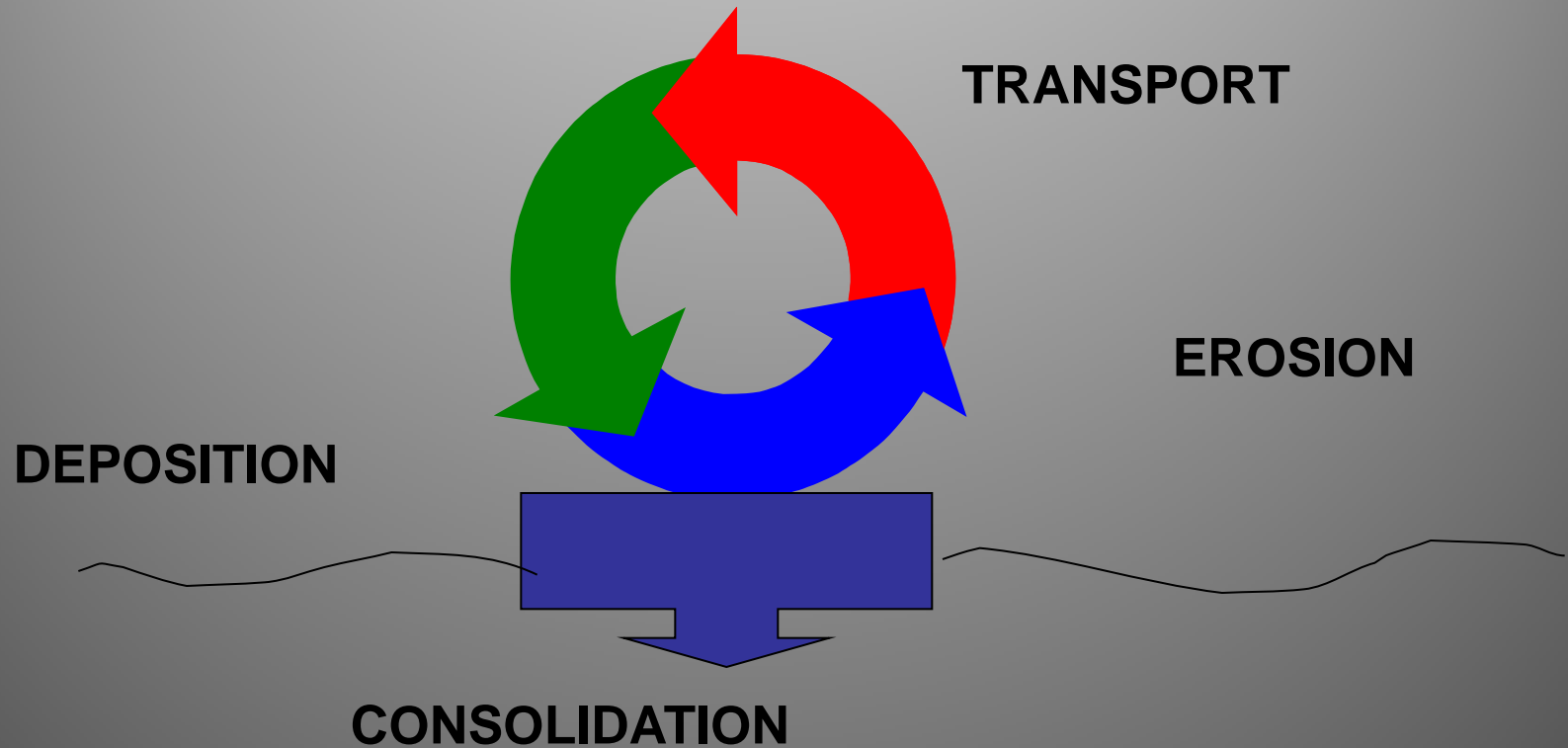
Scottish Oceans Institute



- Erosional behaviour
- Biofilm effects
- Organic contaminants: a new approach



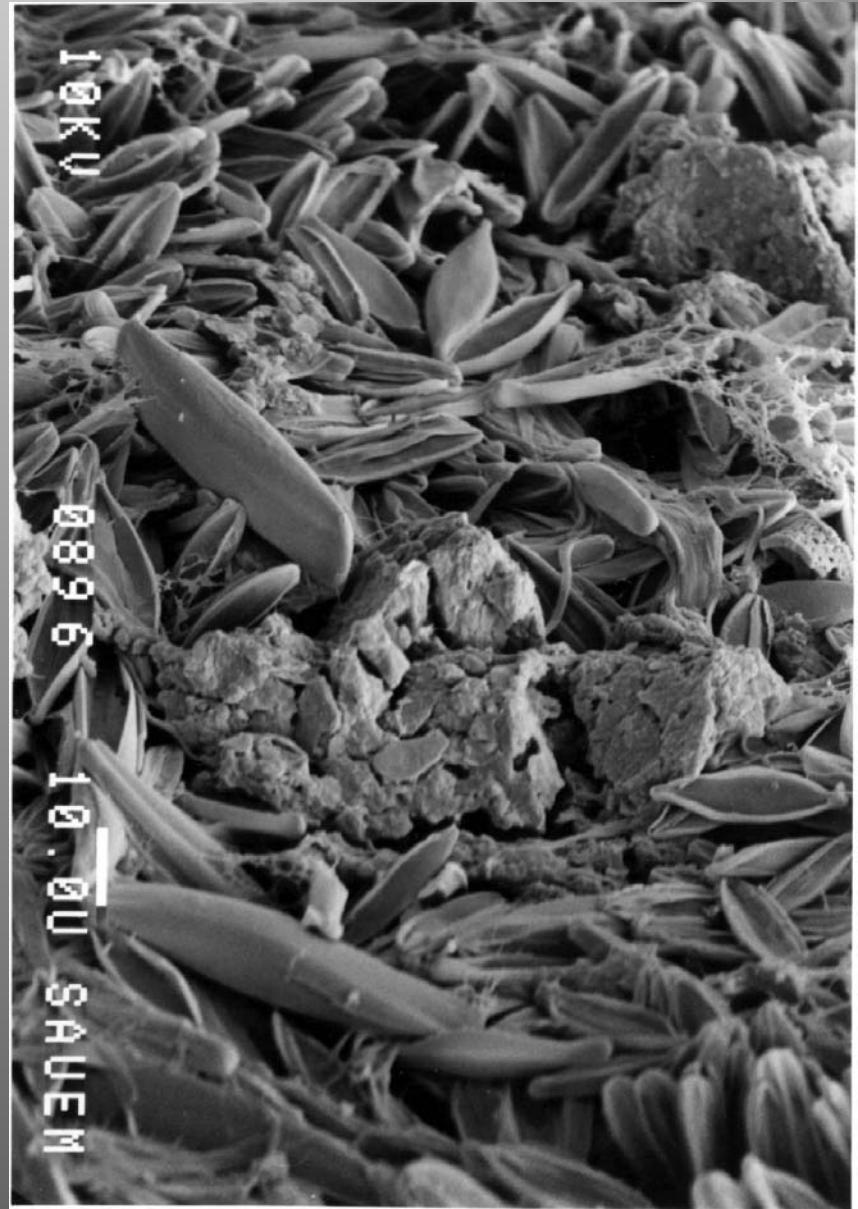
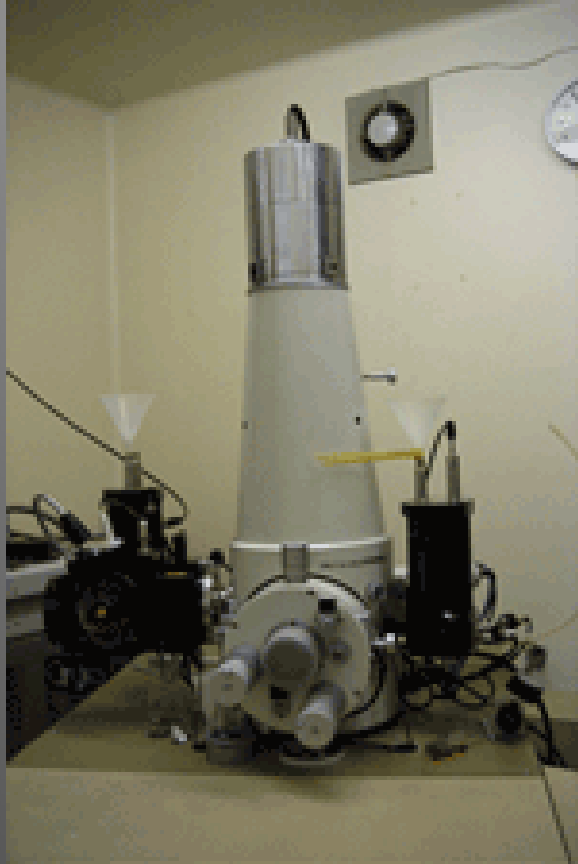
ECOSYSTEM ARCHITECTURE



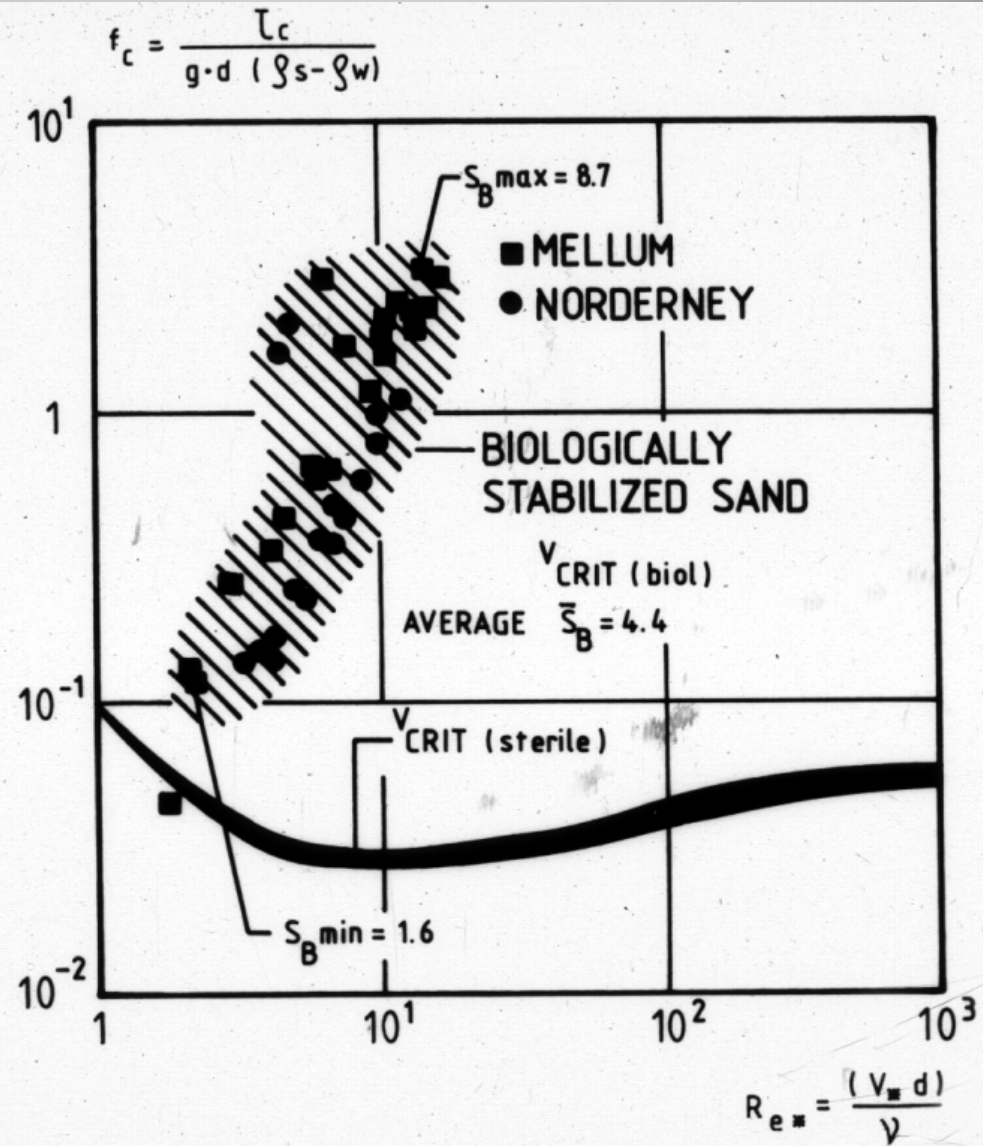
ETDC CYCLE



Low temperature SEM

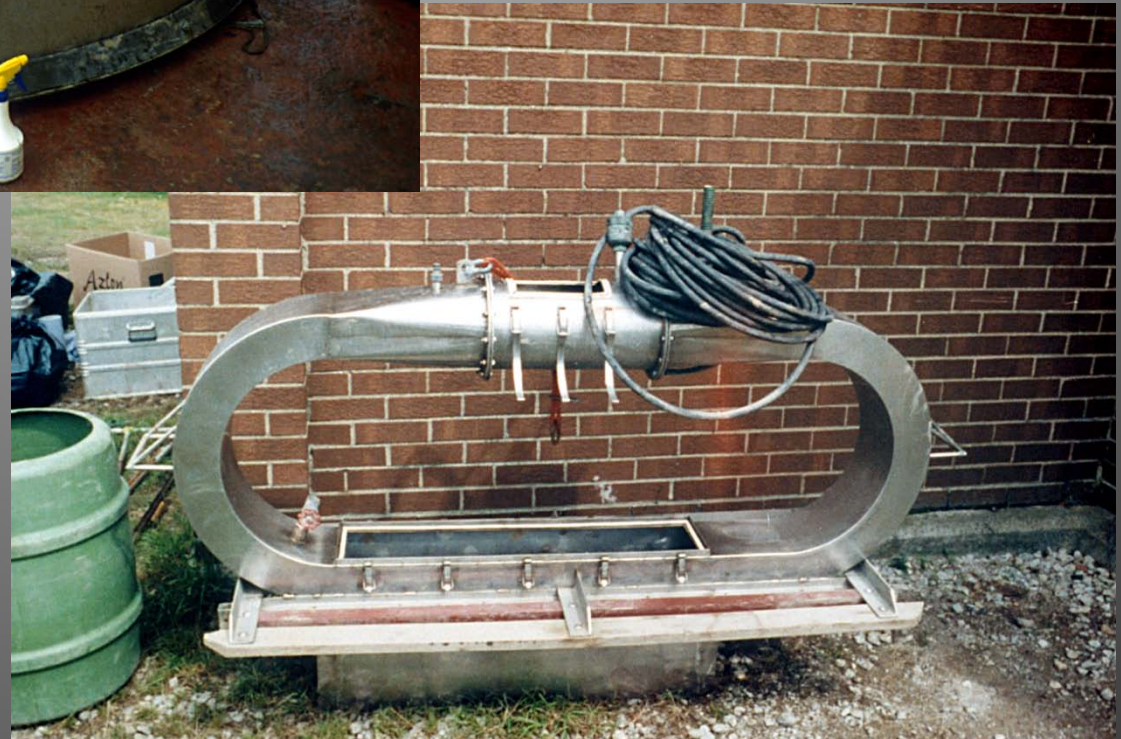


SHIELDS CURVE



Field measurements plotted in the SHIELDS - diagrams

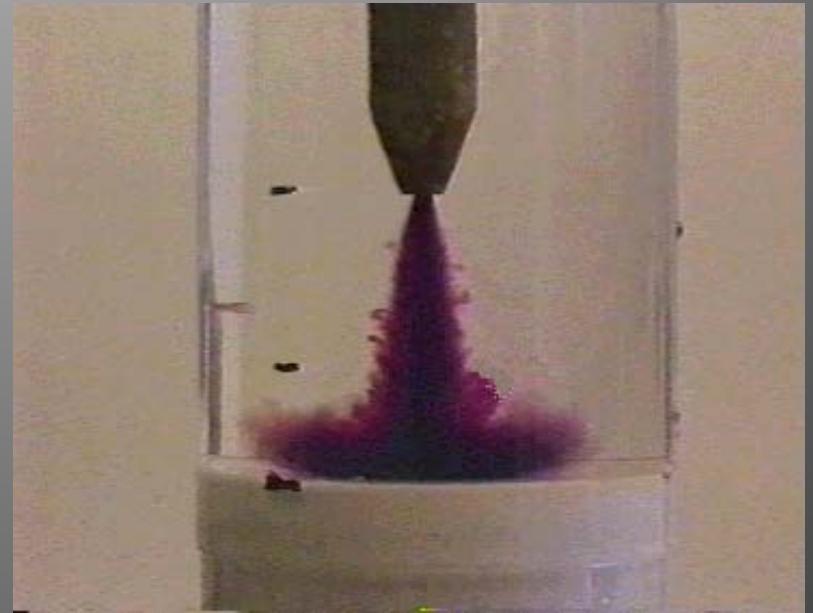
(From Manzenrieder 1983)

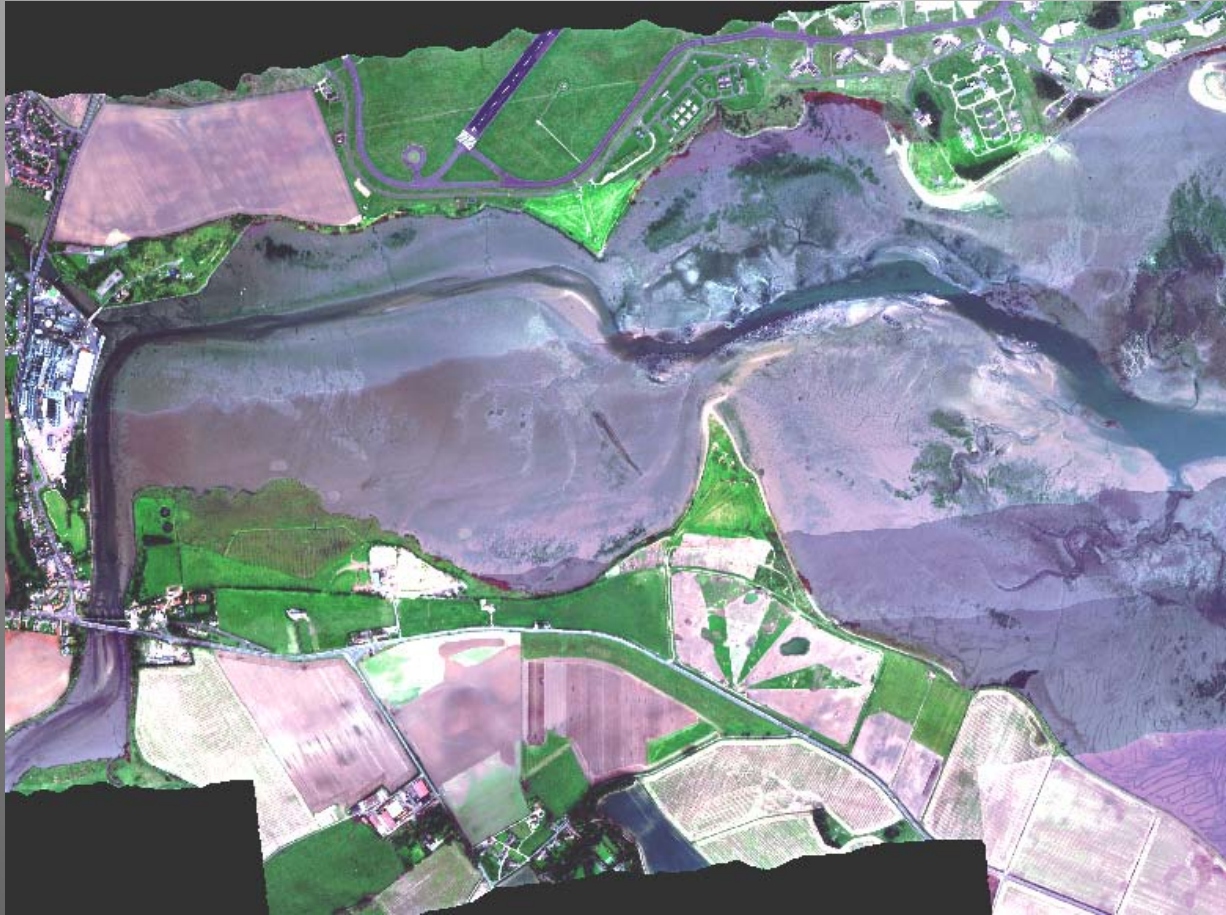


The 2006 Cohesive Strength Meter (CSM)



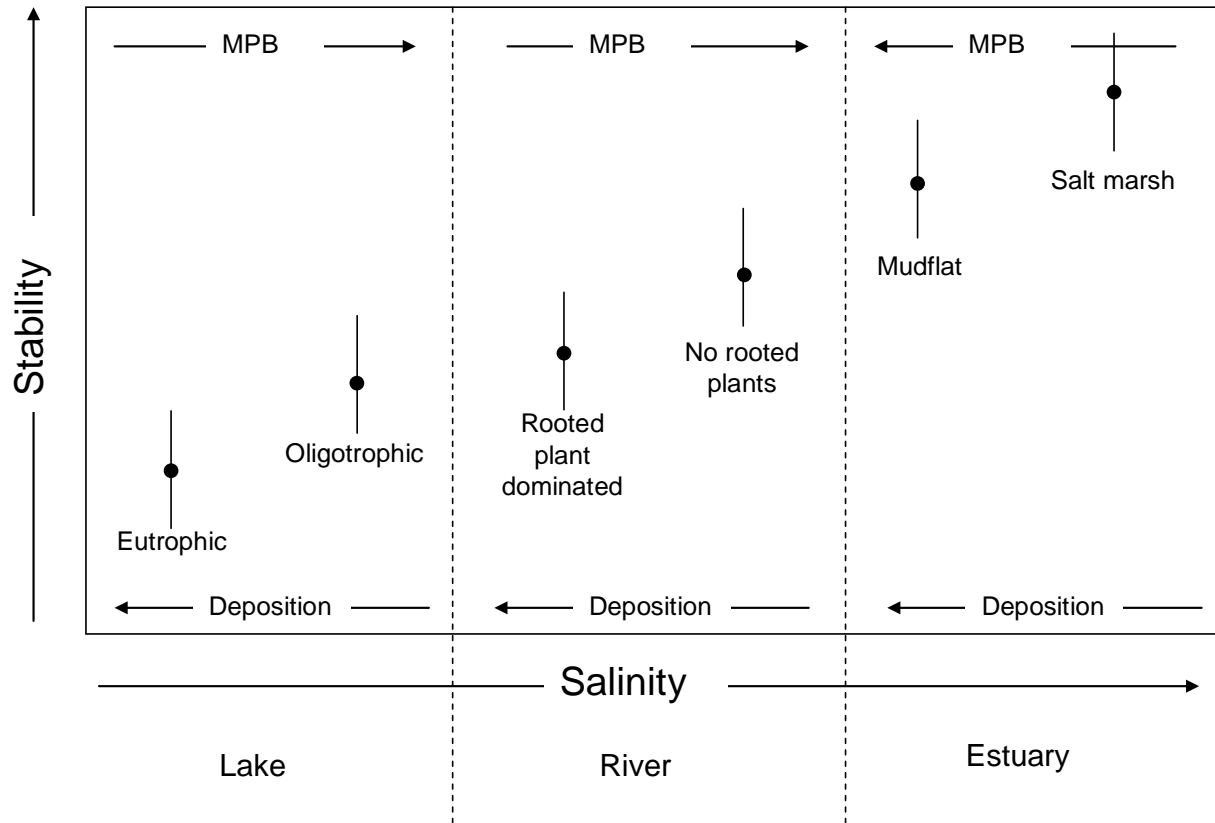
*Sediment stability
measure*





Eden Estuary Scotland

Sediment stability: the catchment theory



Measurement comfort zone

Laminar
(?)
Extremes

Rivers and streams

Torrential
Episodic

Dynamic
Extremes

Tsunami

Wave crash

Density
flows

Shallow lotic
systems

Salt marsh

Lentic
systems

High intertidal

Deep
Lakes

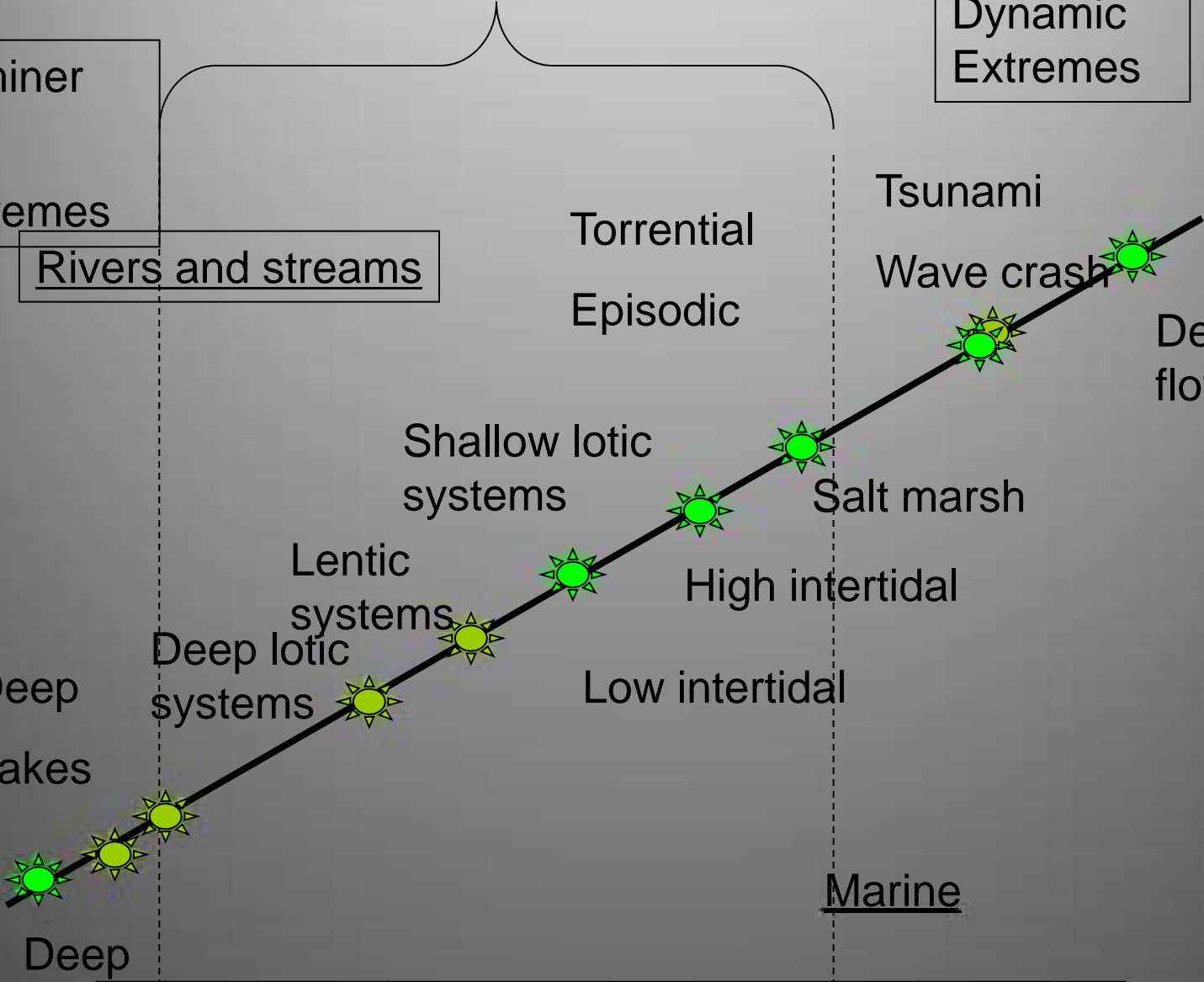
Deep lotic
systems

Low intertidal

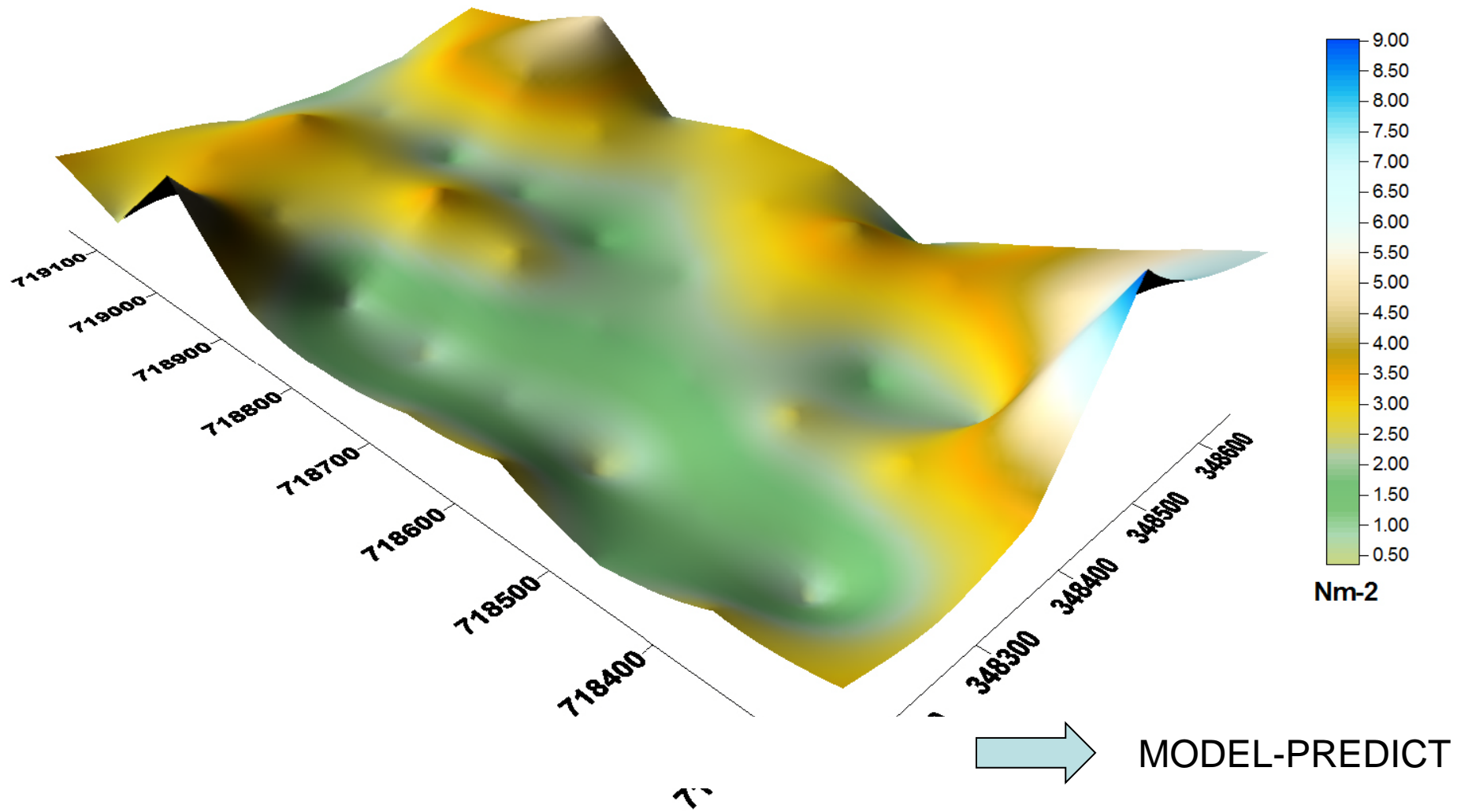
Marine

Deep

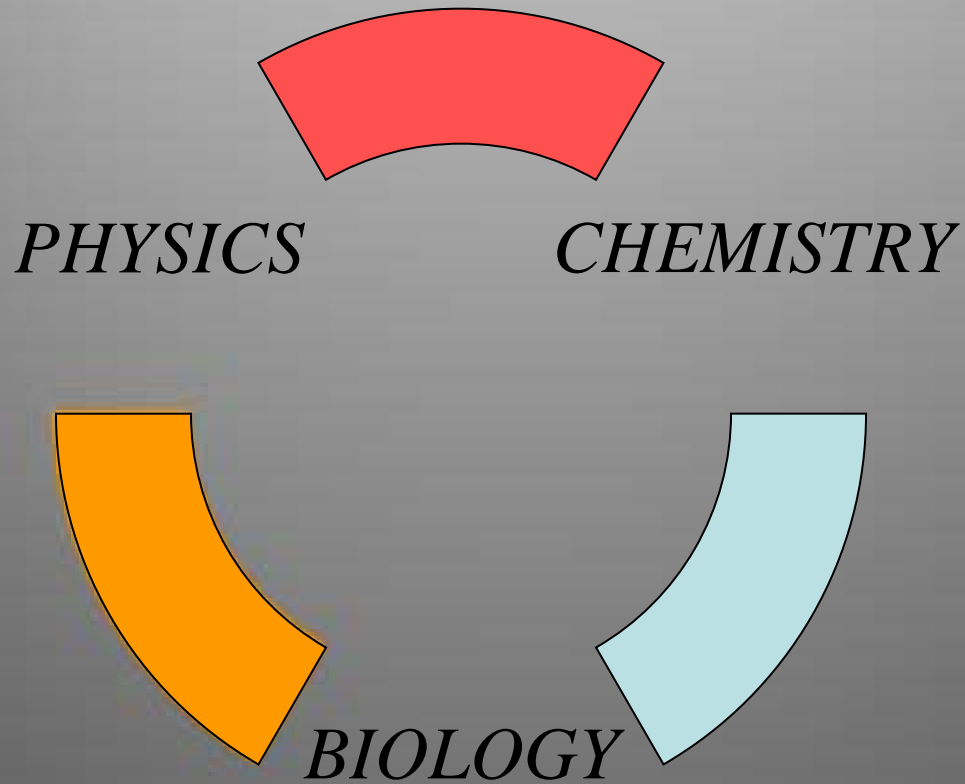
Oceanic



3-D Map of Surface Sediment Stability, Eden Estuary, Fife, Scotland



IT'S NOT ALL ONE WAY.....



THRESHOLD LIMITATIONS.....

DESTRUCTIVE

MAGNETIC PARTICLE INDUCTION

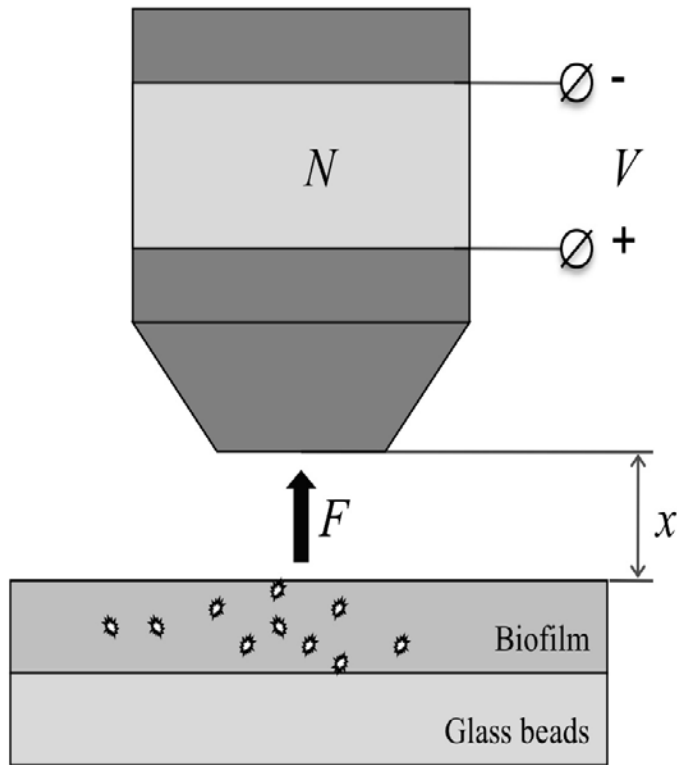
“MAGPI”



Larson, F., Lubarsky, H., Gerbersdorf, S.U. and Paterson, D. 2009.
Surface adhesion measurements in aquatic biofilms using
magnetic particle induction: MagPI.

Limnology and Oceanography: Methods. 7. 490-497.

MagPI : Theory



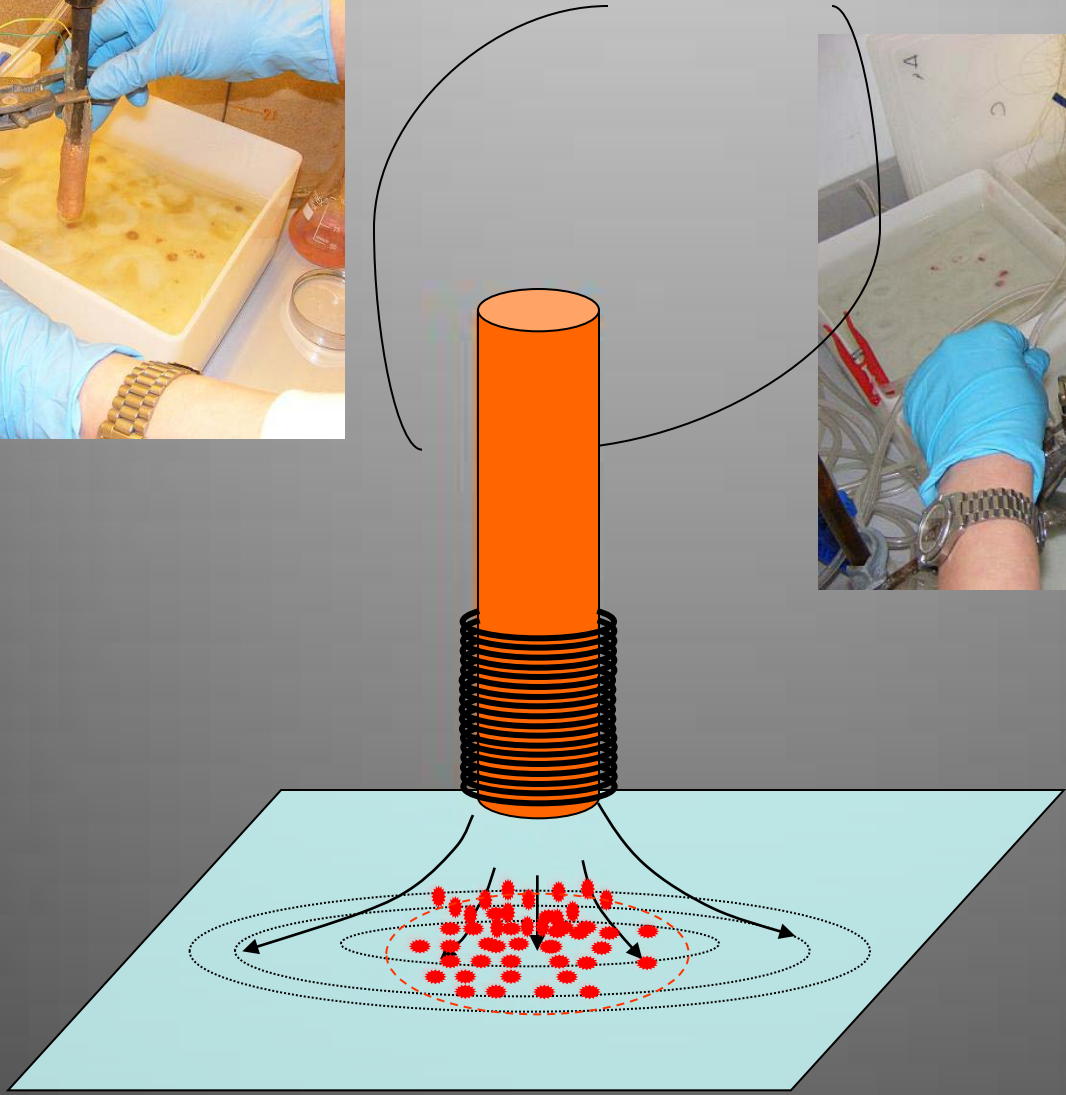
$$F = \frac{B^2 A}{2\mu_0}$$

B is the magnetic flux density,
 A is the area of the pole faces
 μ is the permeability of free space

$$B = \frac{\mu N I}{L}$$

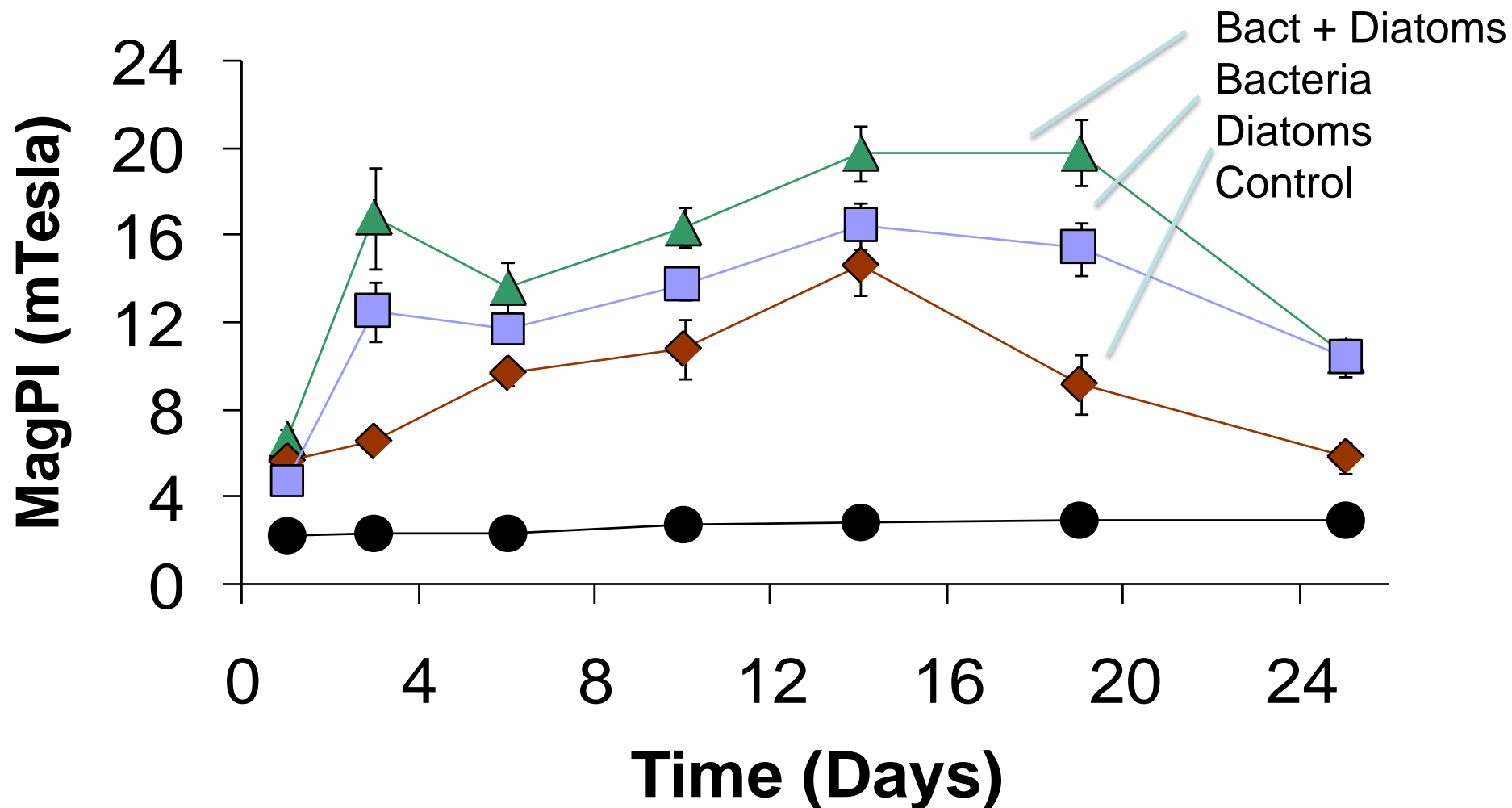
N is number of turns
 I is the current,
 L is the length of the magnetic circuit

$$F = \frac{\mu^2 N^2 I^2 A}{2\mu_0 L^2}$$

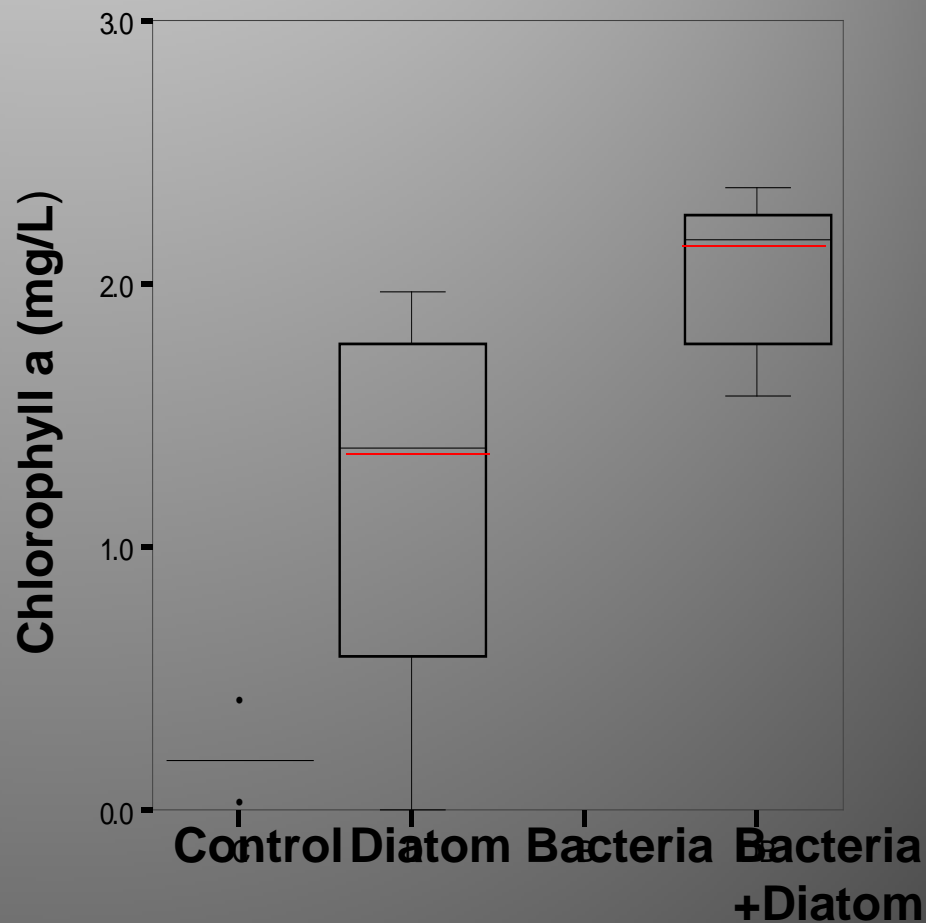
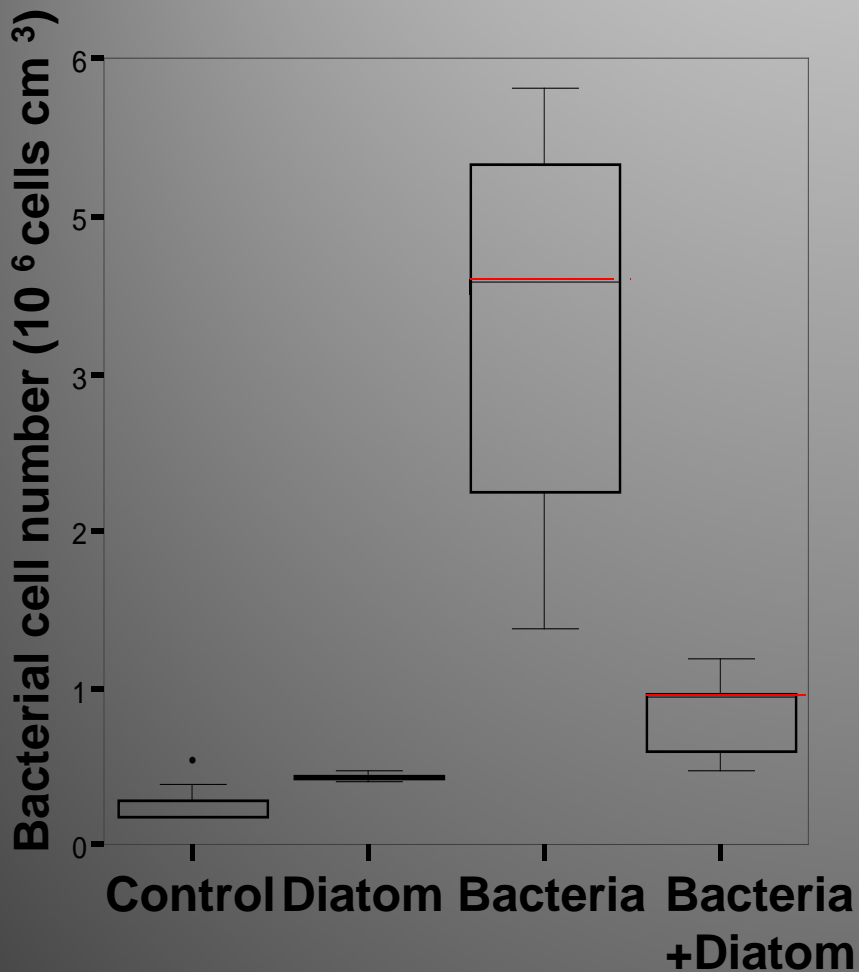




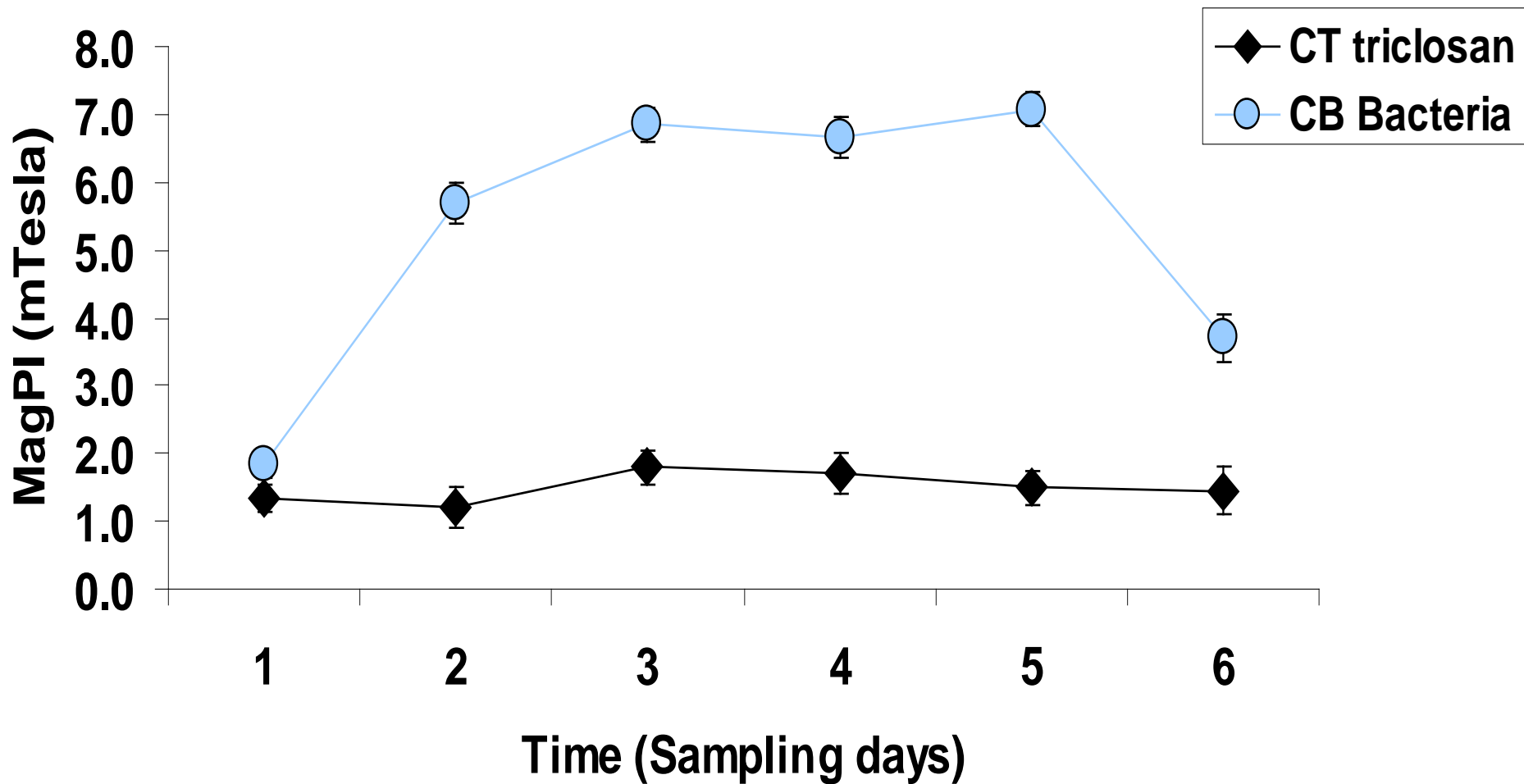
Surface adhesive capacity with: MagPI



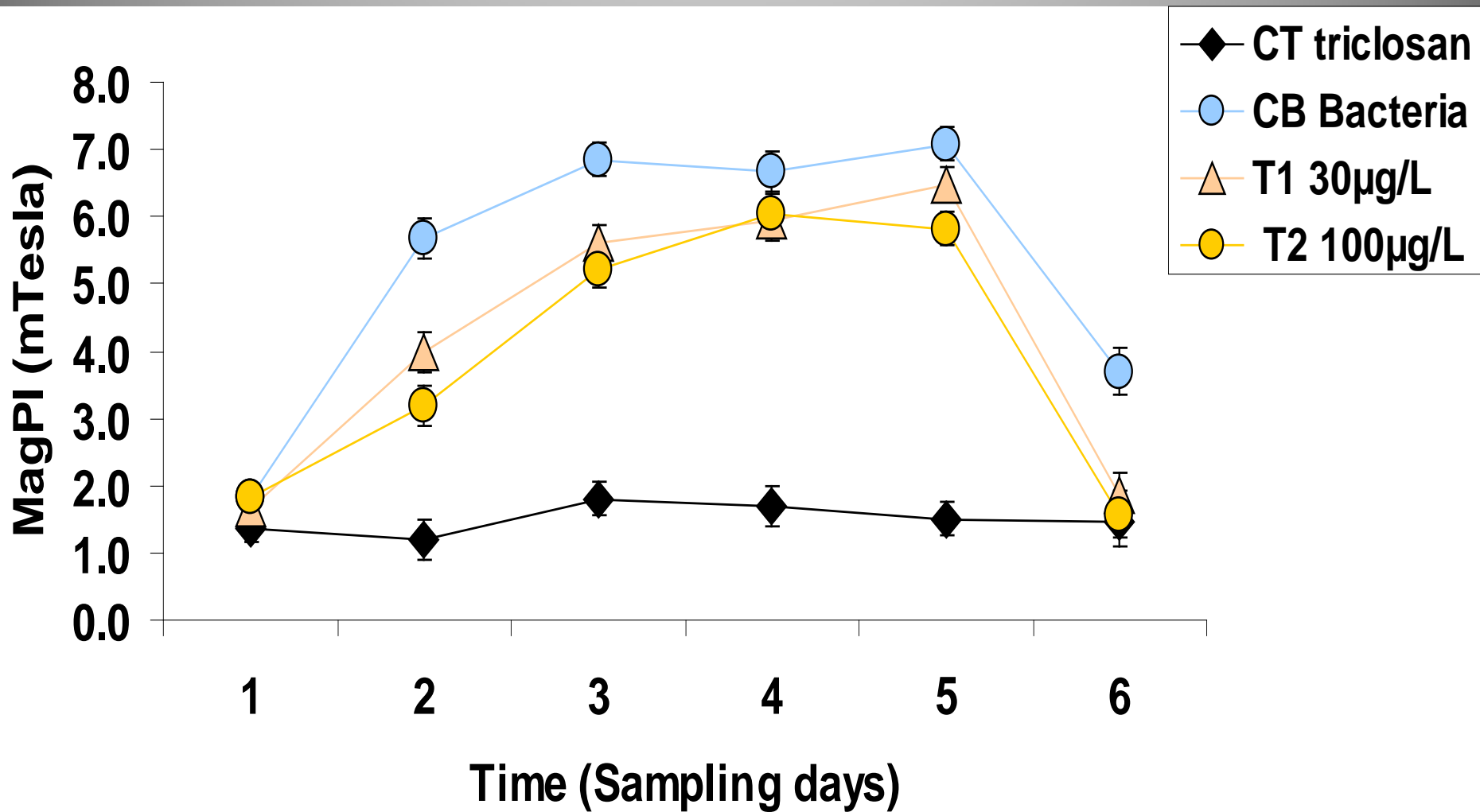
Cell numbers, Biomass



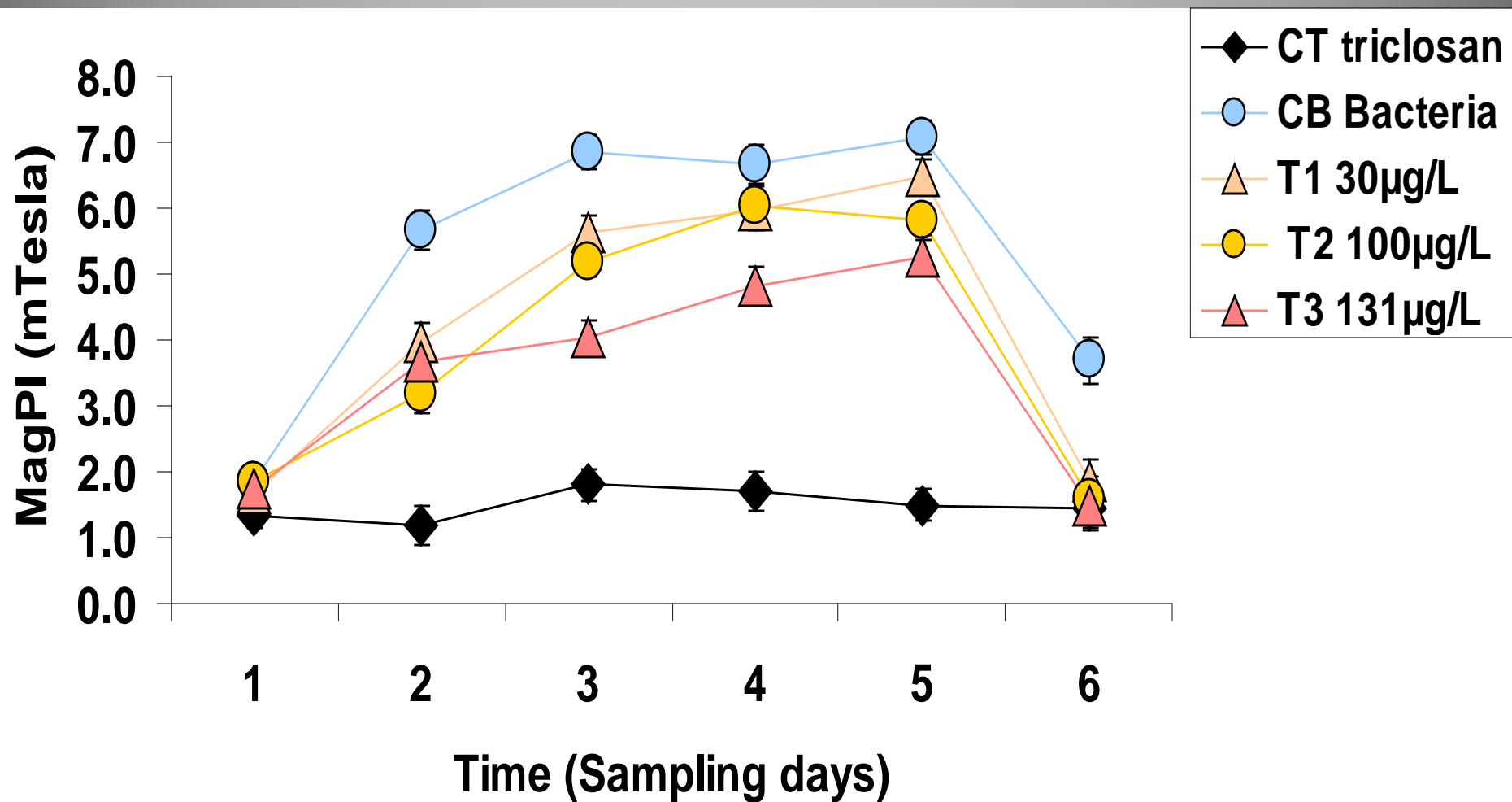
Preliminary result :MagPI (mTesla)



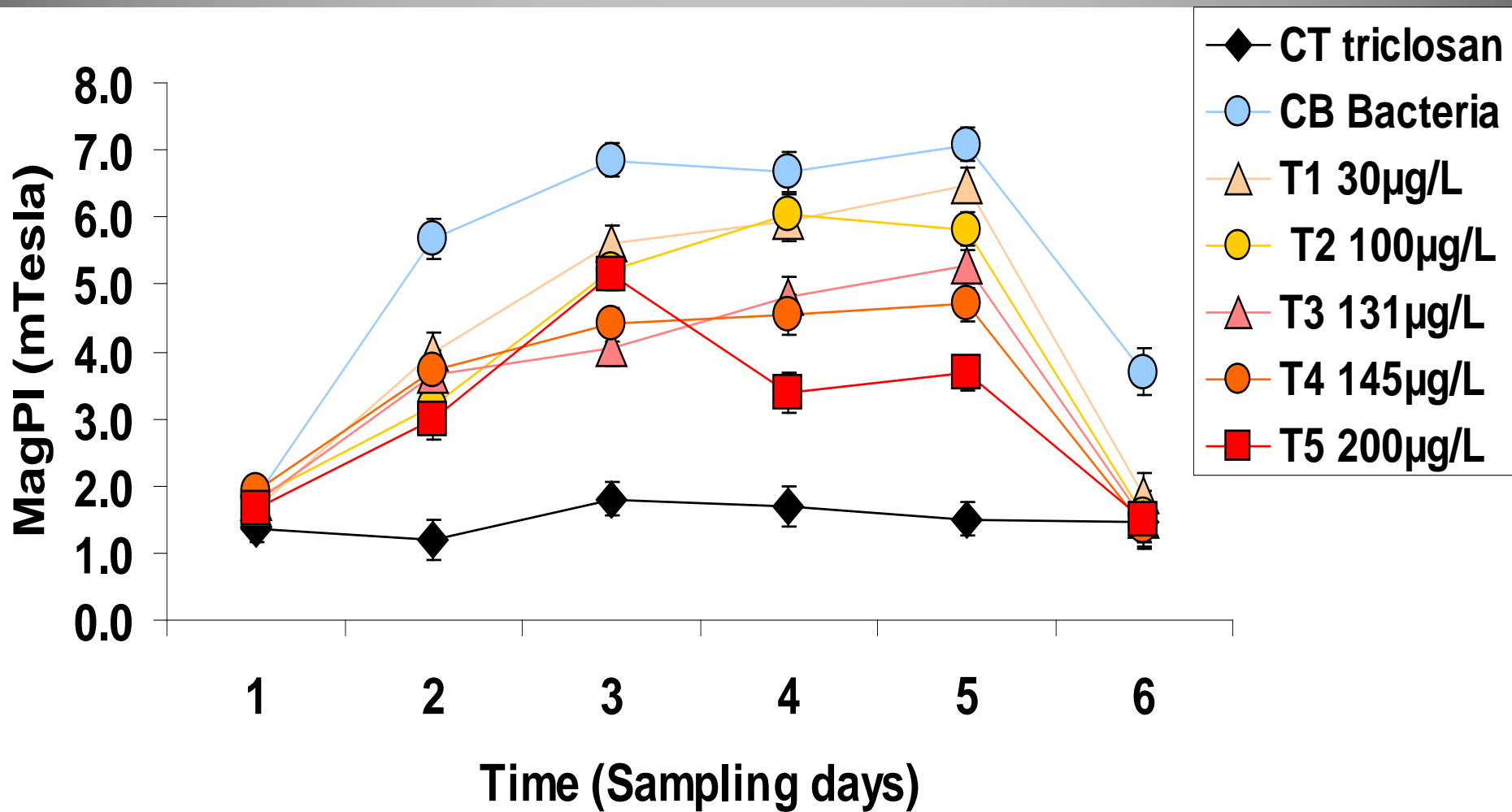
Preliminary result :MagPI (mTesla)



Preliminary result :MagPI (mTesla)



Preliminary result :MagPI (mTesla)



Some recent relevant publications:

Hubas C, Sachidhanandam C, Rybarczyk H, Lubarsky H, Rigaux A, Moens T, Paterson DM (2010)
Bacterivorous nematodes stimulate microbial growth and exopolymer production in marine sediment microcosms. *Marine Ecology Progress Series* doi: 10.3354/meps08851 (on line).

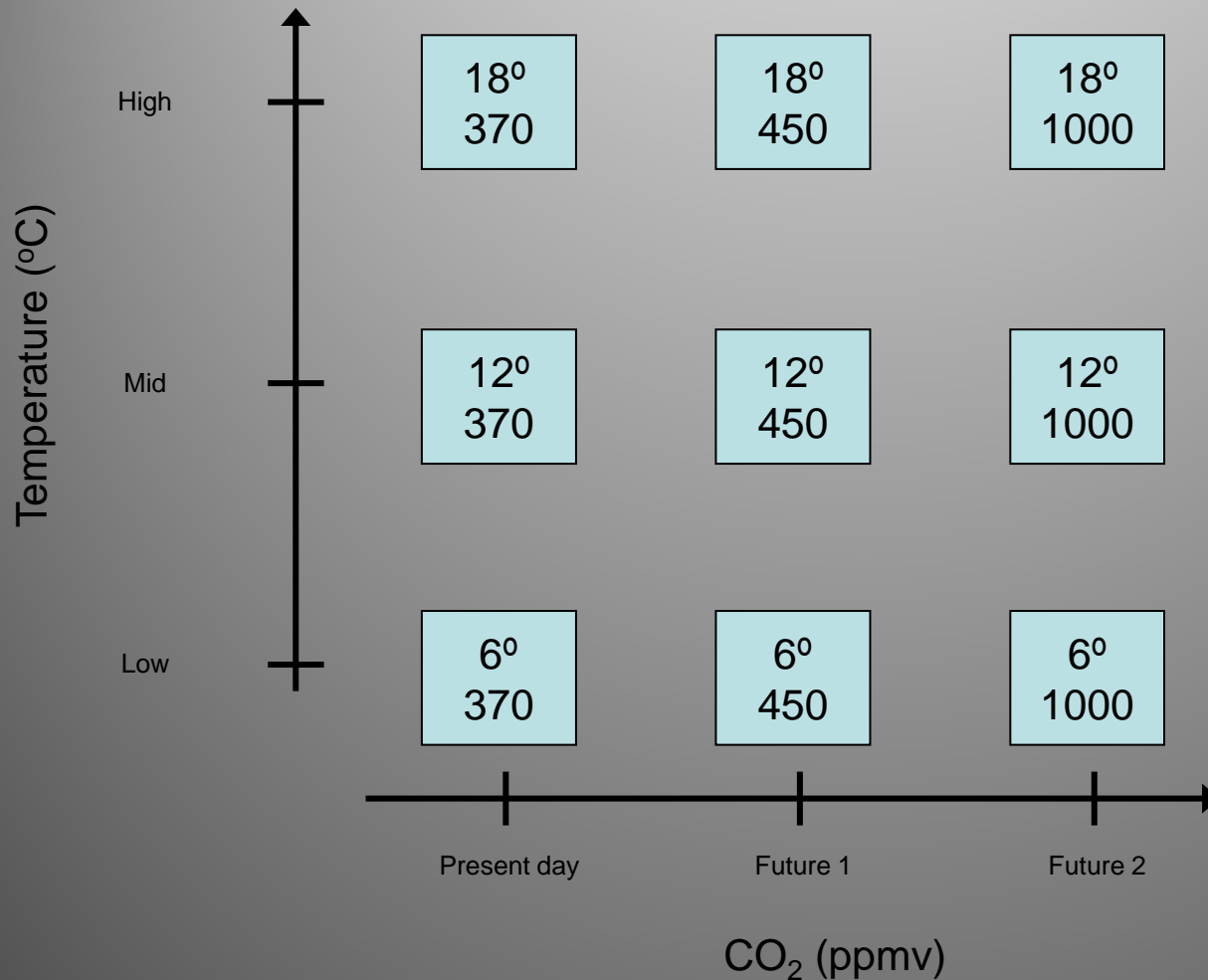
Lubarsky HV, Hubas C, Chocholek M, Larson F, Manz W, Paterson DM, Gerbersdorf SU (2010)
The Stabilisation Potential of Individual and Mixed Assemblages of Natural Bacteria and Microalgae. *PLoS ONE* 5(11): e13794. doi:10.1371/journal.pone.0013794

Gerbersdorf SU, Bittner R, Lubarsky H, Manz W, Paterson DM (2009)
Microbial assemblages as ecosystem engineers of sediment stability.
Journal of Soils and Sediments 9 (6): 640-652 doi: 10.1007/s11368-009-0142-5

Larson F, Lubarsky H., Paterson DM, Gerbersdorf SU (2009)
Surface adhesion measurements in aquatic biofilms using magnetic particle induction: MagPI.
Limnology and Oceanography: Methods 7: 490-497

Gerbersdorf SU, Janke T, Westrich B, Paterson DM (2008).
Microbial stabilization of riverine sediments by extracellular polymeric substances.
Geobiology 6: 57-69 doi: 10.1111/j.1472-4669.2007.00120.x

Gerbersdorf SU, Manz W, Paterson DM (2008)
The engineering potential of natural benthic bacterial assemblages in terms of the erosion resistance of sediments. *FEMS Microbiology Ecology* 66(2): 282-294 DOI



SPID × Temp × CO₂ combinations replicated 3 times = 216 mesocosms

The logo for the Scottish Oceans Institute, featuring the text "SCOTTISH OCEANS INSTITUTE" in white capital letters inside a blue circular emblem with stylized waves.

SCOTTISH
OCEANS
INSTITUTE



Helen Lubarsky

Bryan Spears

Sabine Gerbersdorf

Irvine Davidson

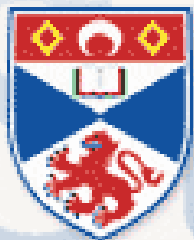
Fredrick Larson

Beccy Aspden

Kevin Black

Emma Defew

James Saunders



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