



MAX-PLANCK-GESELLSCHAFT

# Calcification induced by photosynthesis in marine sediments

Raphaela Schoon

May 5<sup>th</sup>, 2010

Max Planck Institute for Marine Microbiology, Bremen



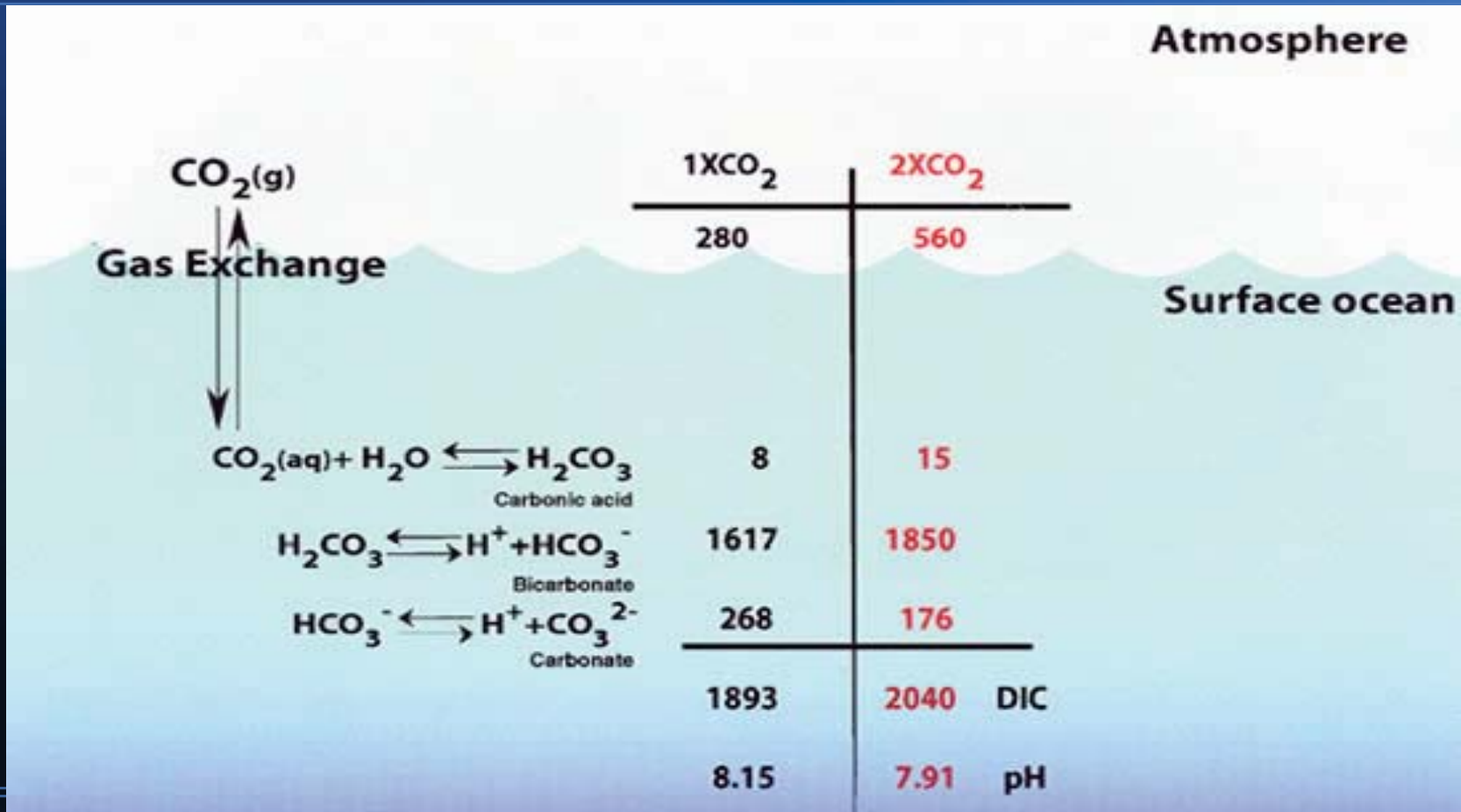
Microsensor Workshop

# Outline

- Introduction to
  - Carbonate system
  - Calcification (photosynthesis and respiration)
- Transient (24 h) microsensor measurements
- Measurements at varying seawater pH

# Introduction

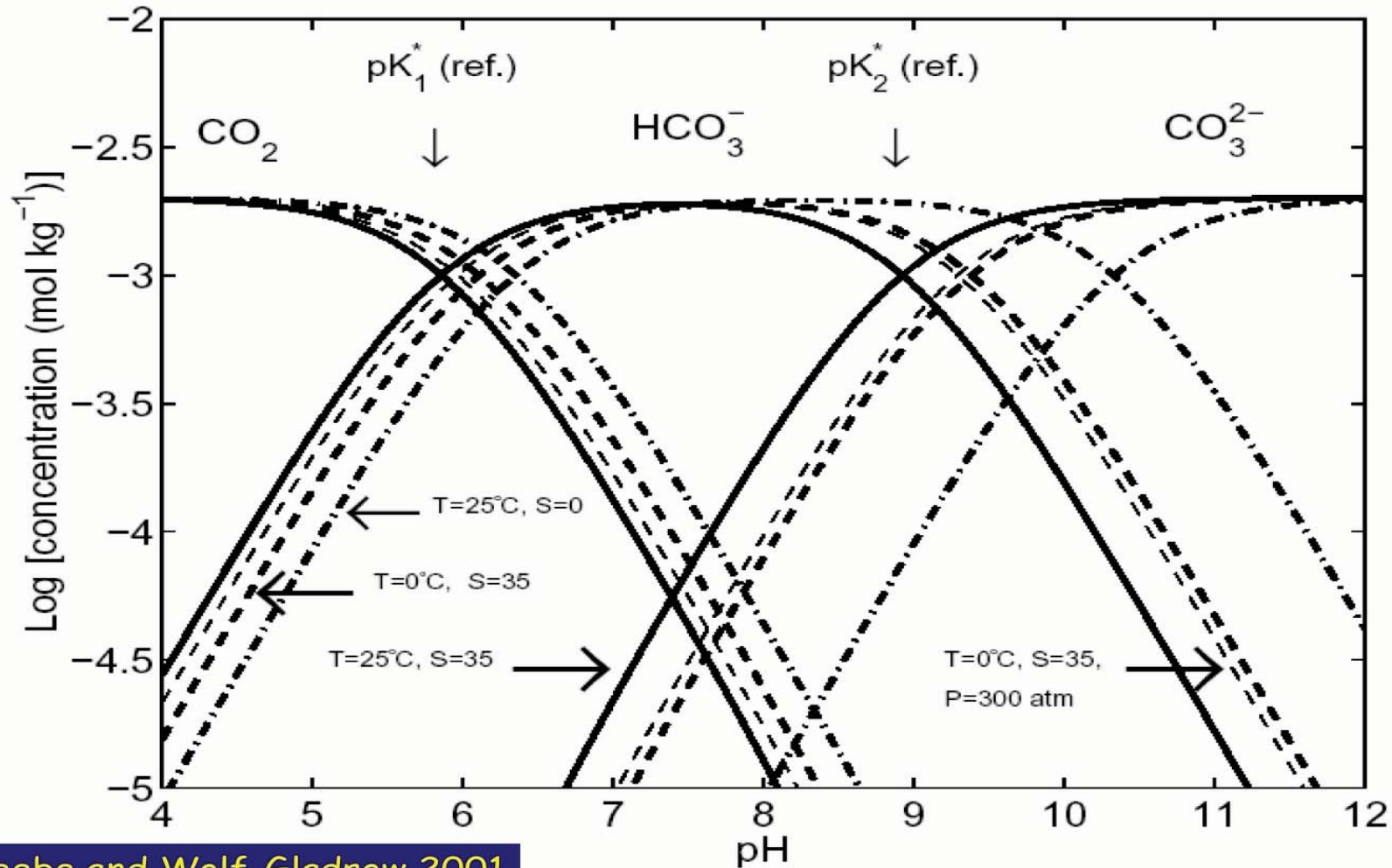
## Carbonate system



(Feely *et al.* 2001)

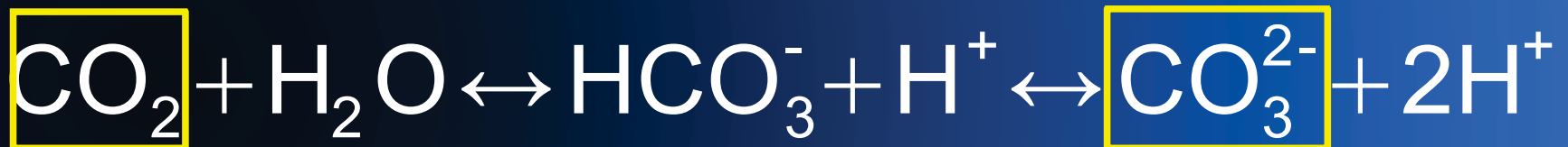
# Introduction

## Carbonate system



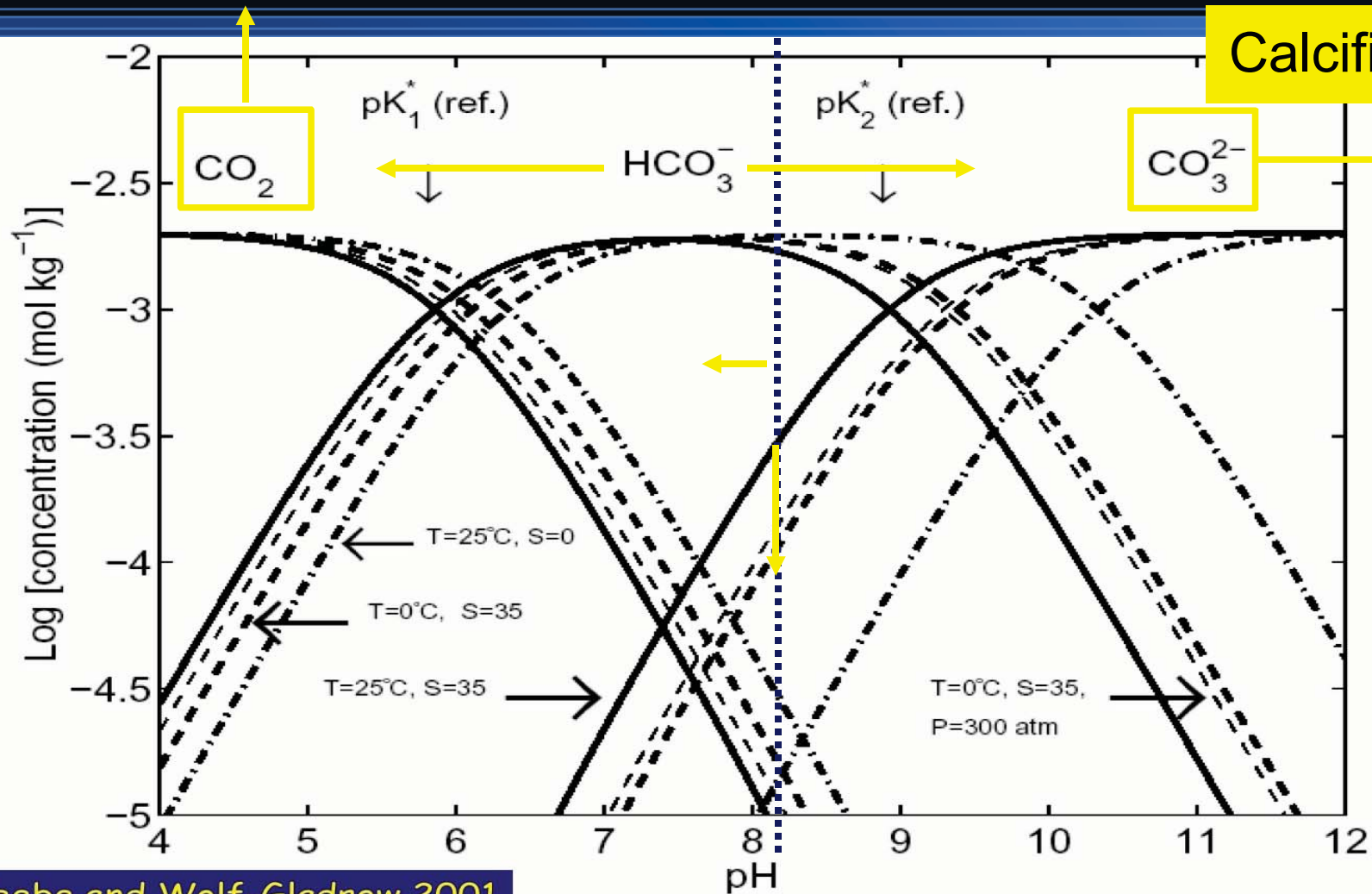
# Introduction

## Calcification (and photosynthesis)



# Introduction

## Calcification

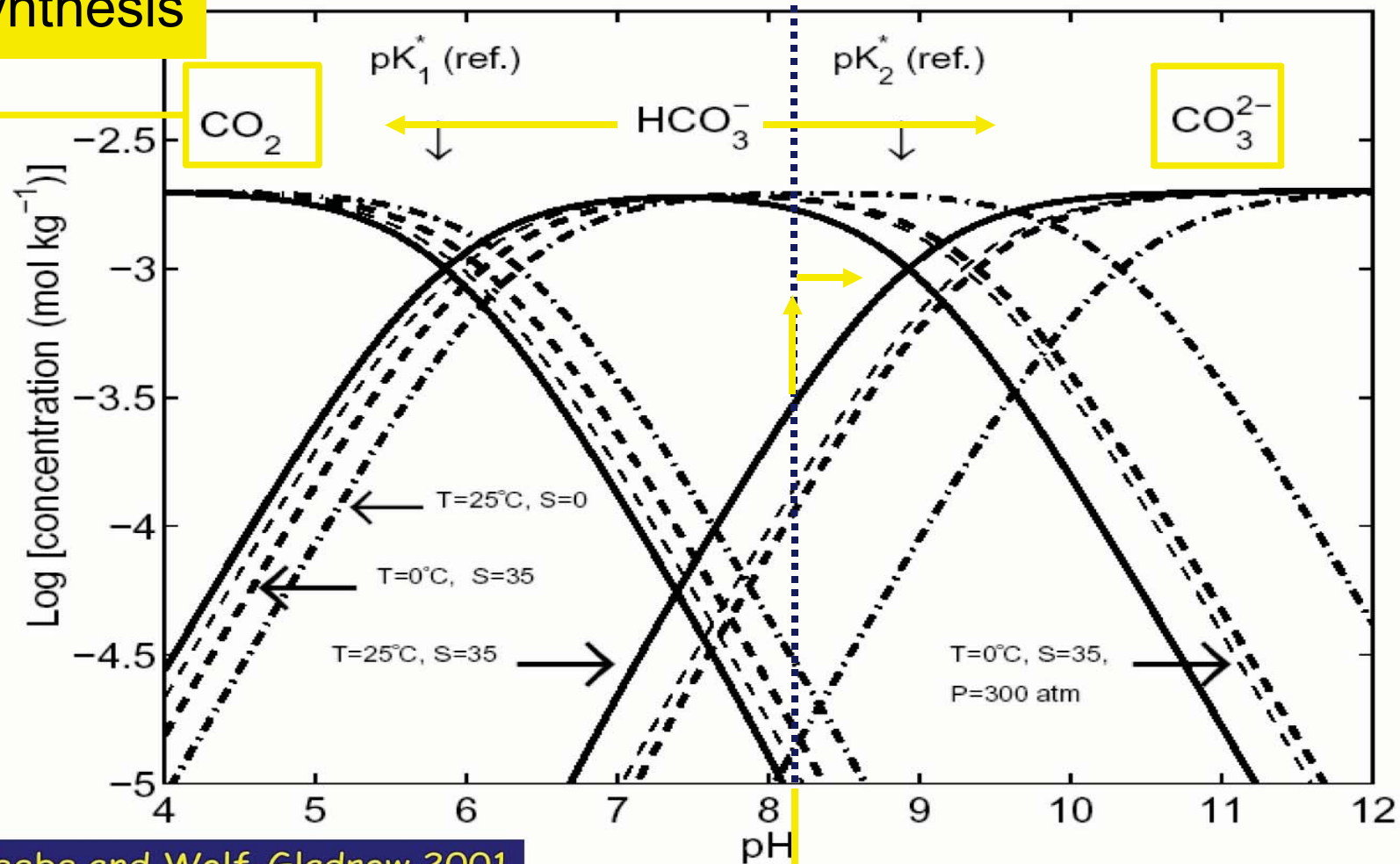


Calcification

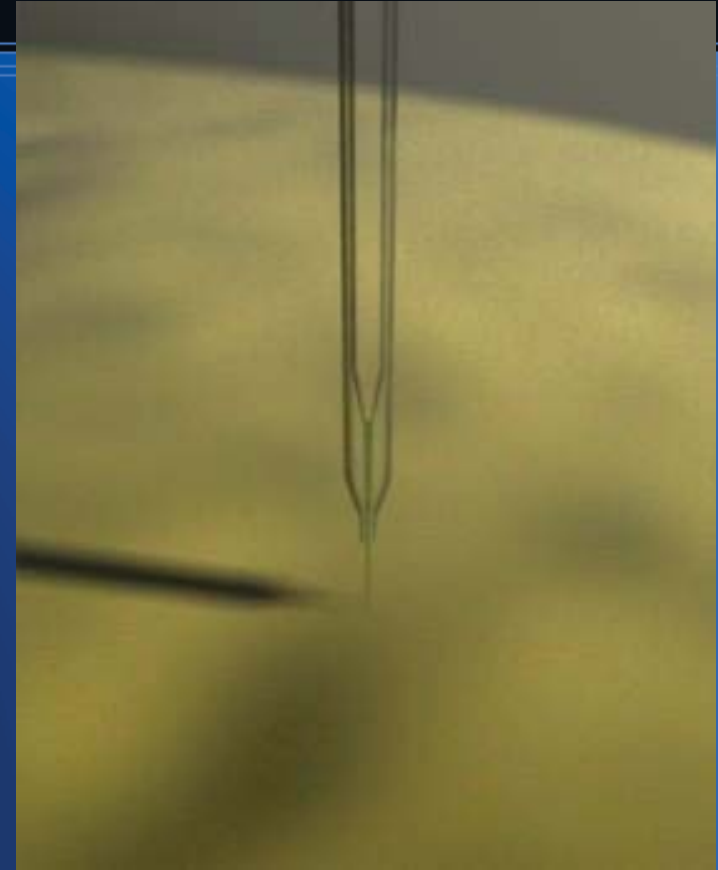
# Introduction

## Photosynthesis

### Photosynthesis



# Set-up

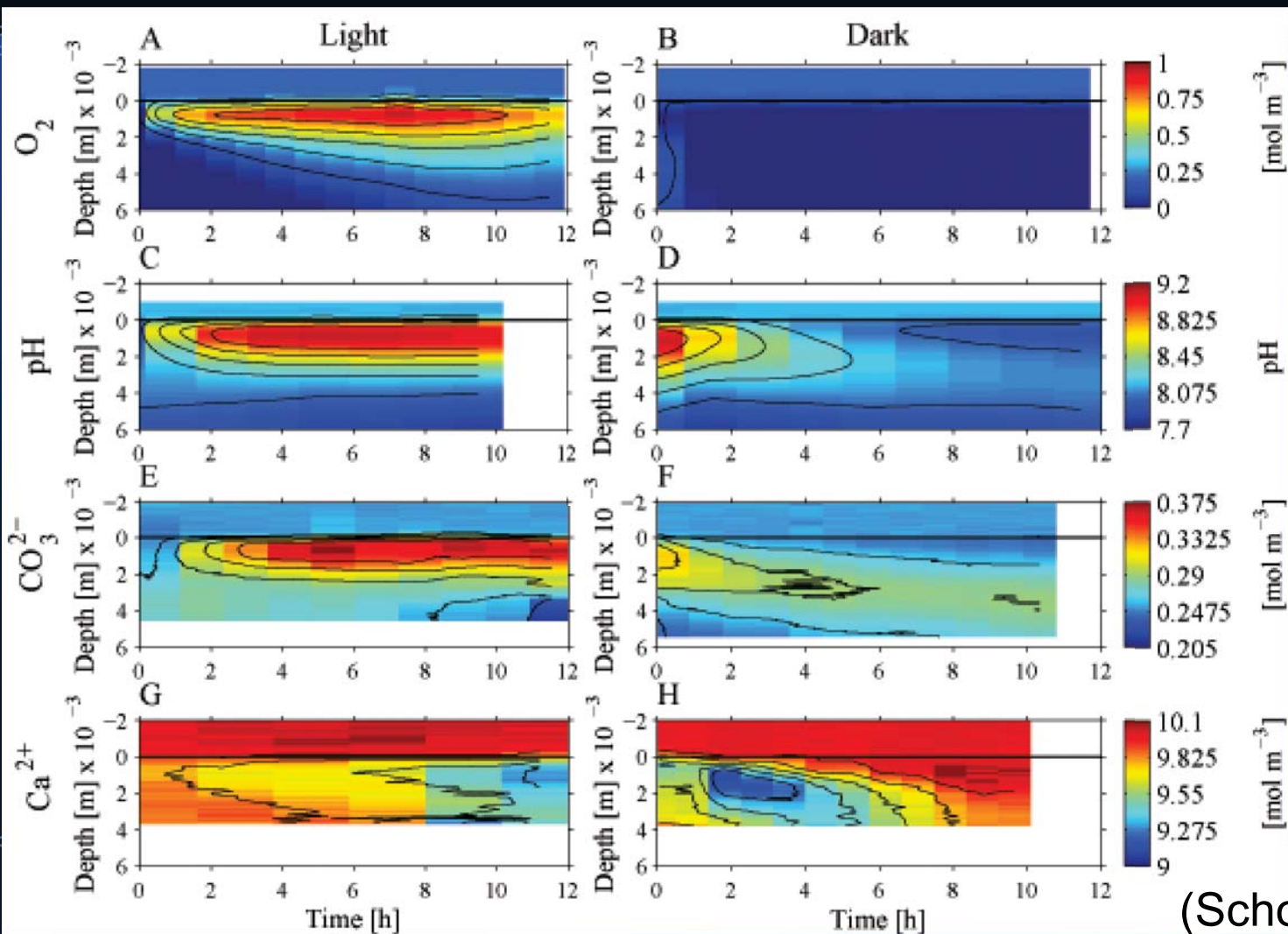


- Carbonate Sediment from the Bait Reef (Australia)
- $O_2$ , pH,  $Ca^{2+}$  and  $CO_3^{2-}$  microsensor measurements



# Results

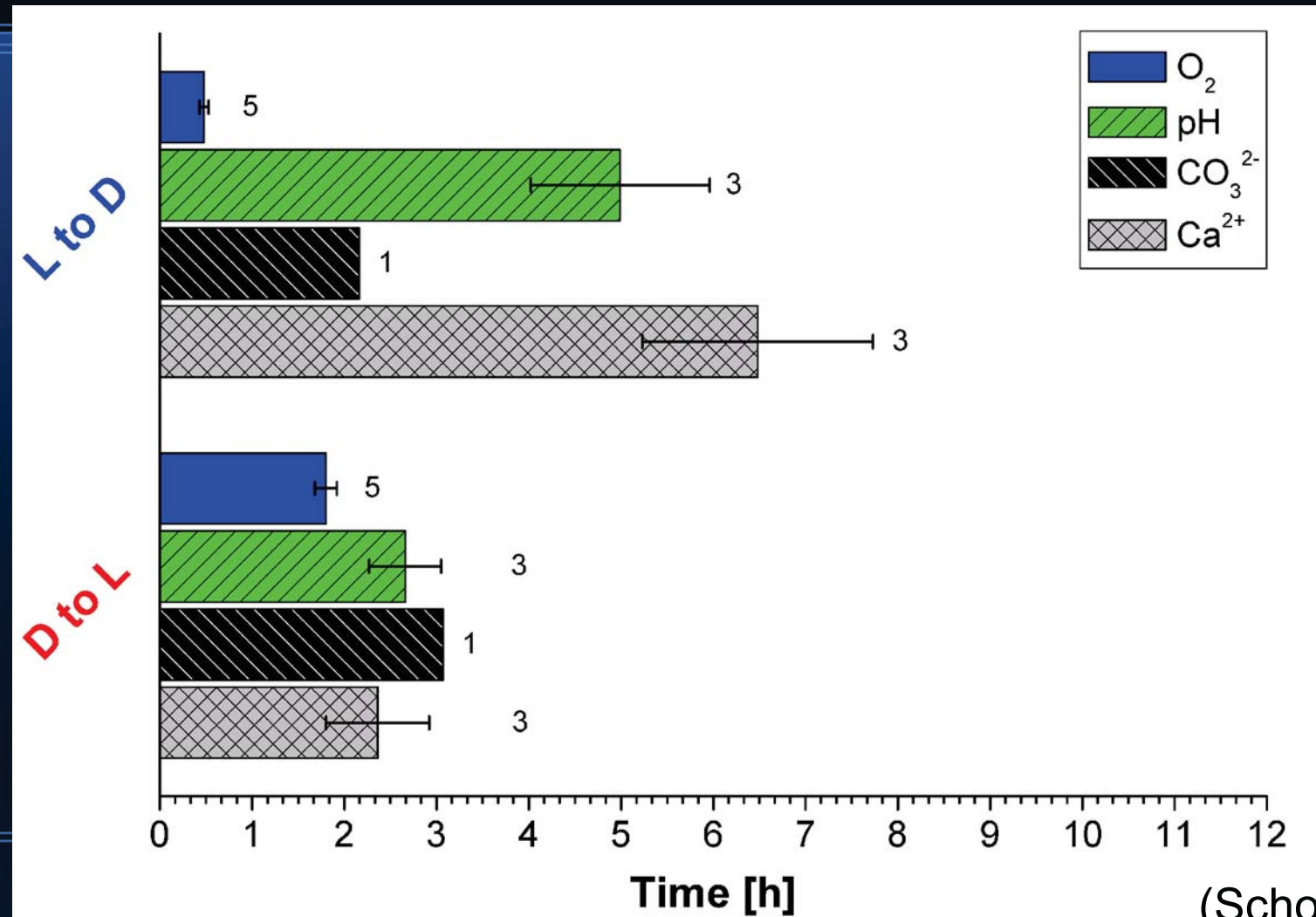
## Microsensor measurements



(Schoon *et al.* 2010)

# Results

## Calculated time to steady state



(Schoon *et al.* 2010)

# Summary

- Photosynthetic induced calcification in carbonate sediments
- Calcification continues in darkness
- Steady state of pH,  $\text{CO}_3^{2-}$  and  $\text{Ca}^{2+}$  lag the on of  $\text{O}_2$
- Microenvironment

# Arising questions

- Has ocean acidification any effect on photosynthesis?

or

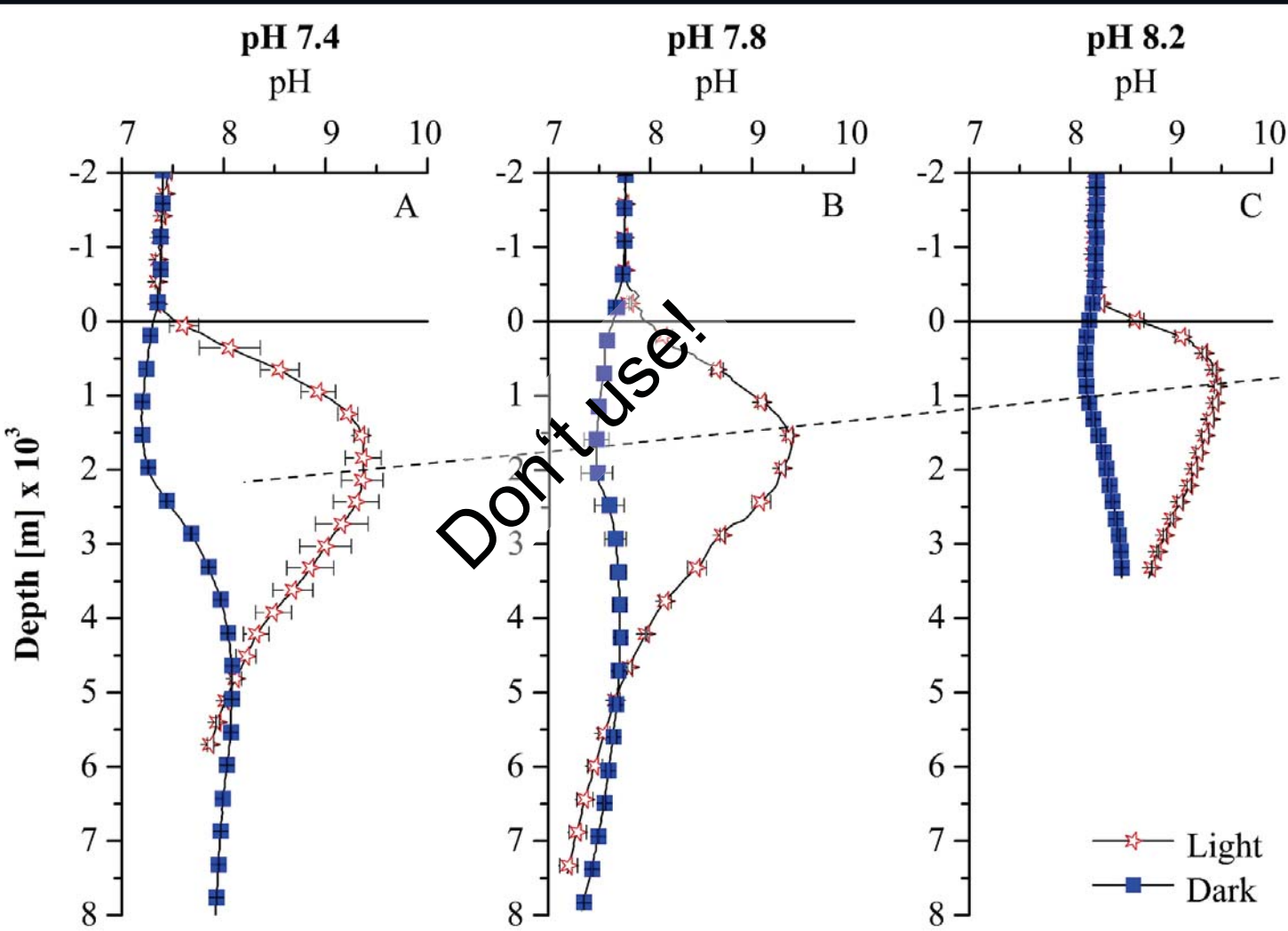
- on calcification?

- ...



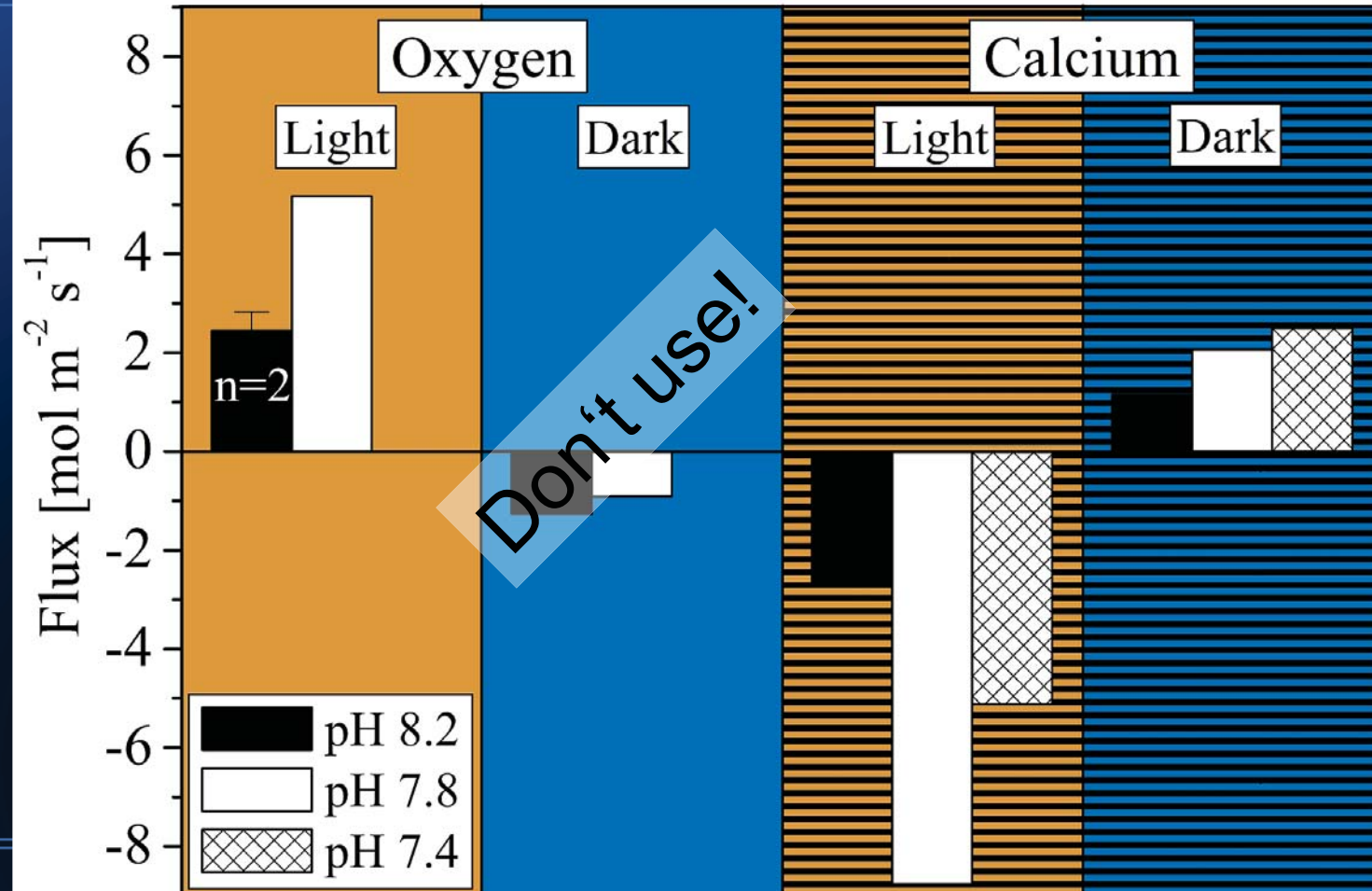
# Results

## pH Microsensor measurements



# Results

calculated fluxes



# Summary

- pH peak in light always around 9.5
- Photosynthesis rate increased with lower seawater pH
- Still net calcification
- Ocean acidification no “negative” effect on microenvironment (short term)



# Aknowledgements

Thanks to

- TA's of the microsensor group
- Tim Cooper (Australian Institute of Marine Science)
- Hakhyun Nam and Byeong Hyo Kim  
(Kwangwoon University, Korea)

# References

- Feely, R. A., Sabine, C. L., Takahashi, T. And Wanninkhof, R. 2001. Uptake and storage of carbon dioxide in the ocean: The global CO<sub>2</sub> survey. *Oceanography* **14**: 18 – 32.
- Schoon, R.; Bissett, A. & de Beer, D. Resilience of pore-water chemistry and calcification in photosynthetic zones of calcifying sediments *Limnology and Oceanography*, 2010, 55, 377 - 385.
- Zeebe, R. E. and Wolf-Gladrow, D. 2001. CO<sub>2</sub> in seawater: Equilibrium, kinetics, isotopes. Elsevier *Oceanography Series*.