

Small organisms with a large climate footprint: the production of DMS by phytoplankton and bacteria

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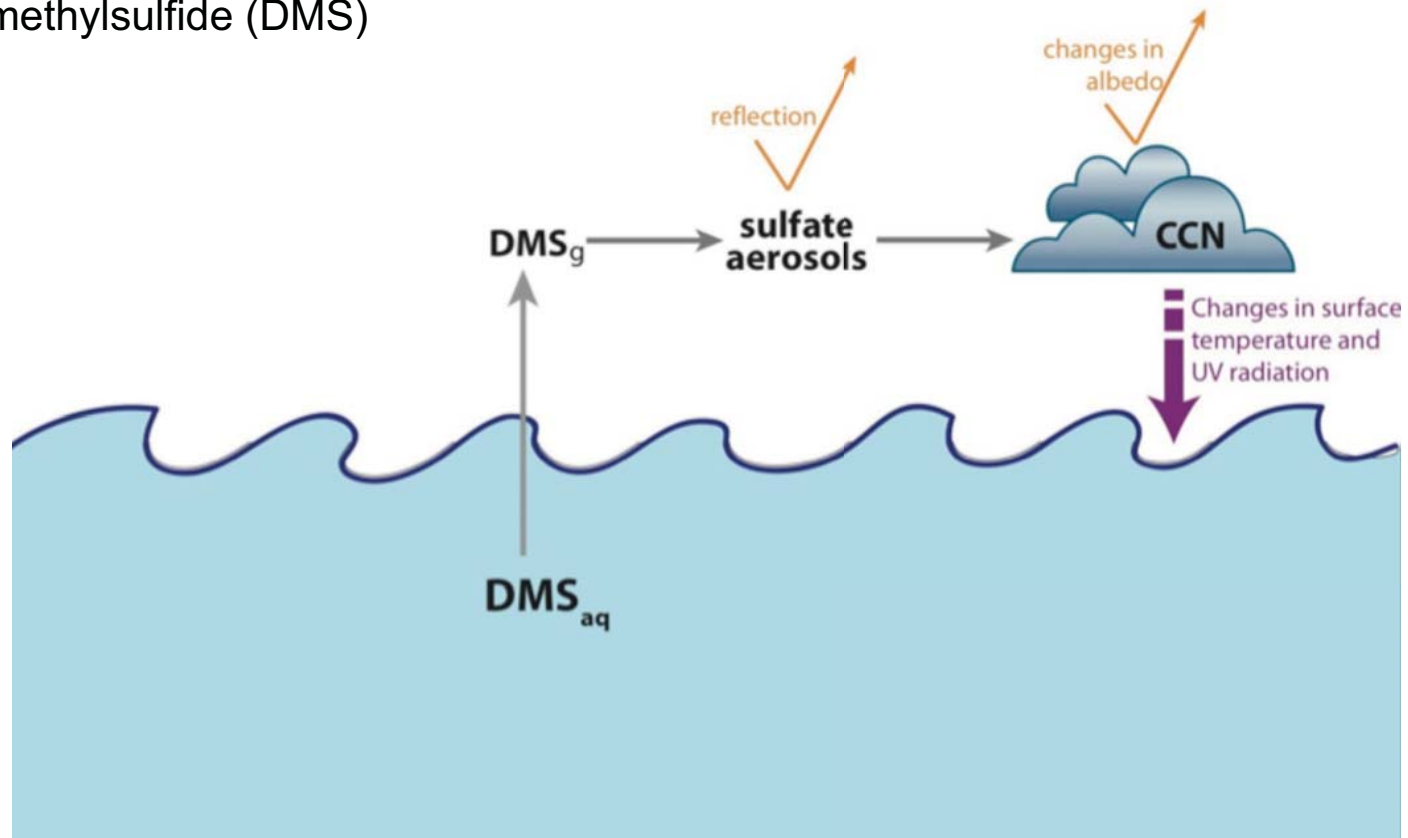
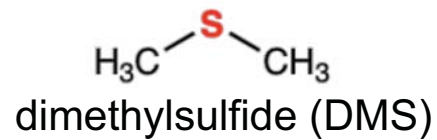
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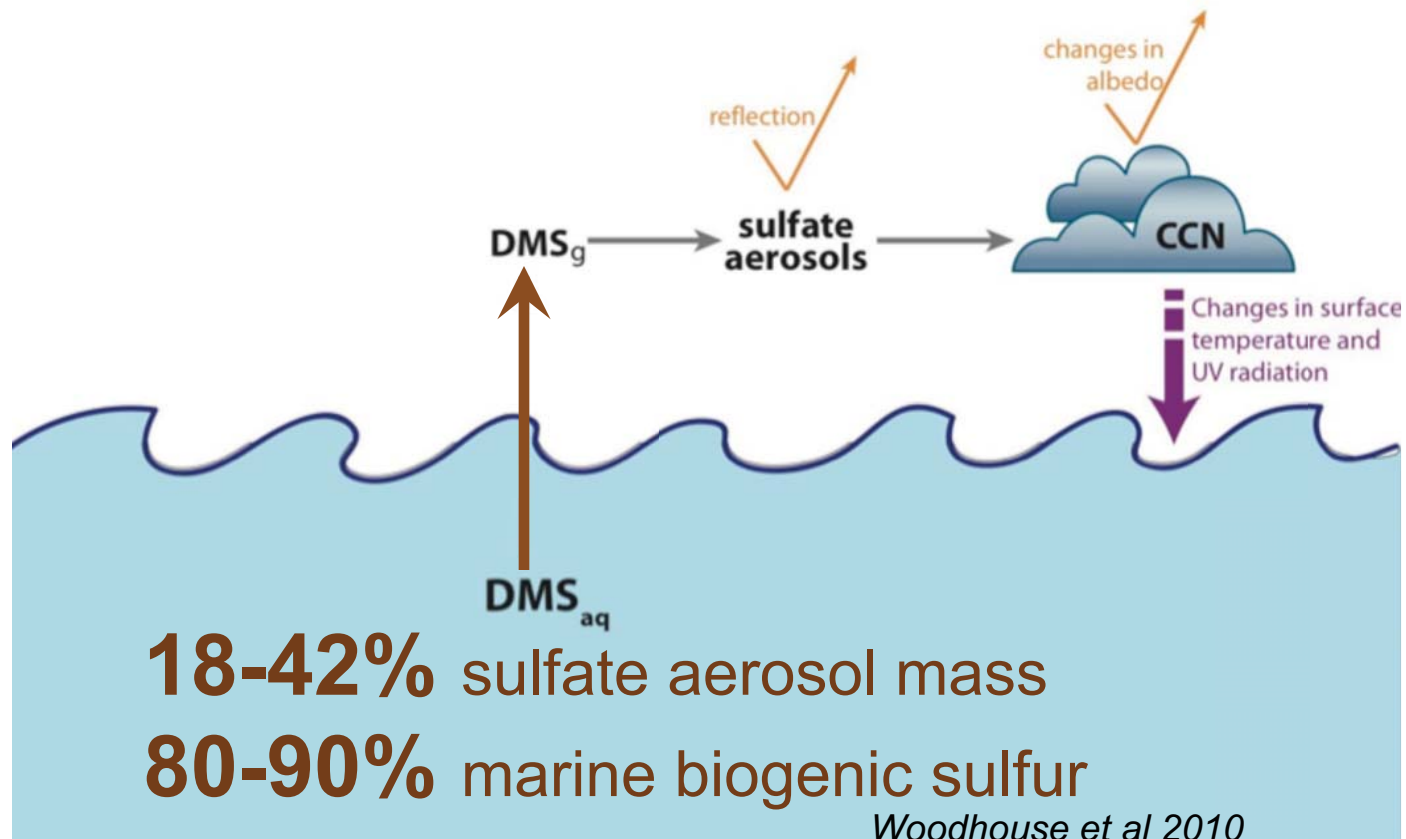
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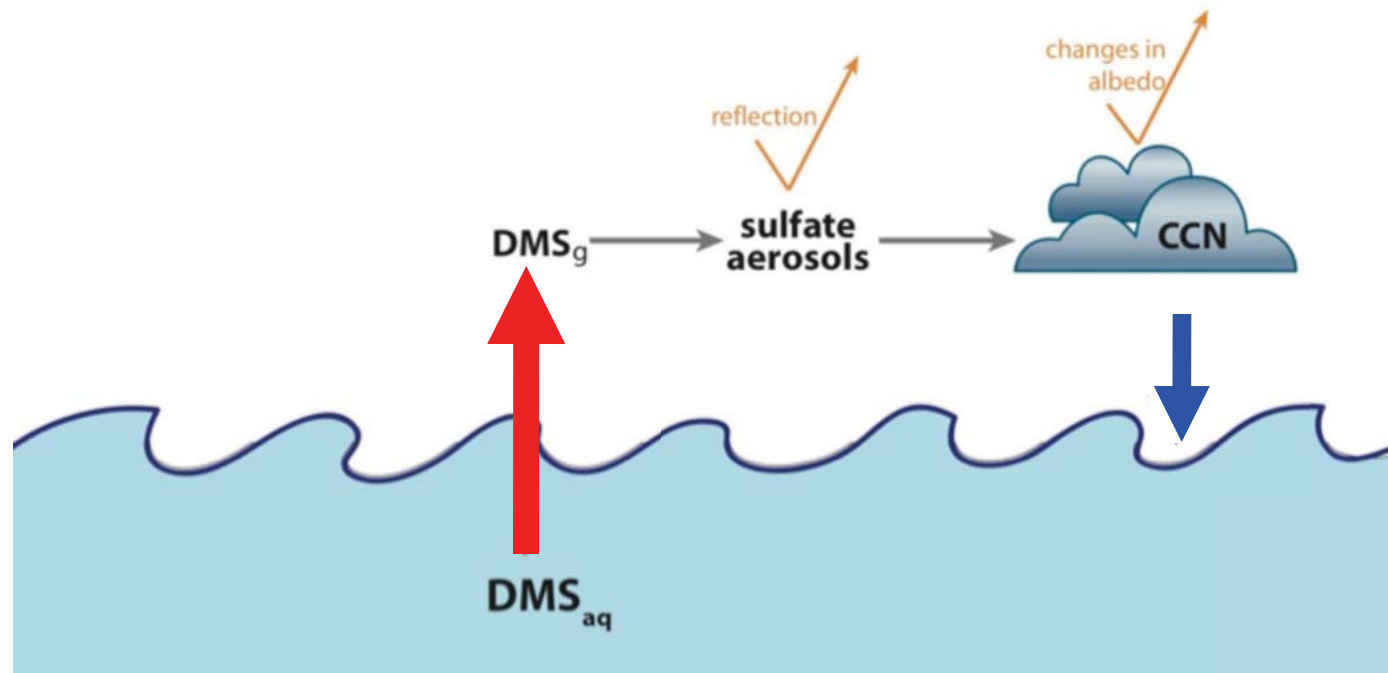
Dimethylsulfide (DMS)



DMS is important source of sulfate aerosols



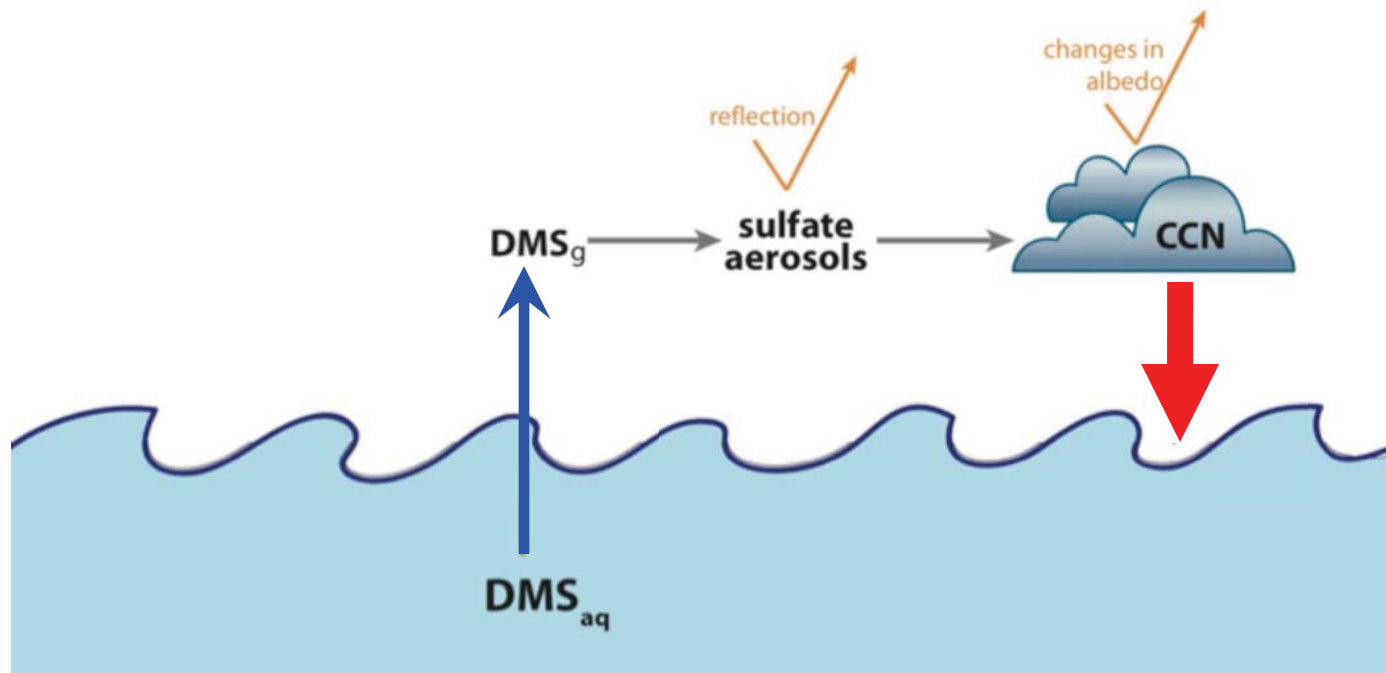
Model predictions ranges from:



14% increase in DMS (*11% offset in warming*)

Gabric et al 2004

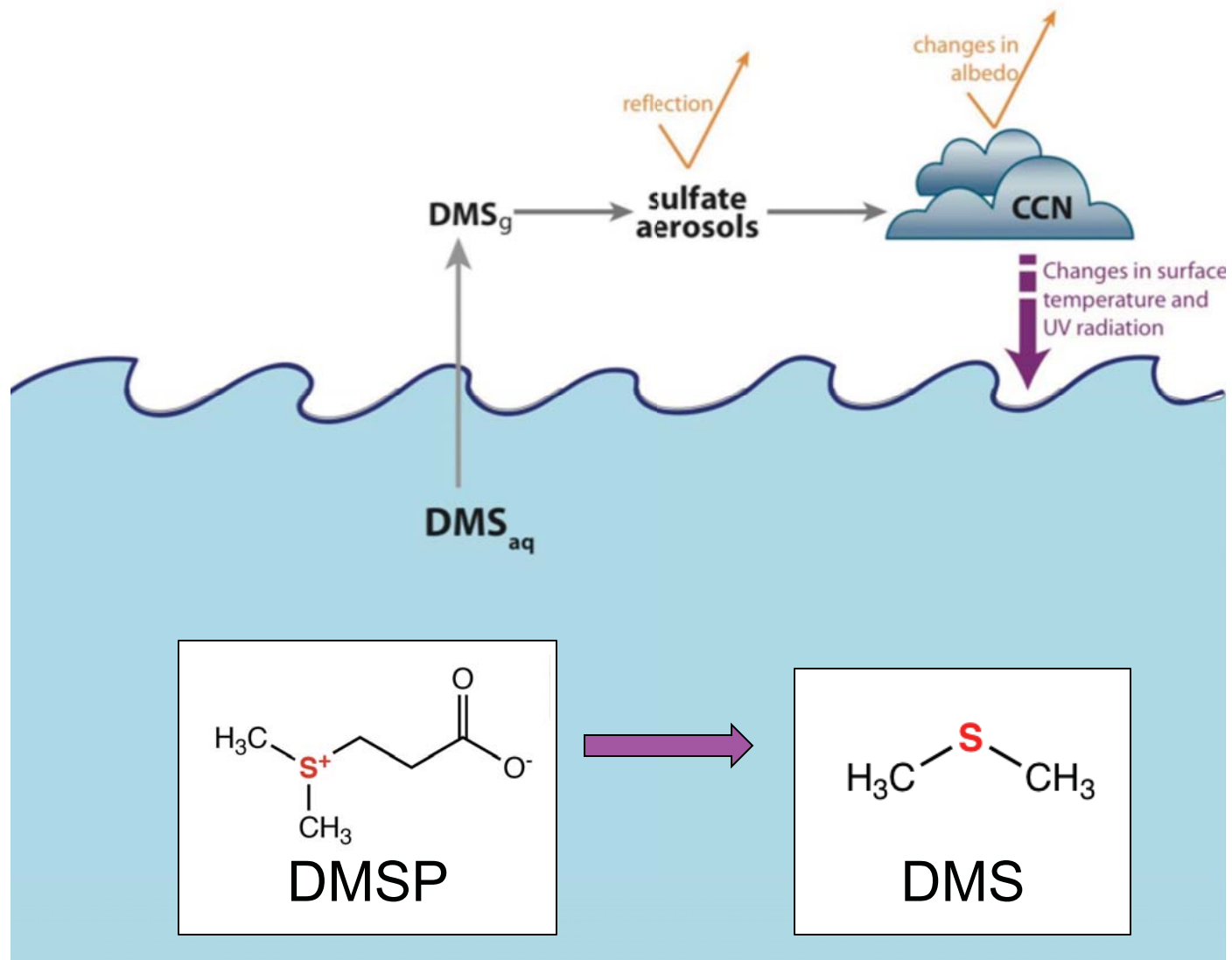
Model predictions ranges from:



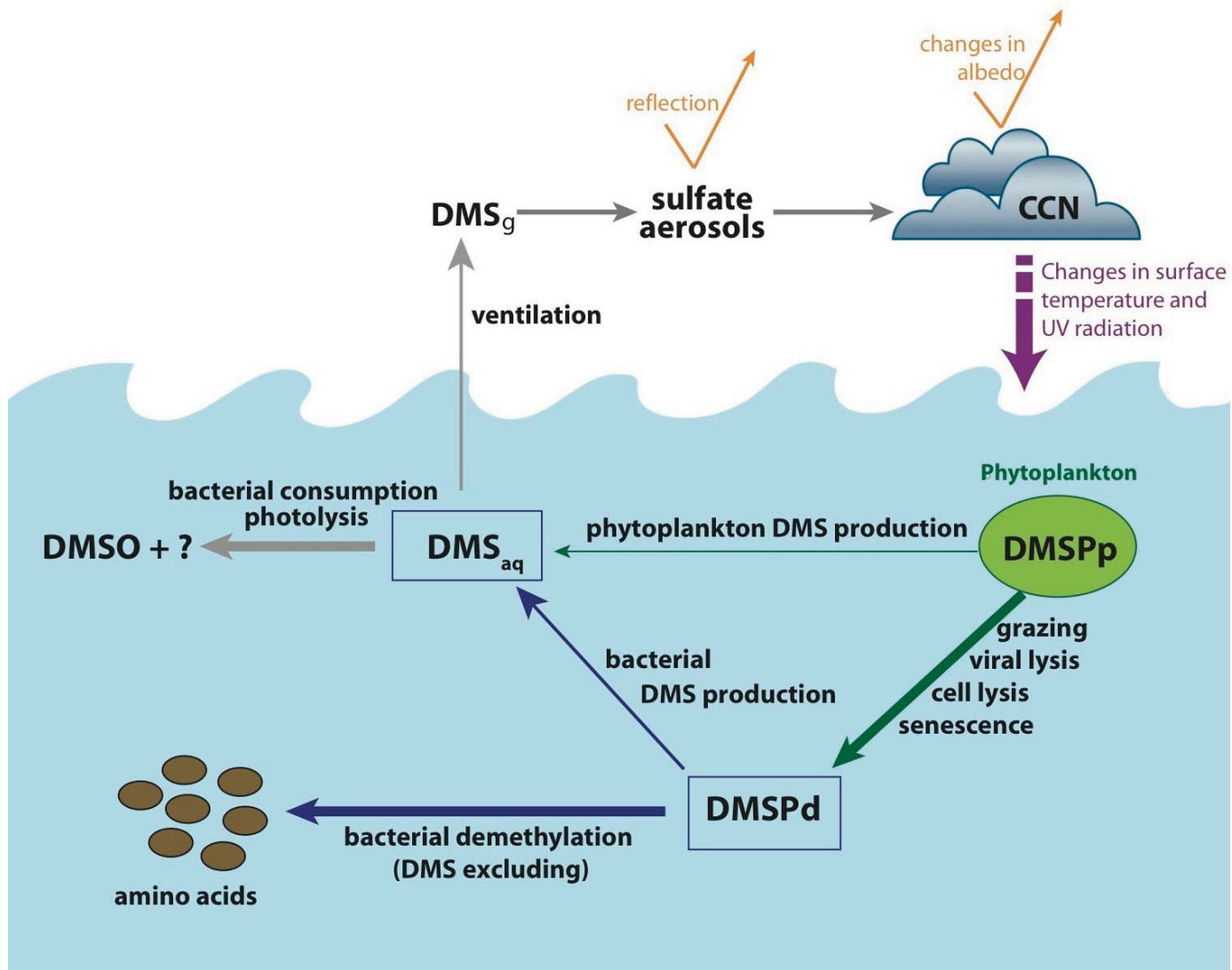
10% decrease in DMS (*17% increase in warming*)

Kloster et al. 2007

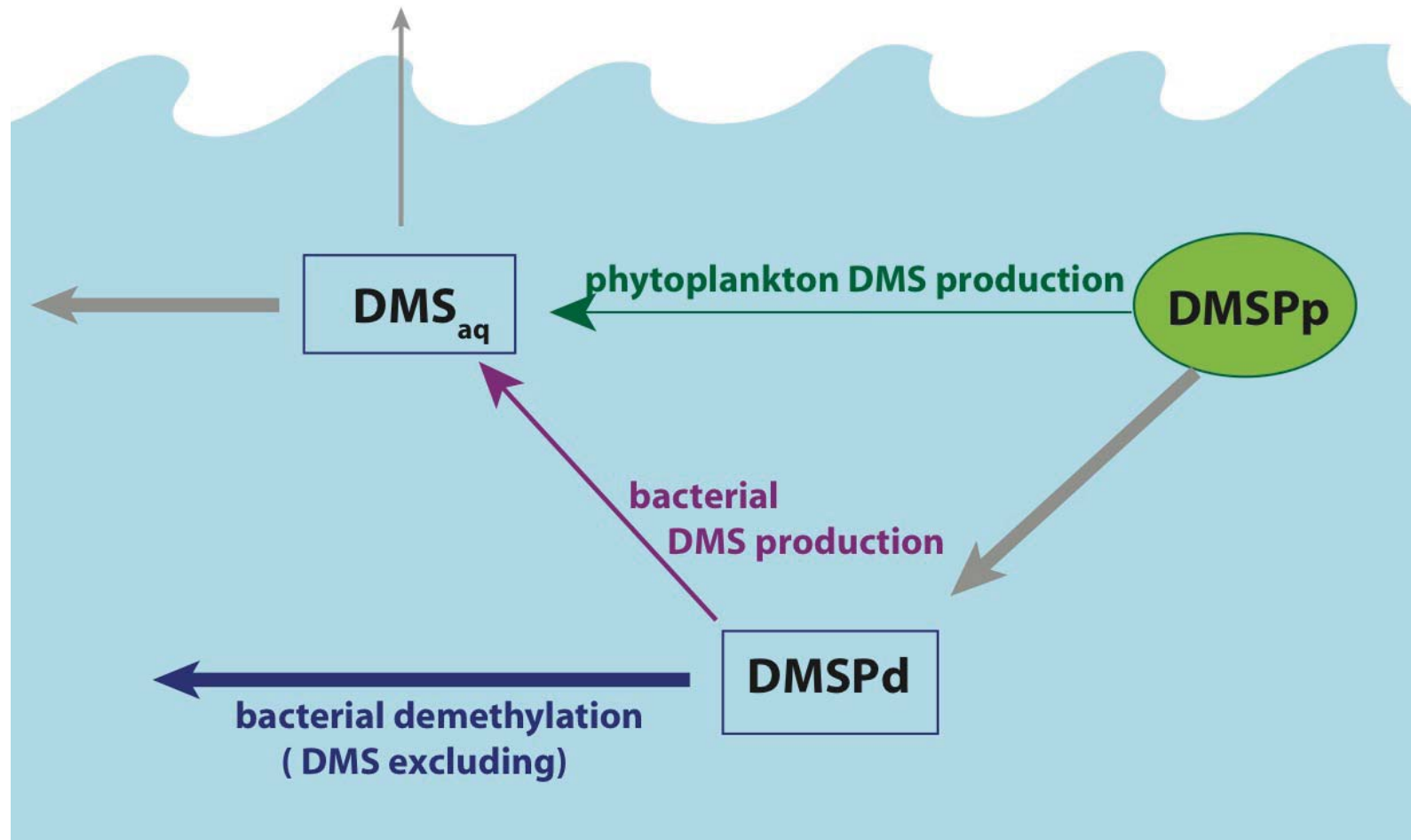
HOW is DMS produced?



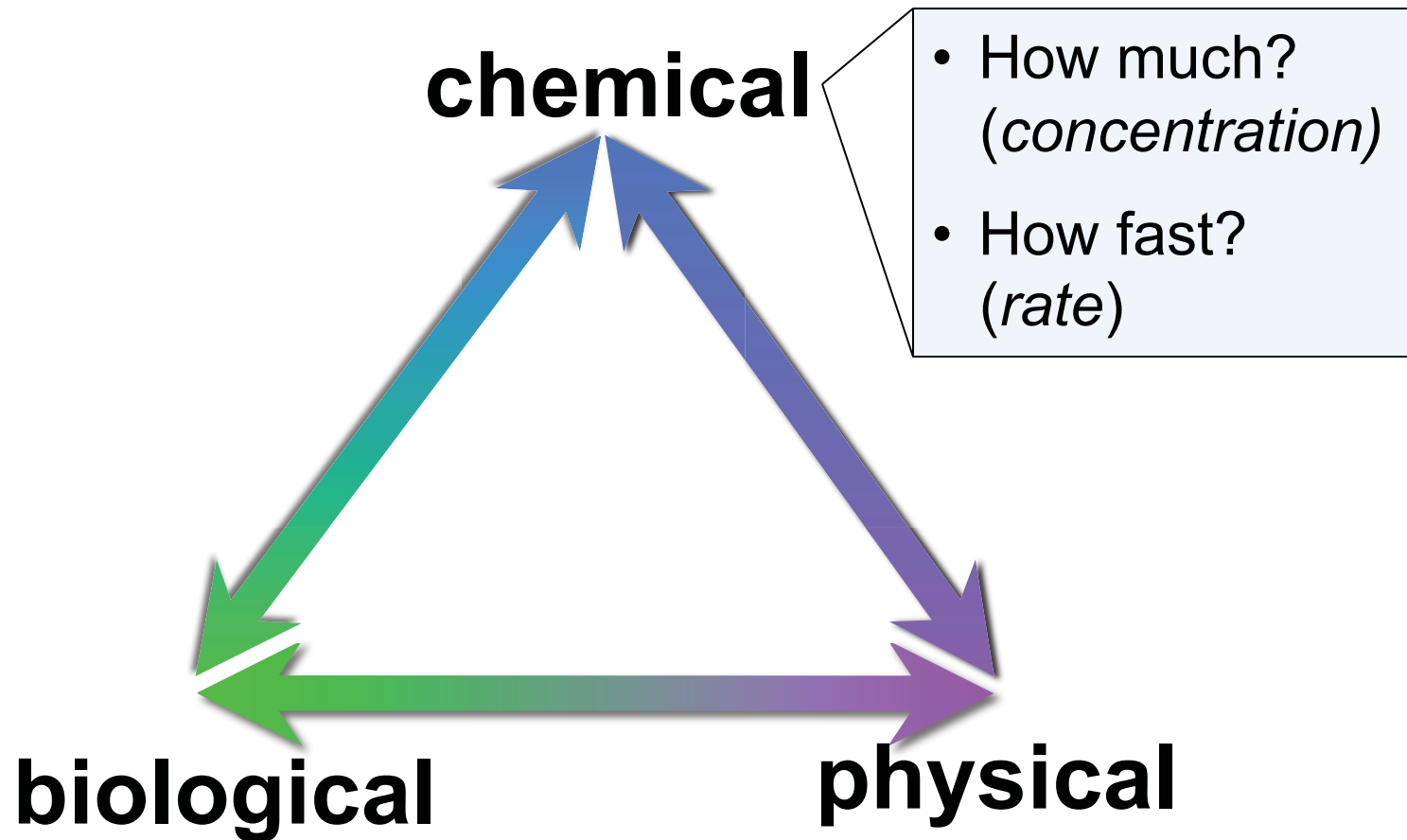
HOW is DMS produced?



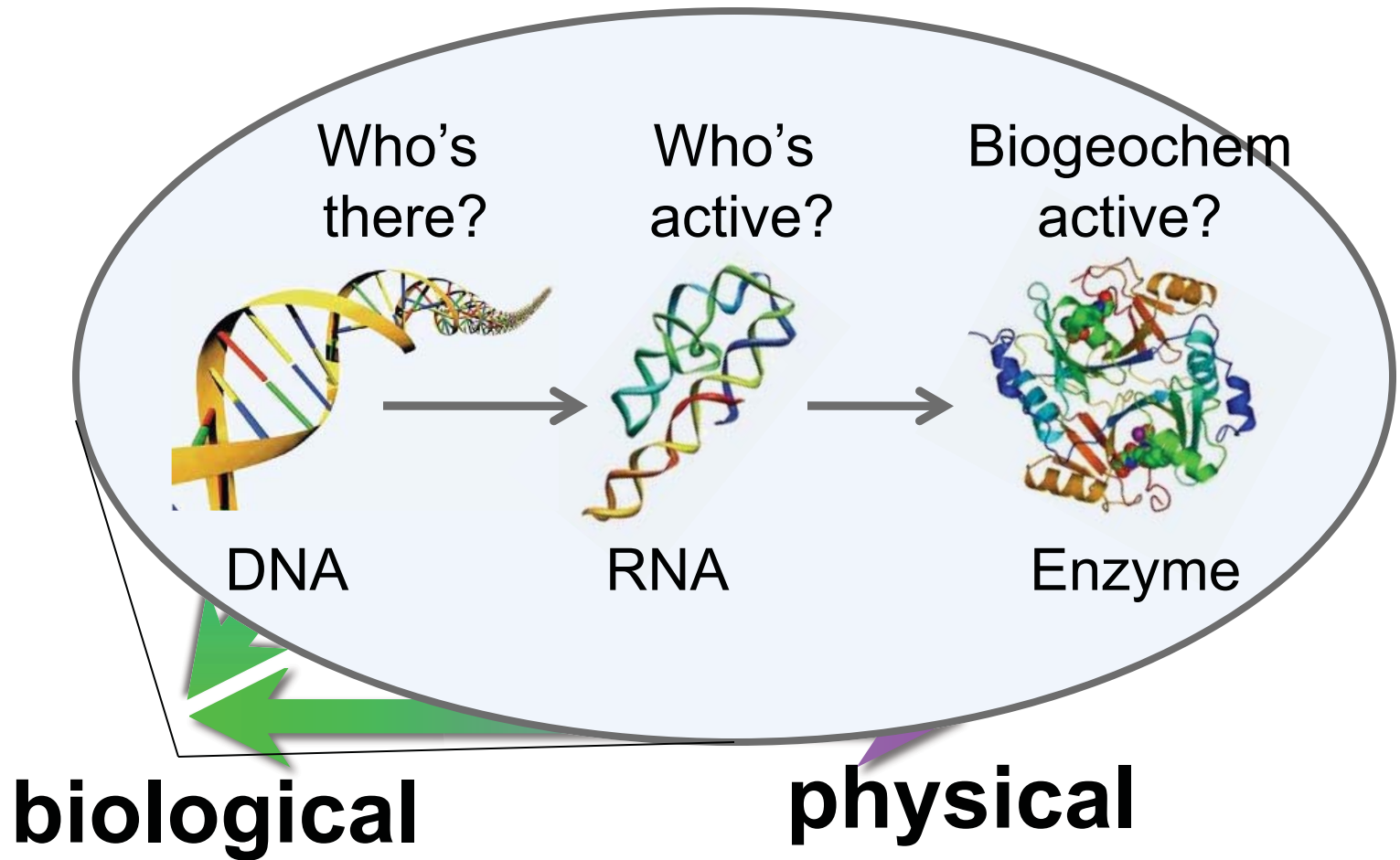
WHEN and WHY is DMS produced?



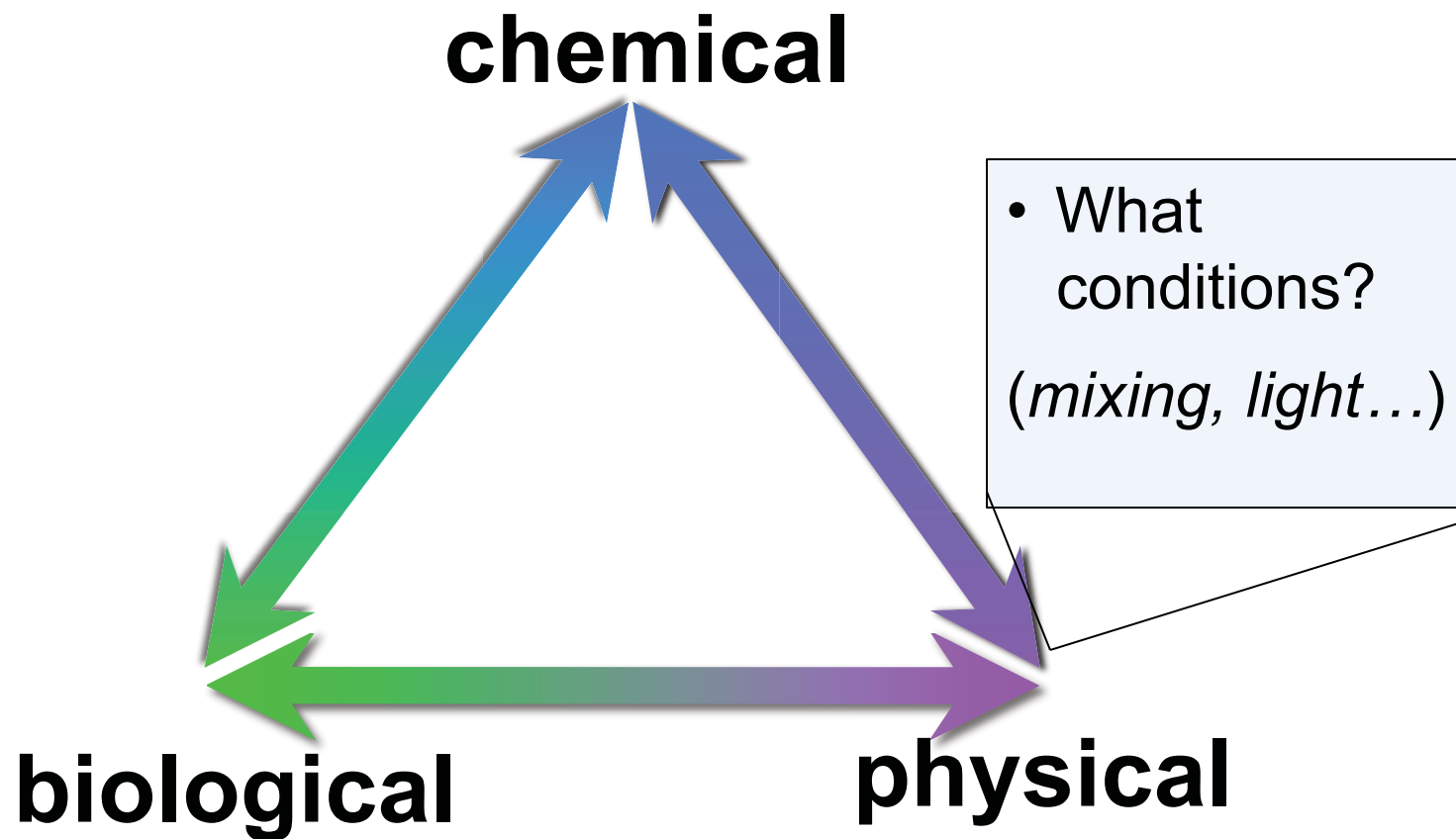
Interdisciplinary Approach



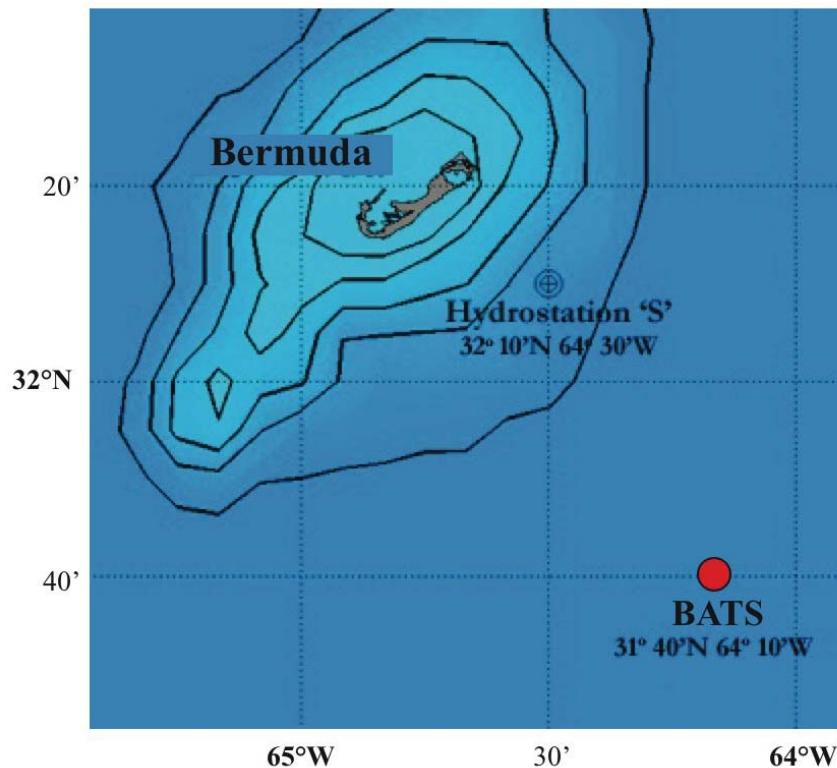
Interdisciplinary Approach



Interdisciplinary Approach

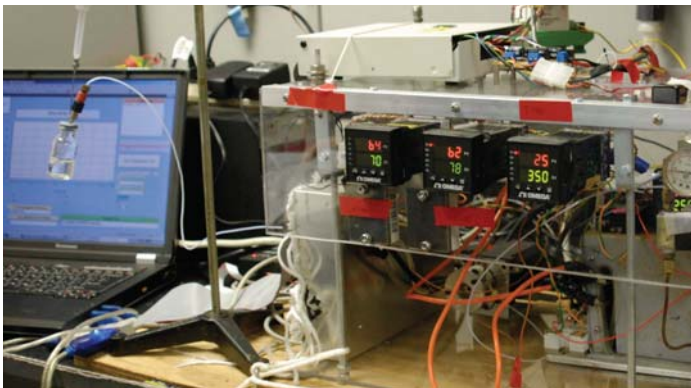


Bermuda Atlantic Time-series Study (BATS) site

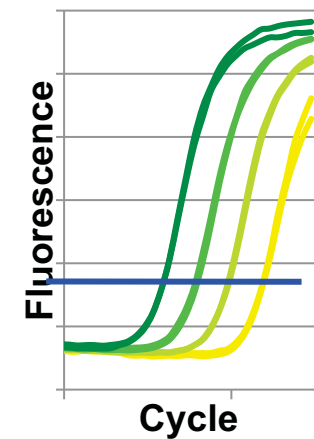


Bermuda Atlantic Time-series Study (BATS) site

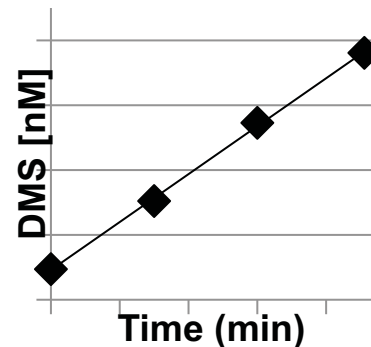
Concentration



Gene Abundance & Expression



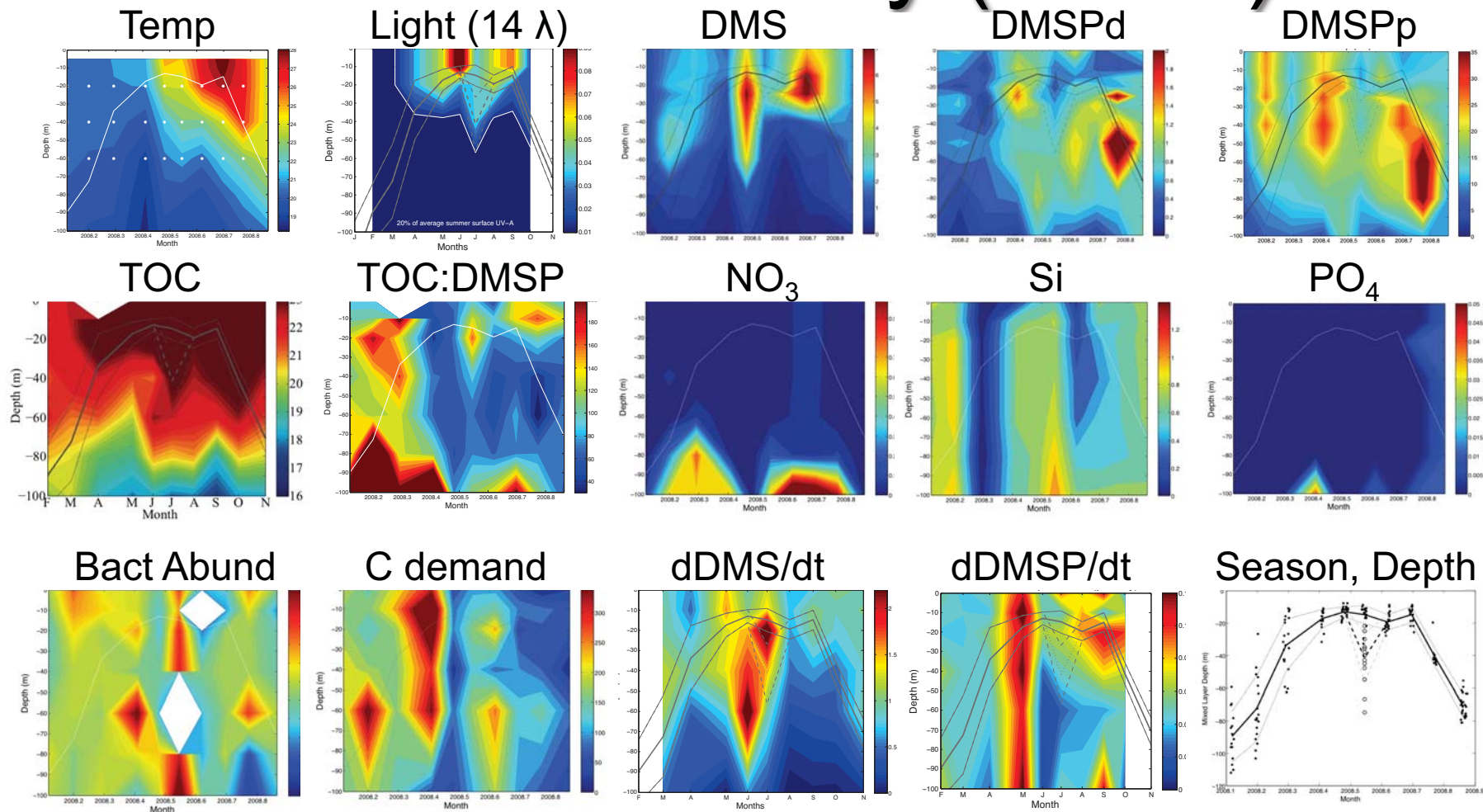
Enzyme Activity



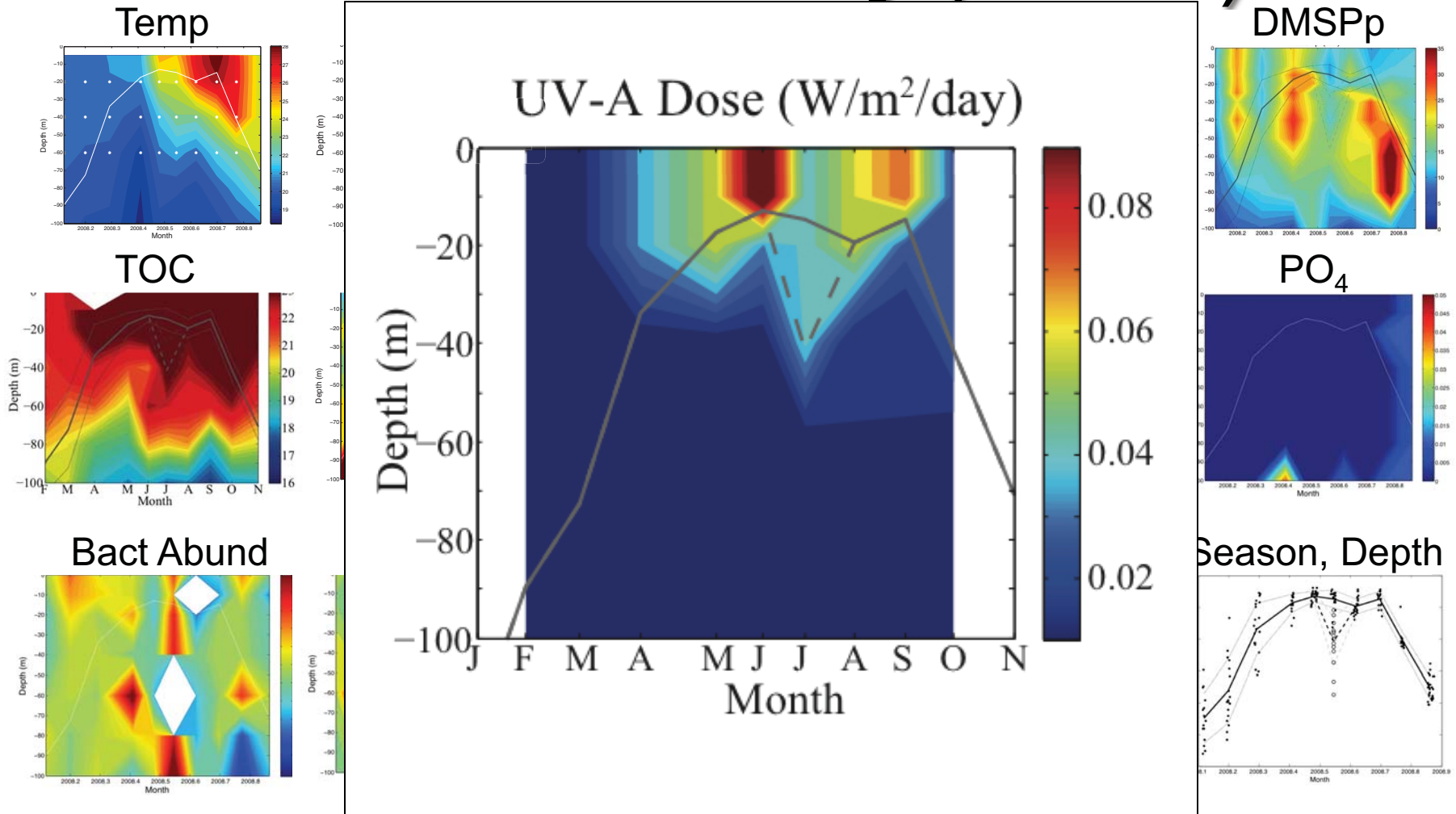
Consumption Rate



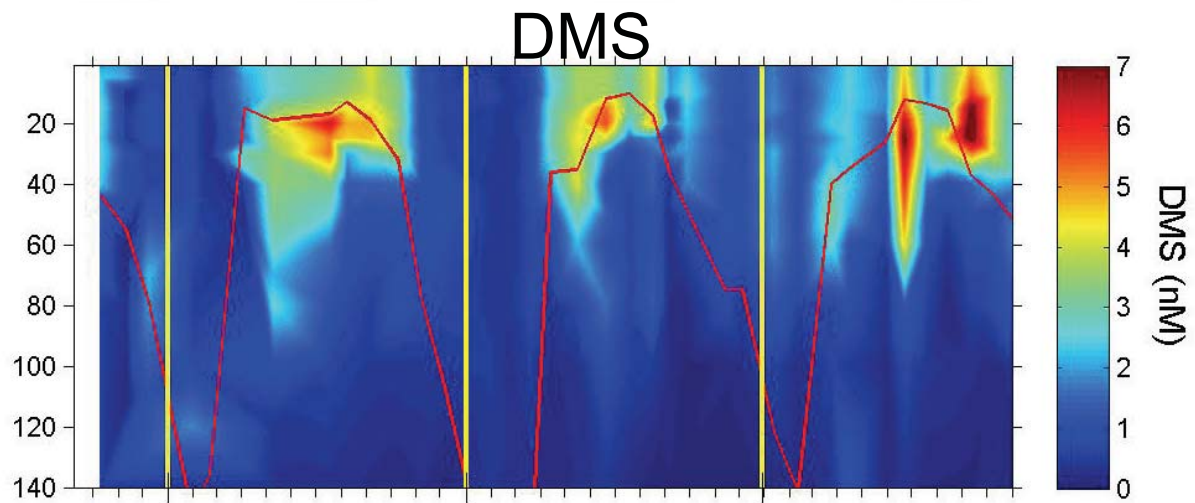
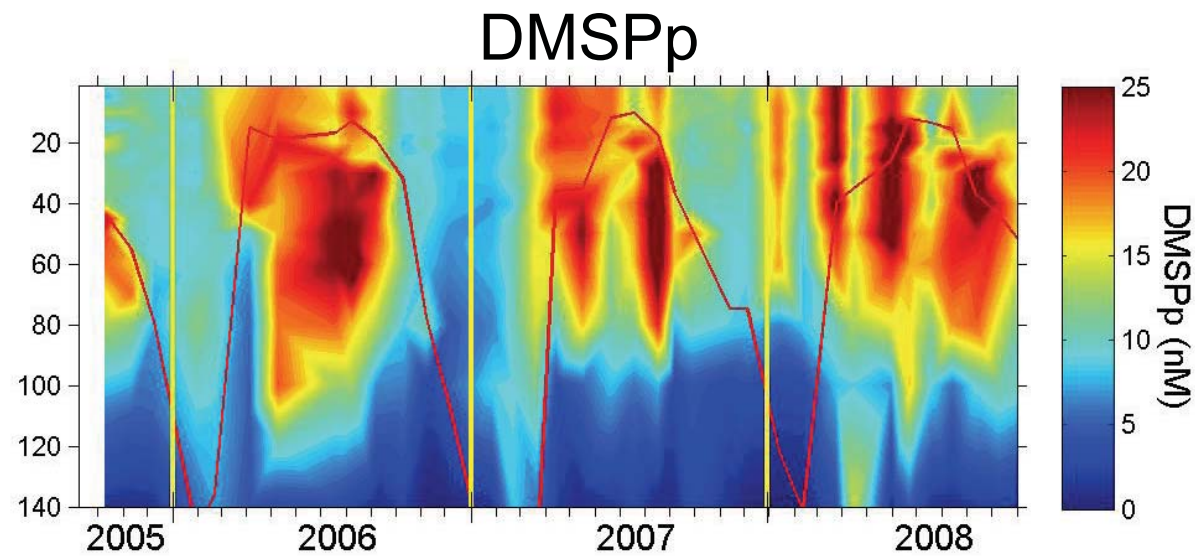
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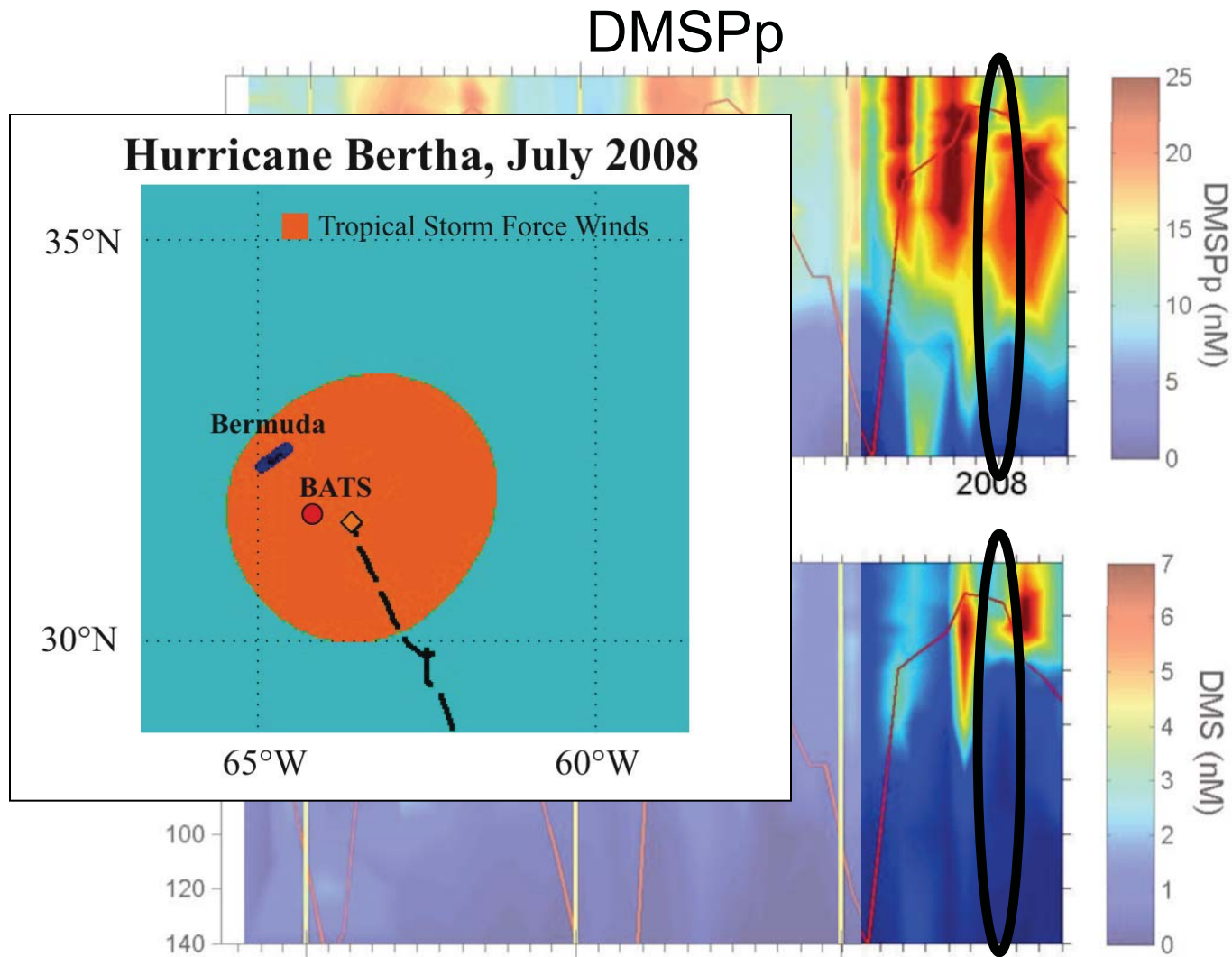


Seasonal Variations in DMS



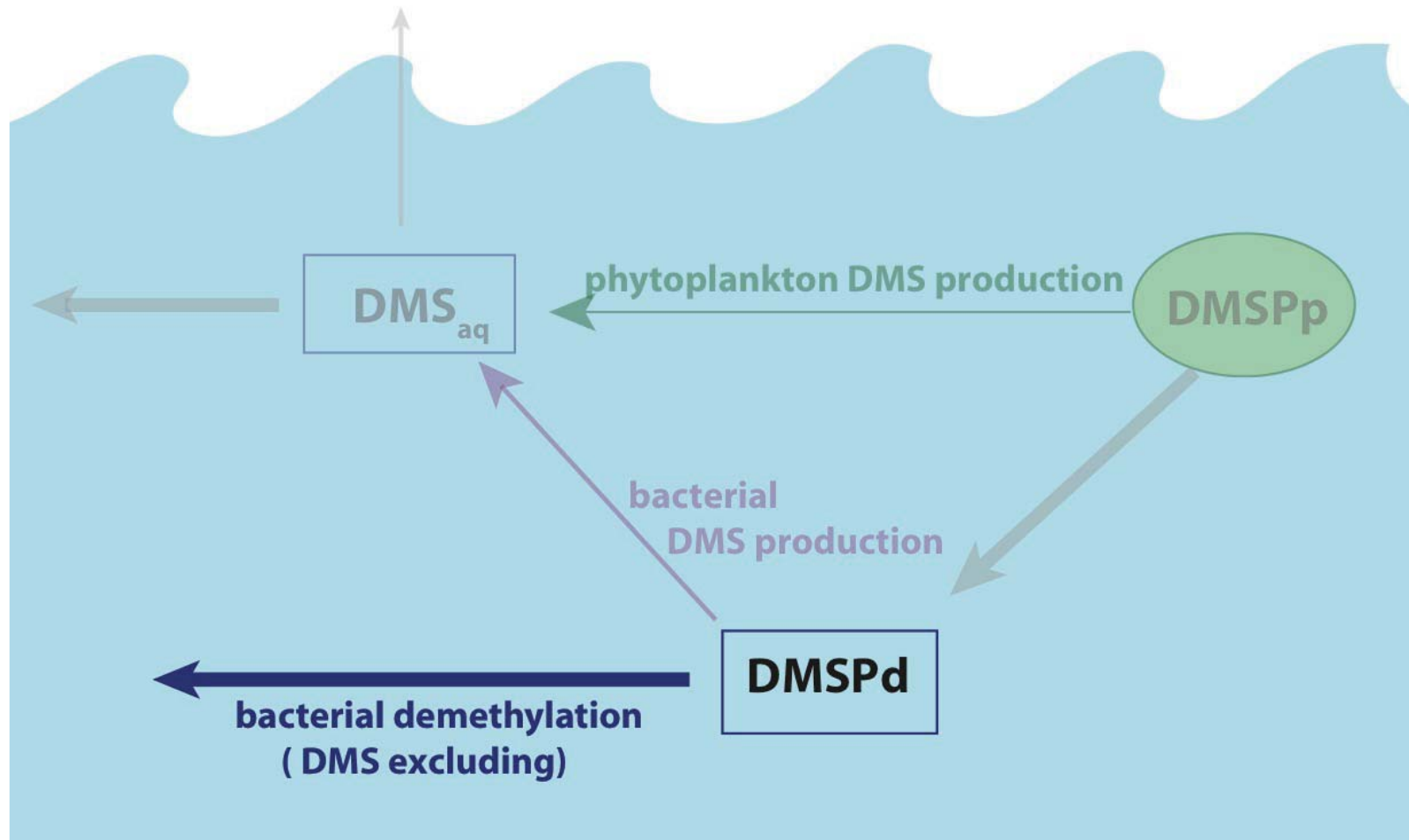
Toole et al. in prep

Seasonal Variations in DMS

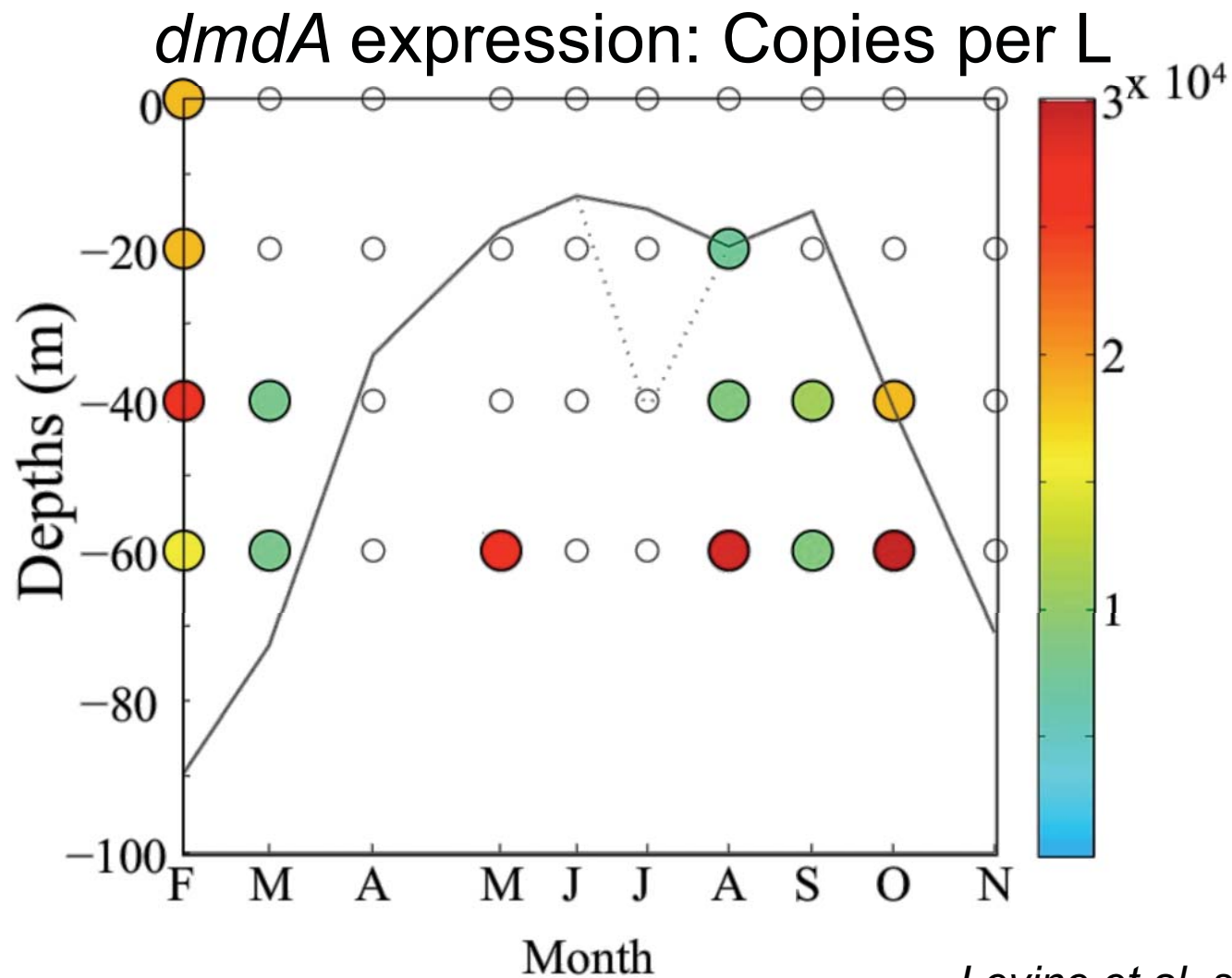


Toole et al. in prep

WHEN and WHY is DMS produced?

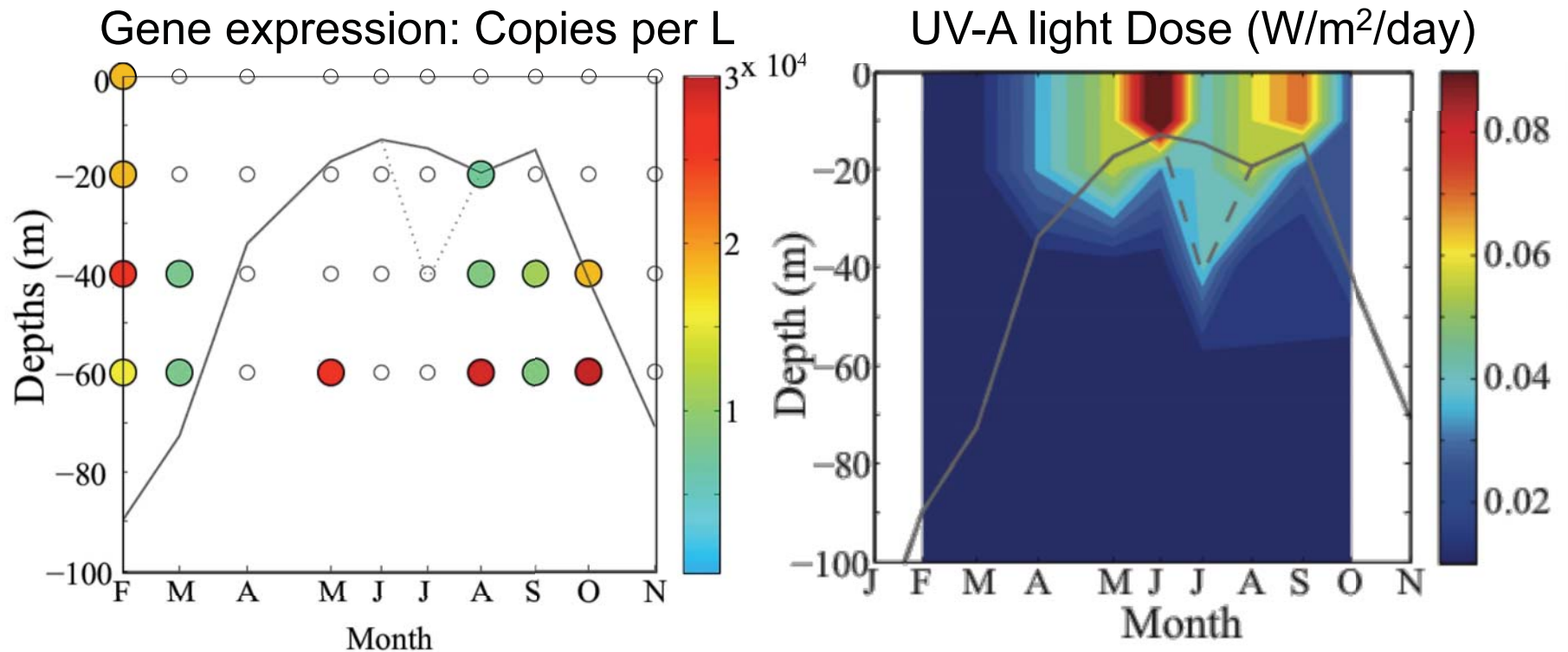


DMS Excluding Gene Expression



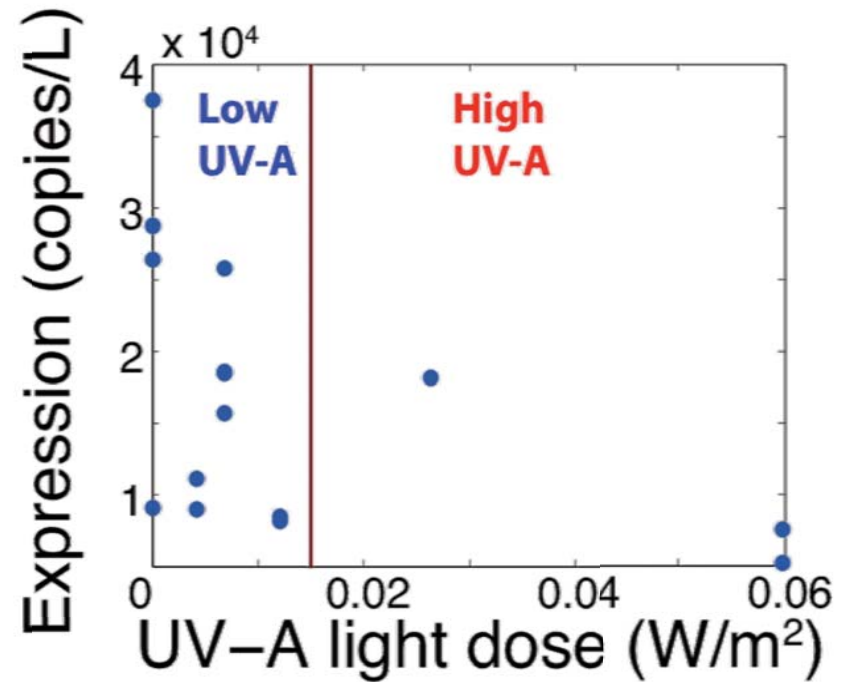
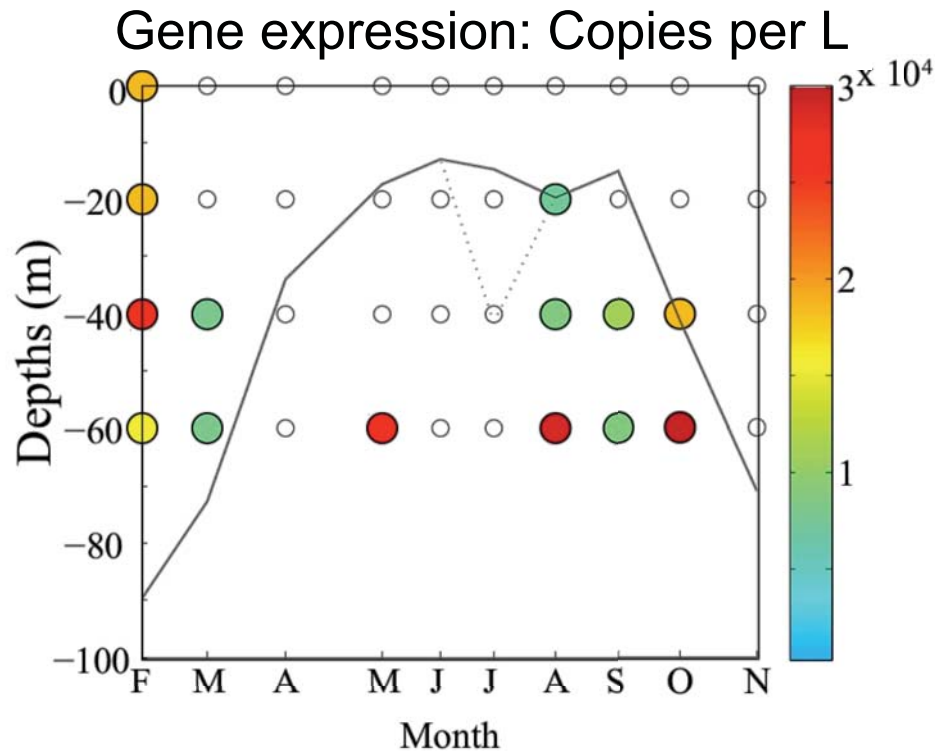
Levine et al. submitted

DMS Excluding Gene Expression



Levine et al. submitted

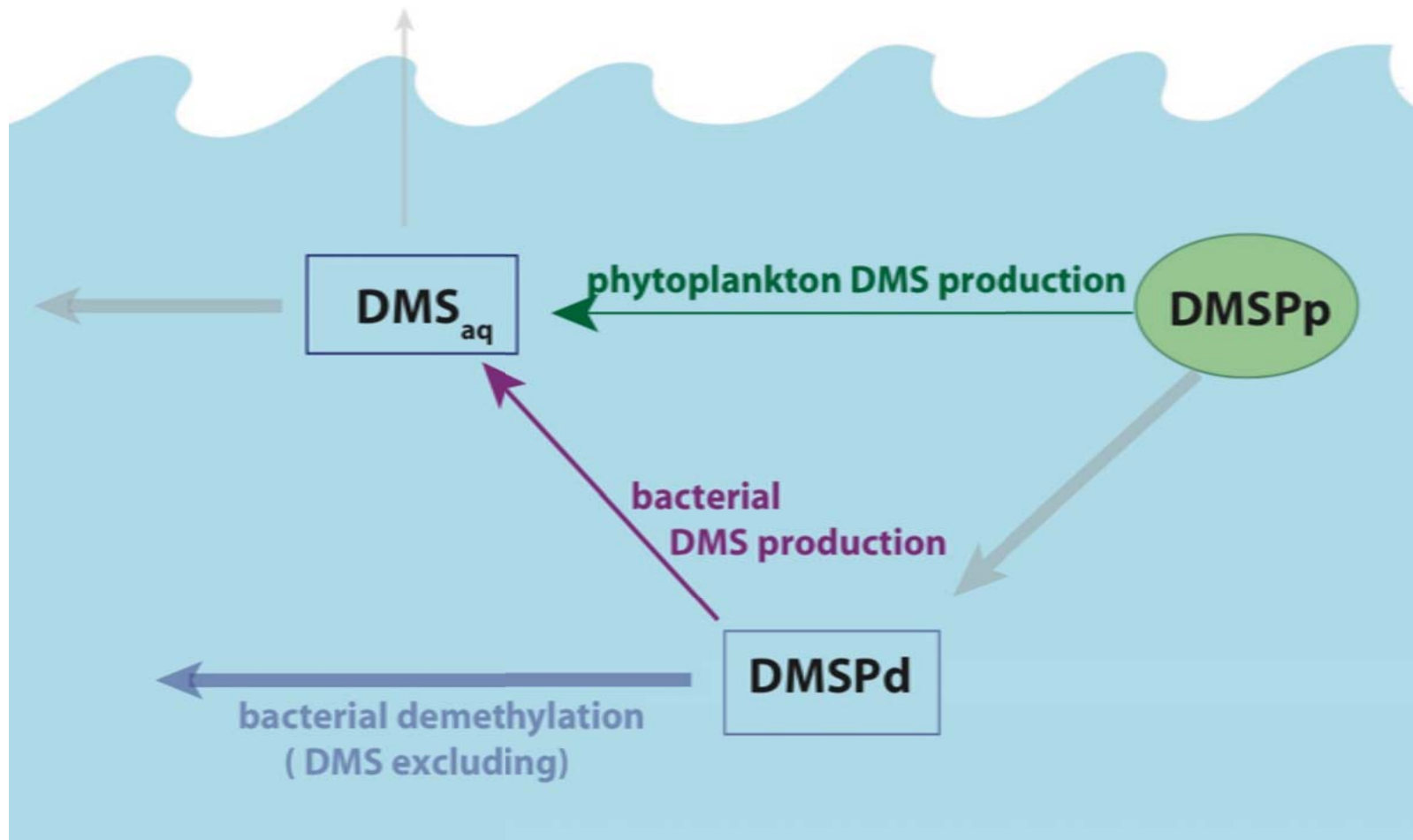
DMS Excluding Gene Expression



UV-A intolerant
(86% under low UV-A dose)

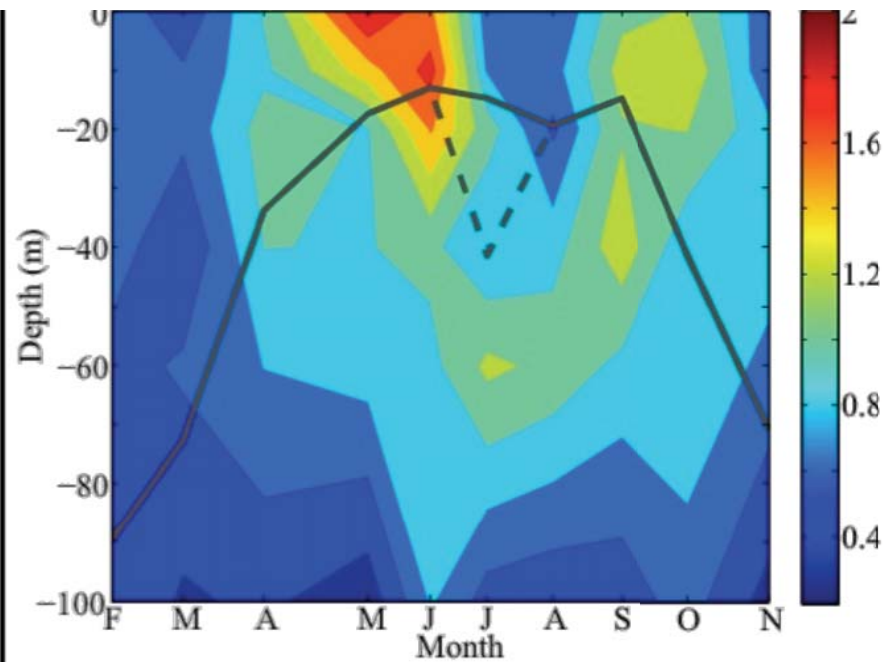
Levine et al. submitted

WHEN and WHY is DMS produced?

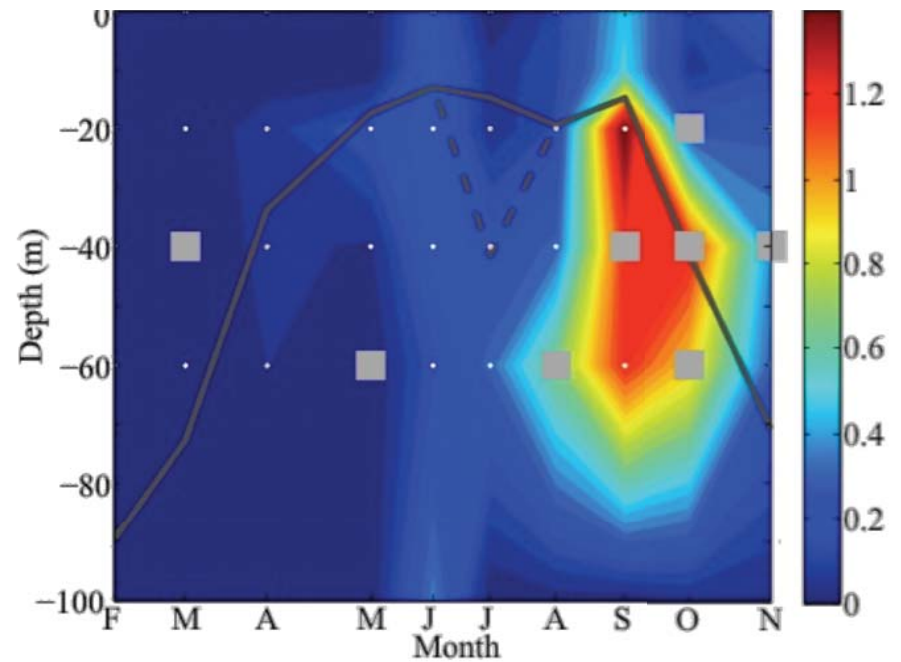


DMS Production

Phytoplankton DMS Producing Enzyme Activity



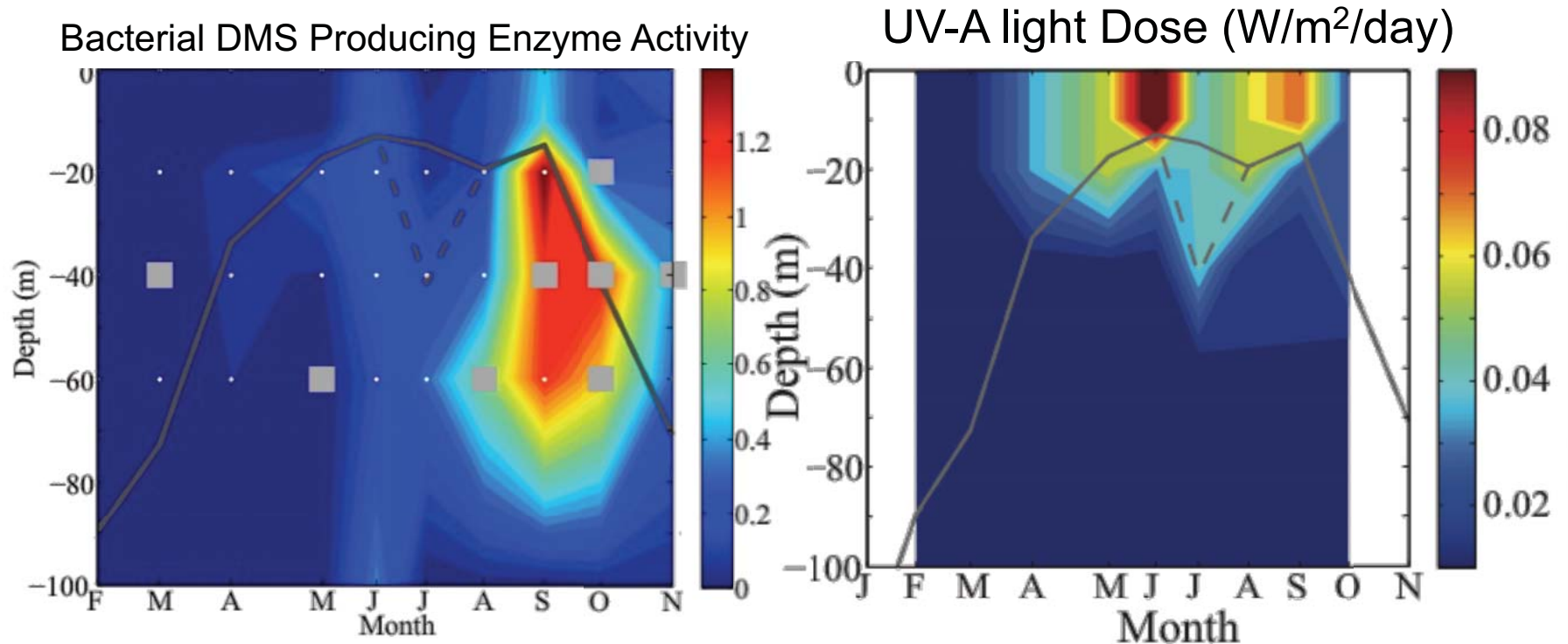
Bacterial DMS Producing Enzyme Activity



□ = *DMS producing gene expression*

Levine et al. submitted

Bacterial DMS Production

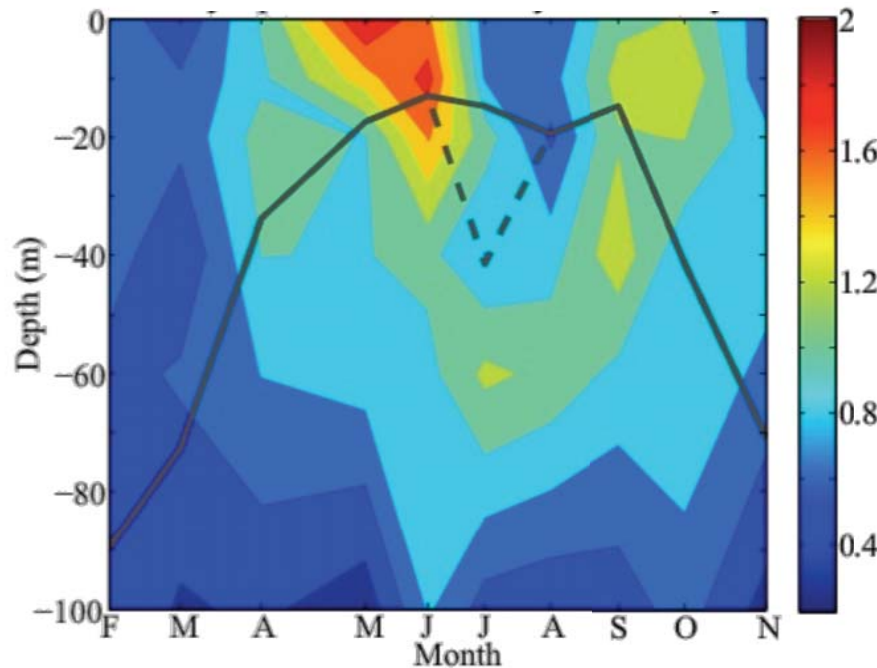


UV-A tolerant
(33% under high UV-A dose)

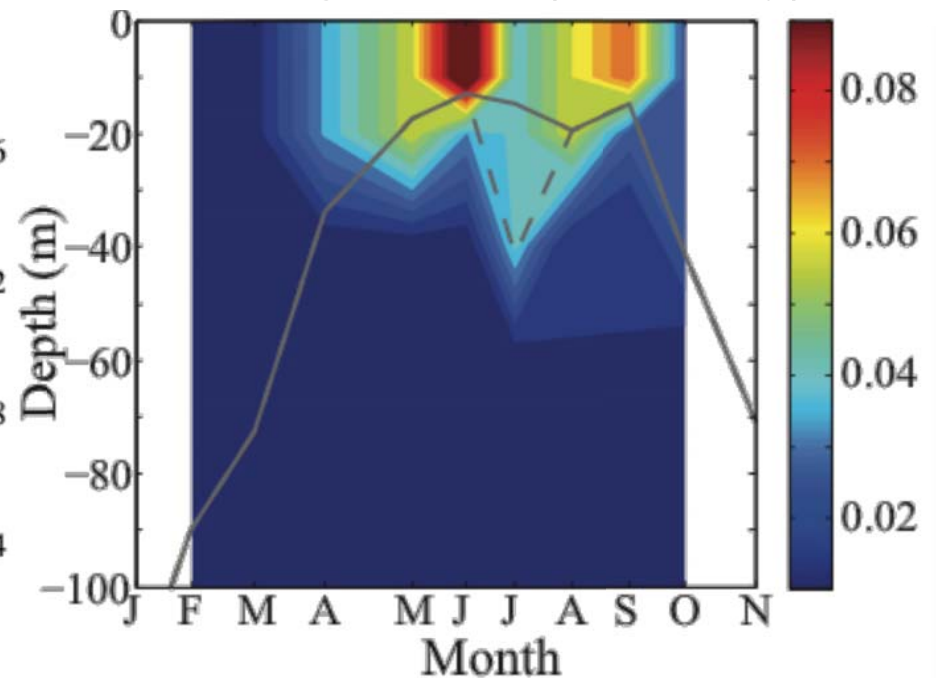
Levine et al. submitted

Phytoplankton DMS Production

Phytoplankton DMS Producing Enzyme Activity



UV-A light Dose (W/m²/day)

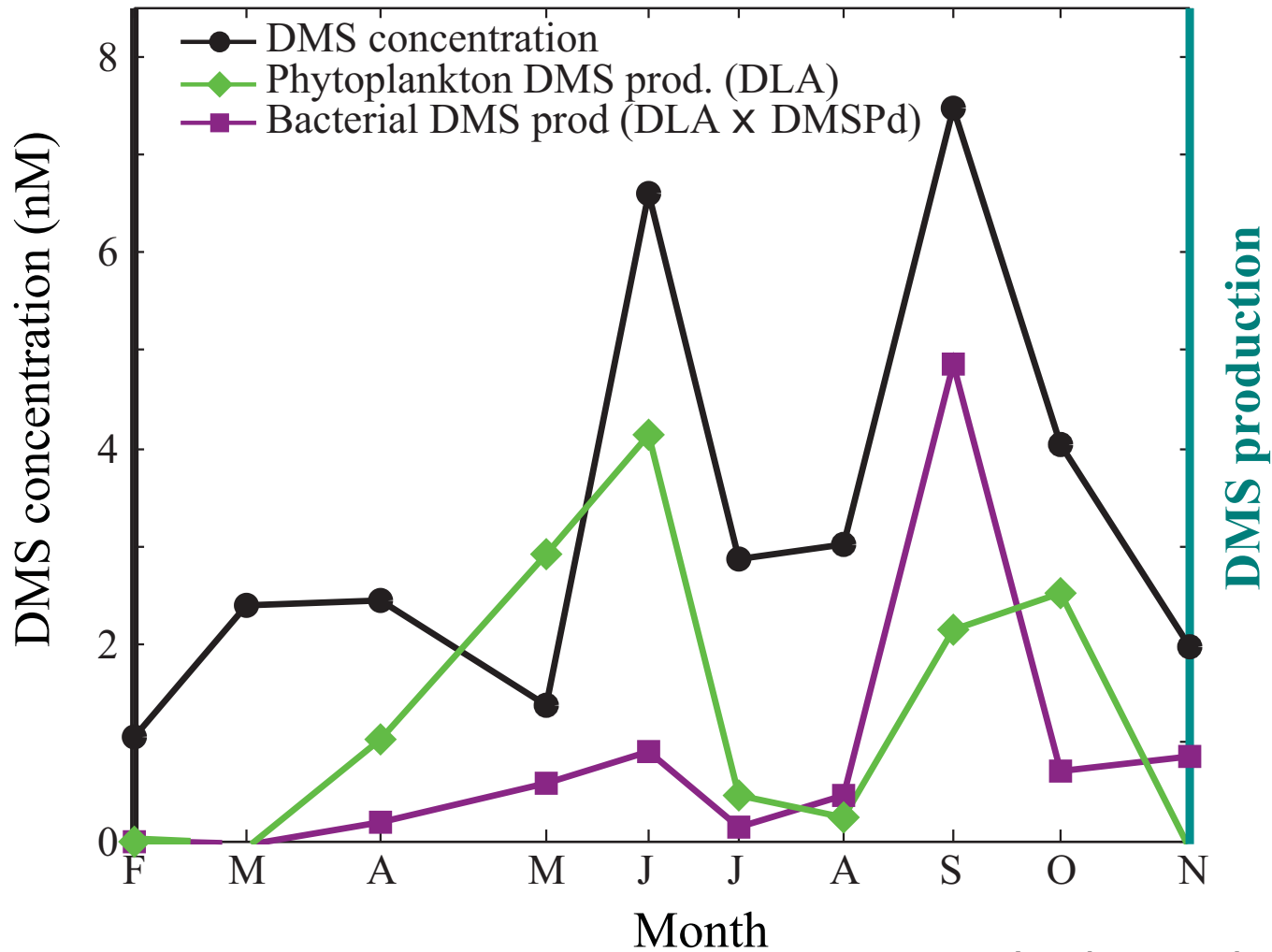


UV-A dependent
(88% under high UV-A dose)

Levine et al. submitted

Estimating DMS Production

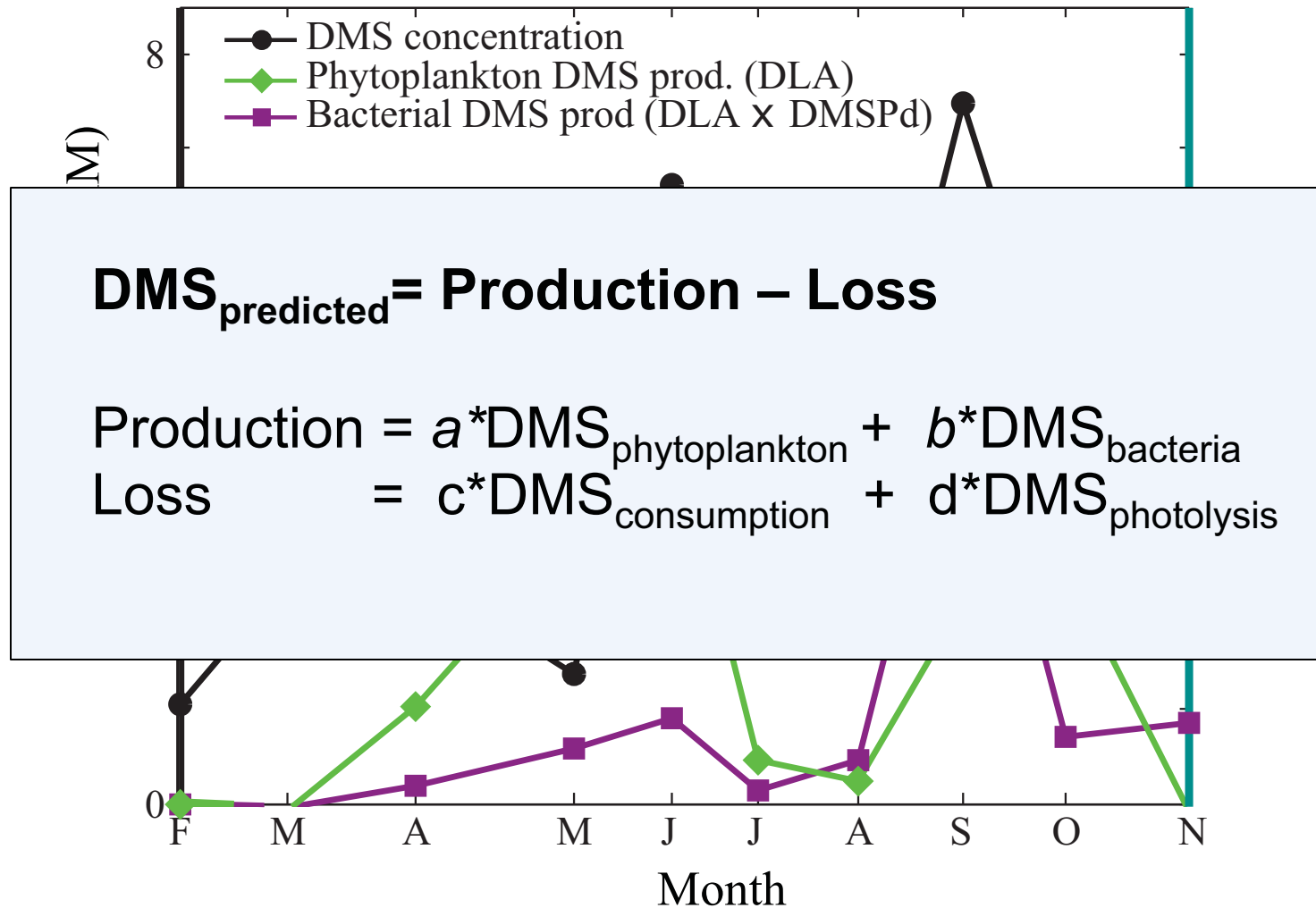
BATS 20m depth



Levine et al. submitted

Estimating DMS Production

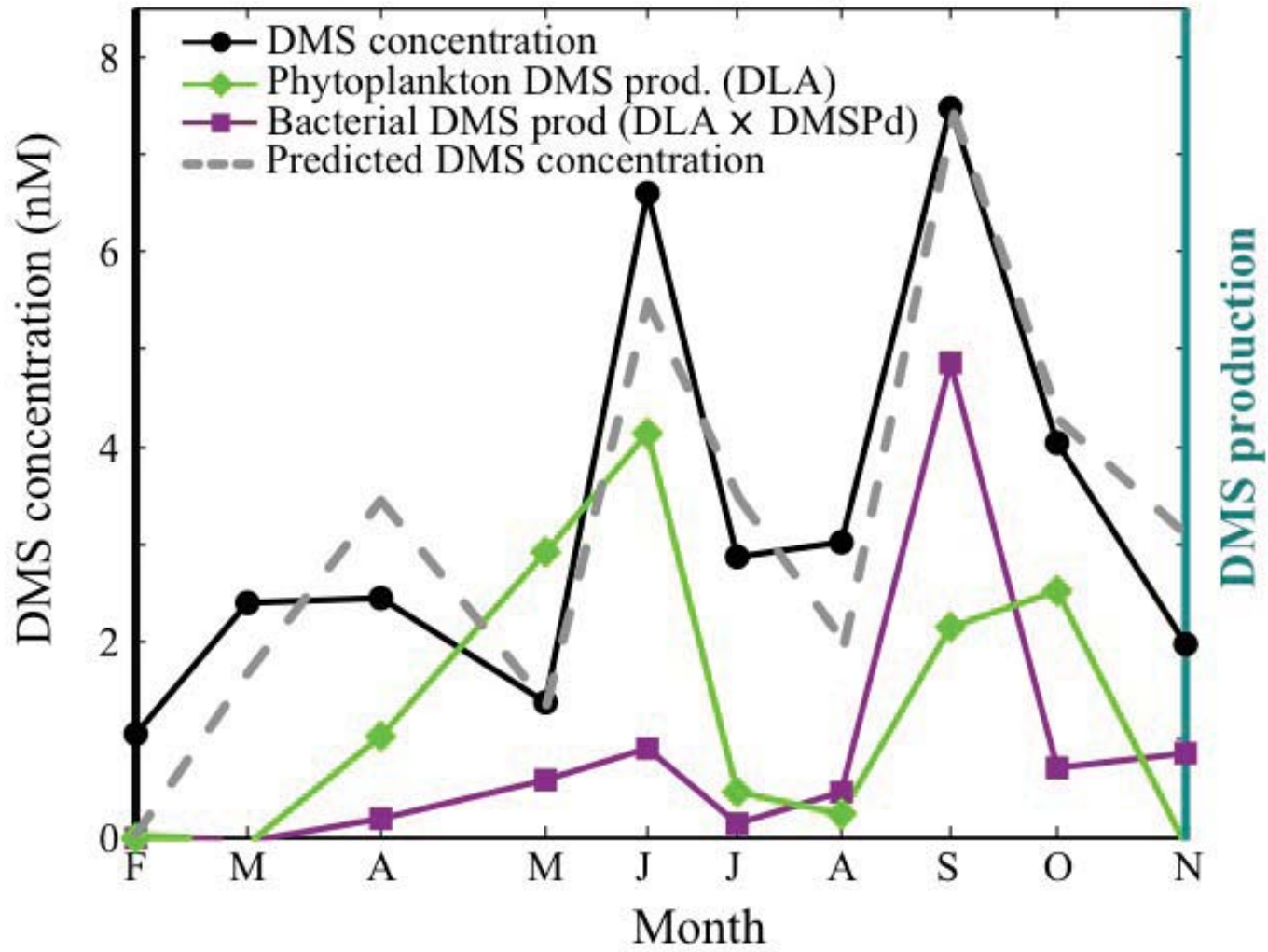
BATS 20m depth



Levine et al. submitted

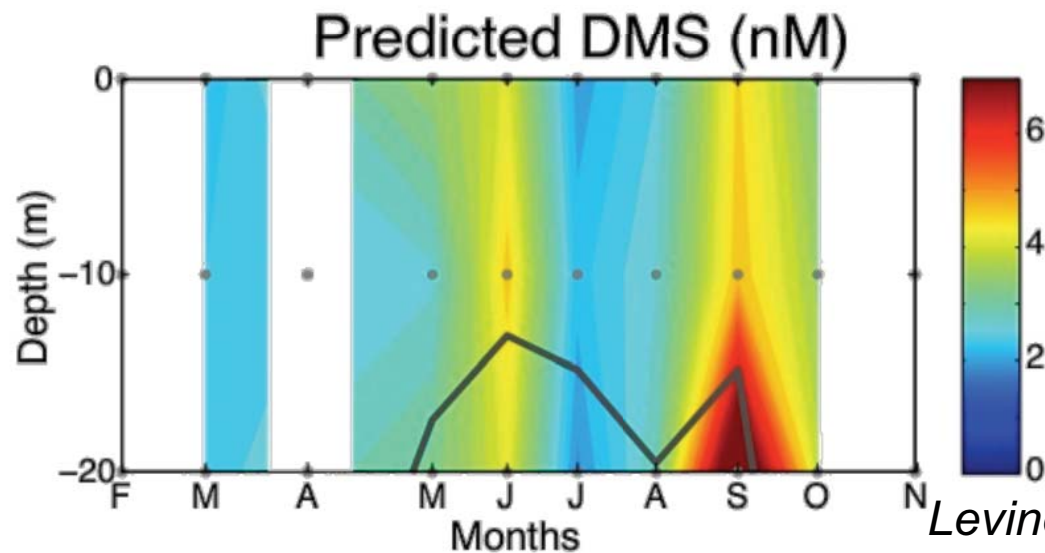
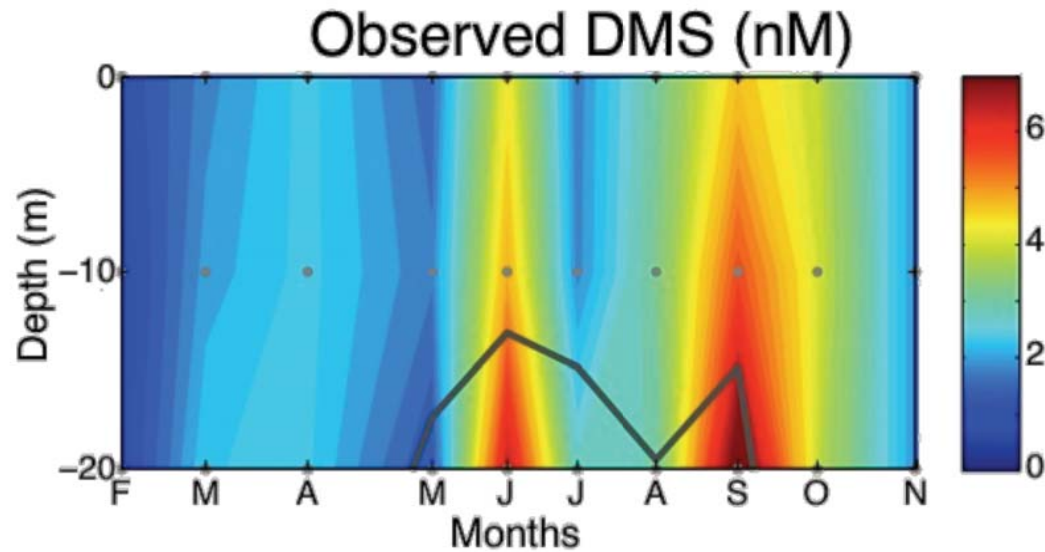
Estimating DMS Production

BATS 20m depth



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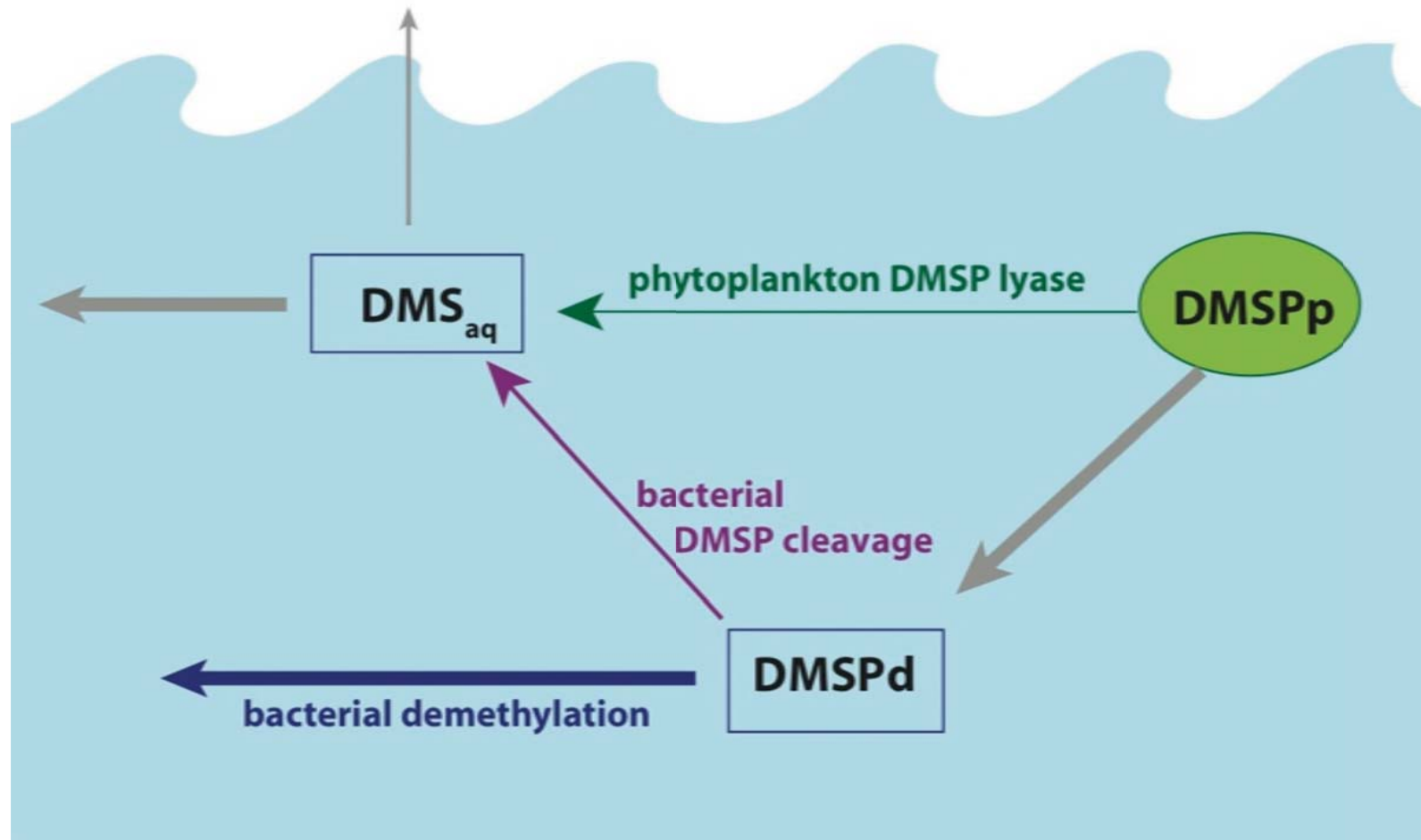
Estimating DMS Production



Levine et al. submitted

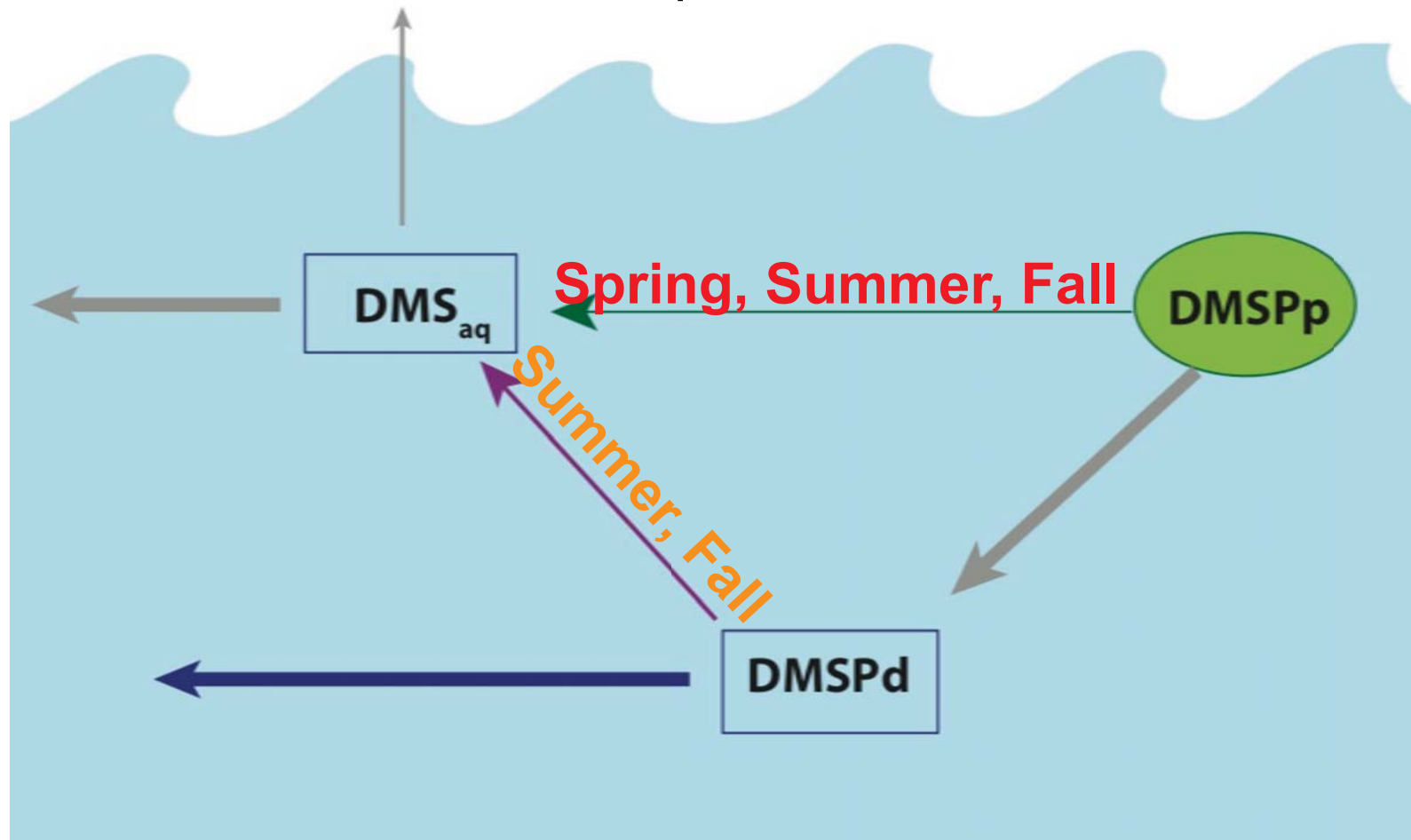
Interdisciplinary Insight

WHEN and WHY is DMS produced?



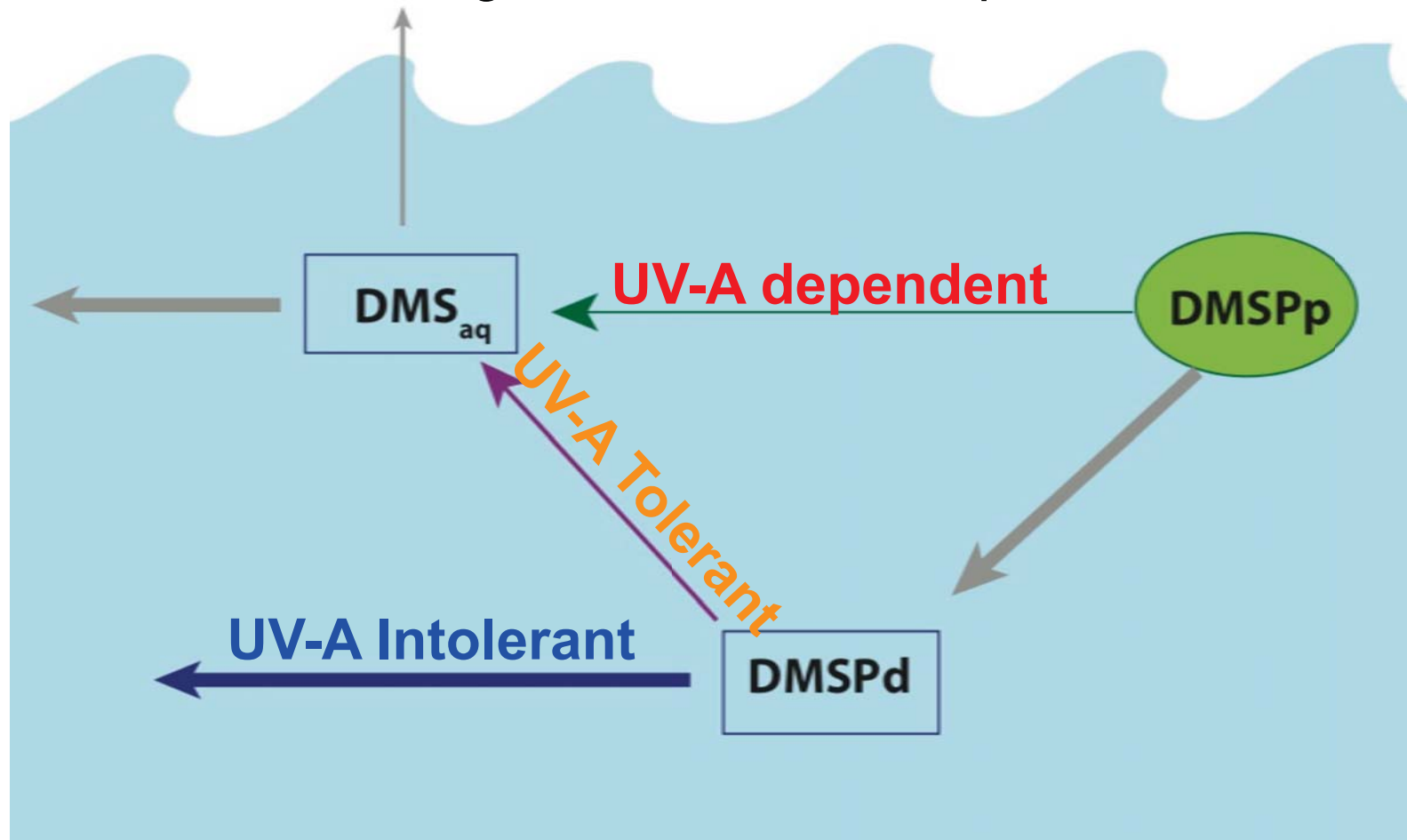
Interdisciplinary Insight

Both phytoplankton and bacteria contribute to DMS production

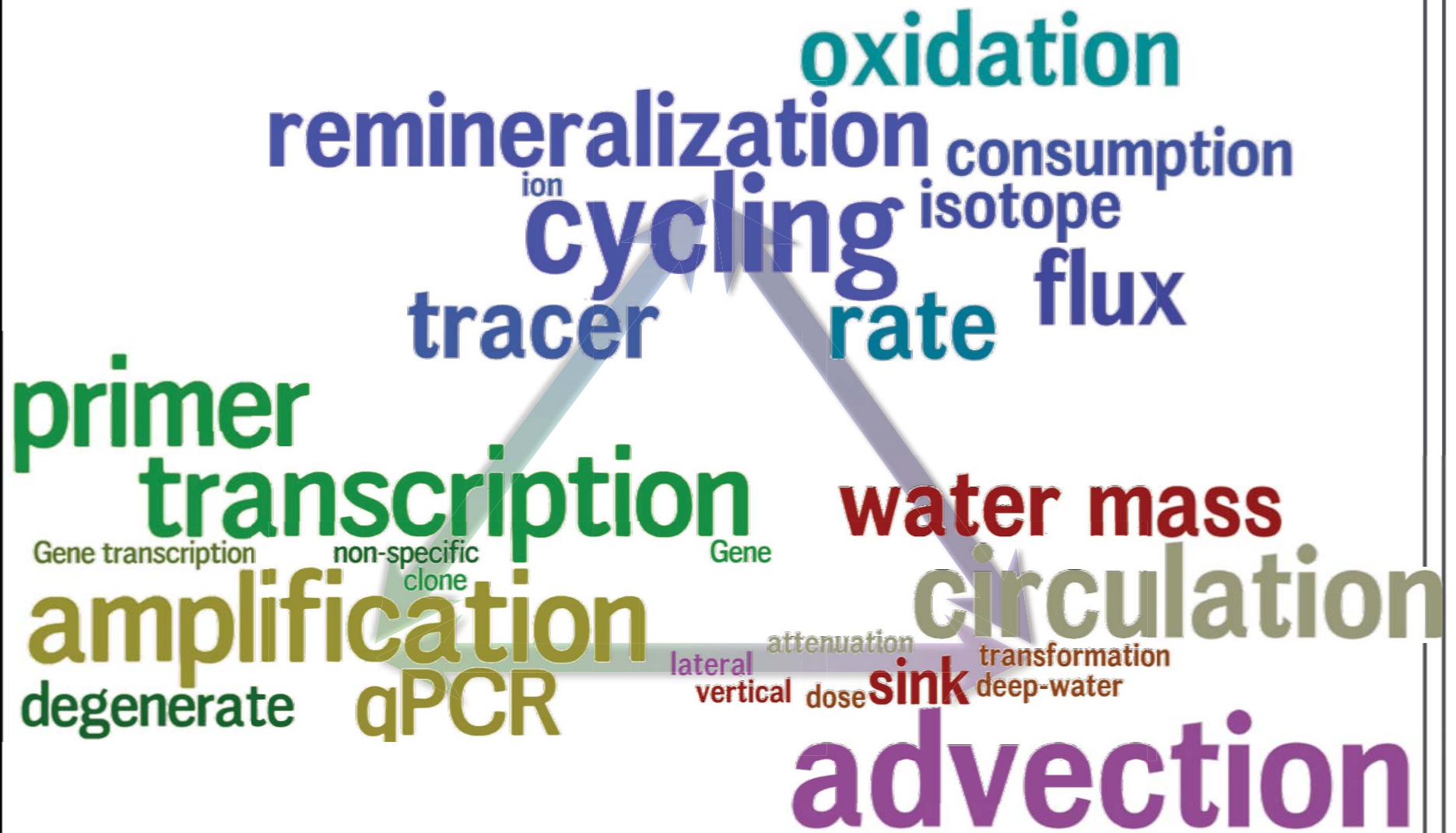


Interdisciplinary Insight

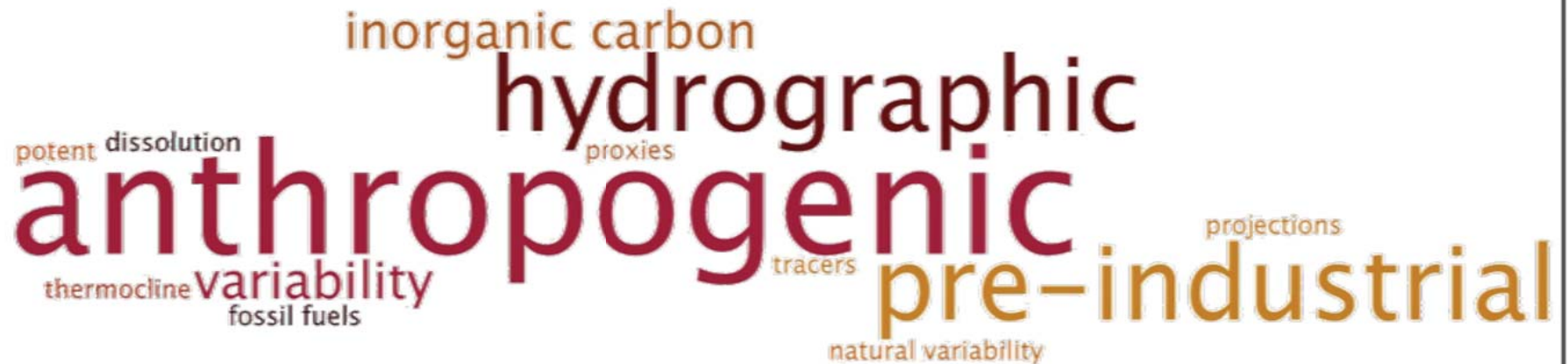
Light (UV-A dose) plays an important role in DMSP degradation and DMS production



Interdisciplinary Challenges



Communicating with non-scientists



A word cloud of climate science terms. The most prominent word is 'anthropogenic' in a large, dark red font. Other significant words include 'hydrographic' in a large, dark red font, and 'pre-industrial' in a large, orange-brown font. Smaller words in various colors (orange, brown, red) include 'inorganic carbon', 'potent', 'dissolution', 'thermocline', 'variability', 'fossil fuels', 'proxies', 'tracers', and 'projections'.

inorganic carbon
potent dissolution
thermocline variability
fossil fuels
hydrographic
proxies
anthropogenic
tracers
pre-industrial
projections
natural variability

Communicating with non-scientists

A word cloud centered around the word "ocean". The word "ocean" is the largest and most prominent, rendered in a dark red color. Other words are scattered around it in various sizes and colors, including dark red, brown, and black. The words include: "water", "scientists", "surface", "levels", "small", "may", "higher", "much", "life", "atmosphere", "marine", "chemistry", "climate", and "carbon dioxide".

water
scientists
surface levels
small
may
higher
much life
atmosphere
marine
chemistry
climate
carbon dioxide