Cycle platform: Cycle-PO4 validation and biochemistry

**Cycle**-in-situ wet chemical analysis platform

- High resolution in-situ mooring for novel observations
  - Yaquina Bay is dominated by import of production (blooms) from coastal ocean. Using in-situ sensors it is possible to witness-in-situ (bay) production.

**Concept:**
- Cycle-PO4 has been validated and field tested extensively.
- High resolution in-situ sensor data allows for detailed observations.
- The Yaquina River drainage basin is a source of nitrate, but not phosphate.
- There is no detectable source of phosphate due to resuspension of sediments in Yaquina Bay.

**Upwelled Nutrients drive productivity**

- High tide PO4 = Low tide PO4 in red, and for NO3 in blue. FR > 50 in black.
- Nitrate (magenta) in blue. FR *50 in black.
- Associated production increase suggests a small bloom utilized NH4 over NO3.

**NH4 in Yaquina Bay from intertidal mffitiids**

- Nitrate (magenta) in blue. FR *50 in black.
- NH4 decreases relative to NO3 when PO4 comes into system.

**Extensive validation and field testing**

- After comparing 6 different labs, many (15+) instruments, 828772. Microfluidic research was done at Oregon State University: Koch, C.R. dissertation, 2009, Oregon State University, 16:1; upwelling axis; aspect ratio of Cycle platform, reagents and optics modified.
- Extensive validation and field testing - SBE, ECO, ISUS, CYCLE - based software.
- Reagent stability - Sensitivity in low power and mini instruments - Complex automated operations - Ultimate application: cell identification + challenges controlling and lysing whole cells.

**Cycle-PO4 Publications**

- Access to Cycle platform, reagents and optics modified.
- Initial Cycle platform: Cycle-PO4

**Concept phase: Cycle-Fe**

**Concept:**
- Use Cycle platform
- A dimethyl-g-phenyleneediamine (DPD) method
- Absorption based detection
- Trace metal-clean instrument

**Concept phase: Total Phosphorus and Nitrogen (TPTN)**

**Concept:**
- Use commercial PO4 and optical NO3 sensor for TP and TN detection of digested sample
- 80-60 min sampling interval

**Acknowledgements**

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**Microfluidic instrument for in-situ wet chemistry**

**Concept:**
- Mini/low power sensor for autonomous platforms and tight spots

**High resolution in-situ mooring for novel observations**

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- NH4 decreases relative to NO3 when PO4 comes into system.

**Period observed where NH4 apparently used over NO3**

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