My PhD: 'Temporal and spatial variations in nutrient loading to lake ecosystems'





Water quality TAG meeting Rotorua 18th February 2013

Overview

- 1. Global latitudinal gradients in N:P and chl-nutrient relationships
- 2. National relationships between land use and in-lake nutrients
- 3. Quantifying storm flow nutrient loads to Lake Rotorua from two streams
- 4. 3-D modelling of a stream inflow to the lake
- 5. Phosphorus bioavailability







- "Recommendation 7: EBOP and Rotorua District Council (RDC) should carry out more detailed monitoring of storm-flows into Lake Rotorua, especially in the late spring, summer, autumn period to determine if these 'events' are initiating or prolonging blue-green blooms." (B. Hamilton, 2003).
- 2. "Protection Goal #3: Determine the extent of pollution from stormwater runoff." (PCE, 2006).



























Summary:

- Load calculations that do not reflect 个 TN and TP concentrations with 个 discharge will significantly underestimate loads to the lake
- 2. Particulate P concentrations can increase a lot when it rains
- 3. DIN is fairly invariant to discharge **but** some evidence of pulses in the Puarenga Stream after heavy rain
- 4. DON and DOP were minor
- 5. A large data set has been collected











Uusitalo R, Turtola E (2003) Determination of redox-sensitive phosphorus in field runoff without sediment preconcentration. *Journal of Environmental Quality* **32**, 70-77.













Work done by Jamie Peryer-Fursdon, BoPRC summer student



Initial PO₄ (mg P L⁻¹)

□BD-P =NaOH-P =HCI-P



Summary:

- 1. Complex!
- 2. Sediments can remove as well as release P to water
- 3. 100% of PP measured in two streams after moderate rainfall was potentially bioavailable in the longer term
- 4. Abiotic processes (sorption kinetics) have a major role in regulating bioavailability of P in stream inflows
- 5. Consistency of PP speciation within source areas shown by Jamie suggests that further work could aid general understanding







Acknowledgements

Technical support: Joe Butterworth and Chris McBride Monitoring data: Craig Putt, Paul Scholes and Stan Lodge (NIWA) Modelling: Deniz Özkundakci, Mat Allan, Liancong Luo, Hannah Jones and Kohji Murakoa Samplers: Rebecca Eivers and EOS

Site access: Agrodome NZ



3-D modelling



3-D modelling



3-D modelling



Summary:

- 1. A 3-D model successfully simulated field data during a dynamic 5day period
- 2. Phytoplankton distribution and nutrient limitation varied temporally and spatially as a result of horizontal transport processes
- 3. 3-D modelling can potentially help to answer **lots** of questions

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