AquaSentinel: An Advanced Real-Time Biosensor System for Source Water Protection

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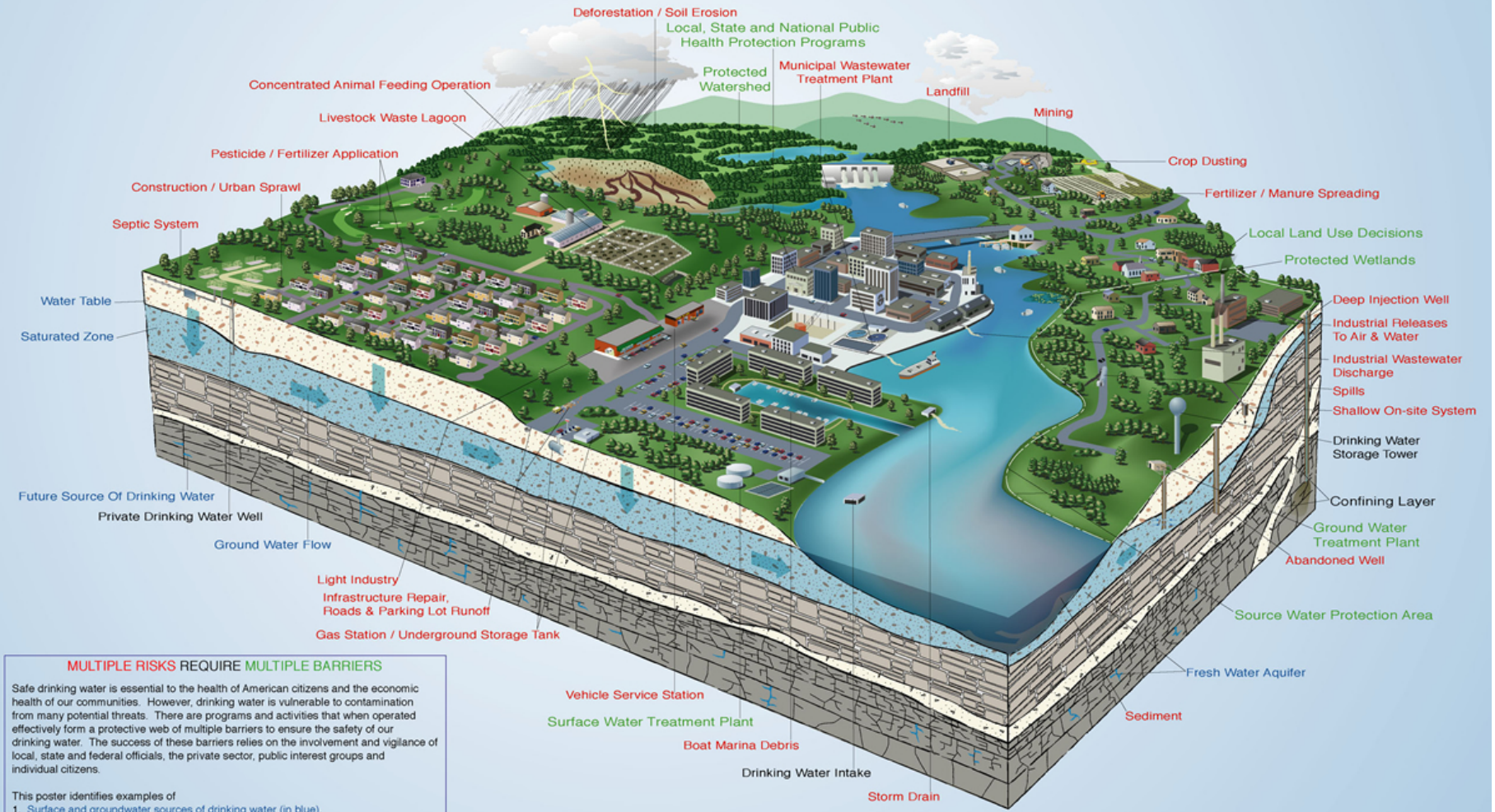
Key Points

--Photosynthetic fluorescence induction is a real-time sentinel assay for measuring algal physiology.

--Toxins that are harmful to humans alter fluorescence induction.

--The specific alteration of fluorescence induction may correlate with the chemical nature of the toxin.

Safe Drinking Water Act - Protecting America's Public Health



MULTIPLE RISKS REQUIRE MULTIPLE BARRIERS

Safe drinking water is essential to the health of American citizens and the economic health of our communities. However, drinking water is vulnerable to contamination from many potential threats. There are programs and activities that when operated effectively form a protective web of multiple barriers to ensure the safety of our drinking water. The success of these barriers relies on the involvement and vigilance of local, state and federal officials, the private sector, public interest groups and individual citizens.

This poster identifies examples of

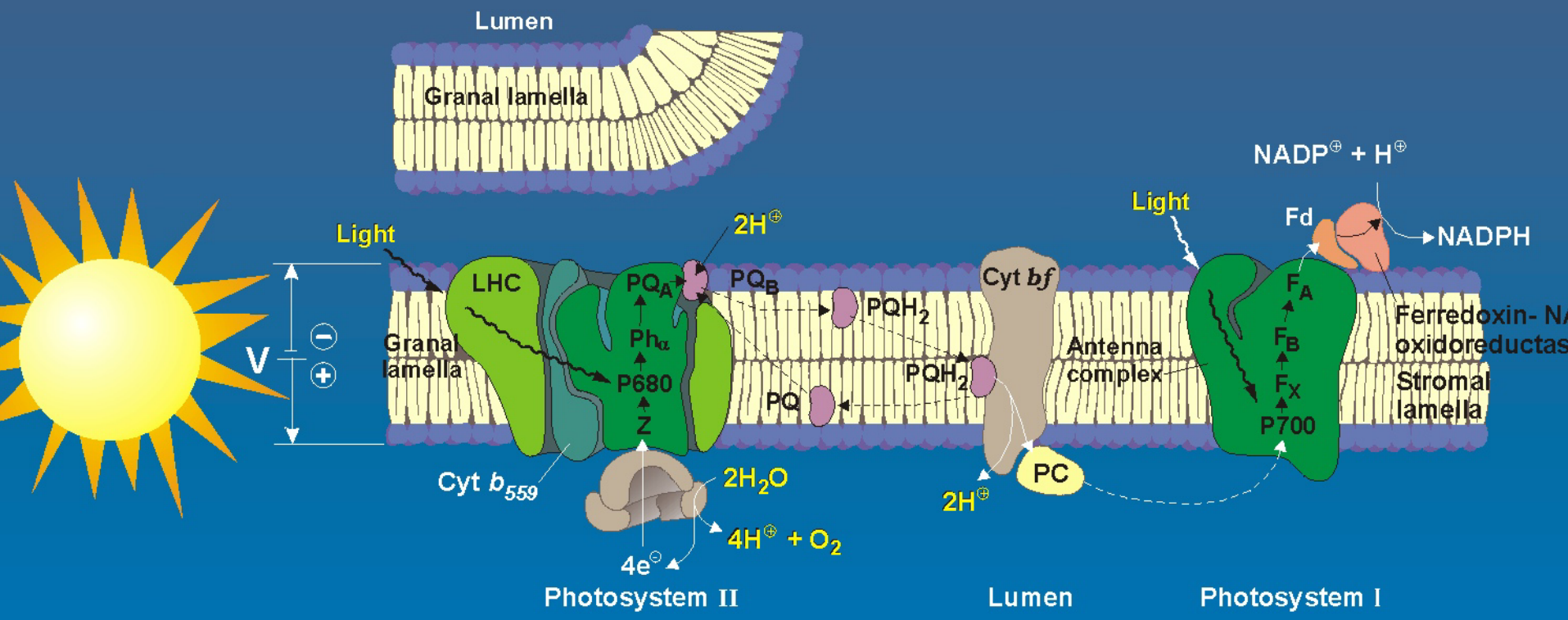
1. Surface and groundwater sources of drinking water (in blue),
2. Potential threats to those drinking water sources (in red), and
3. The multiple barriers that together protect our nation's public health (in green).
   - Risk Prevention Barrier
   - Risk Management Barrier
   - Risk Monitoring and Compliance Barrier
   - Individual Action Barrier

Safe Drinking Water Hotline – (800) 426-4791 Safewater Web Site – www.epa.gov/safewater

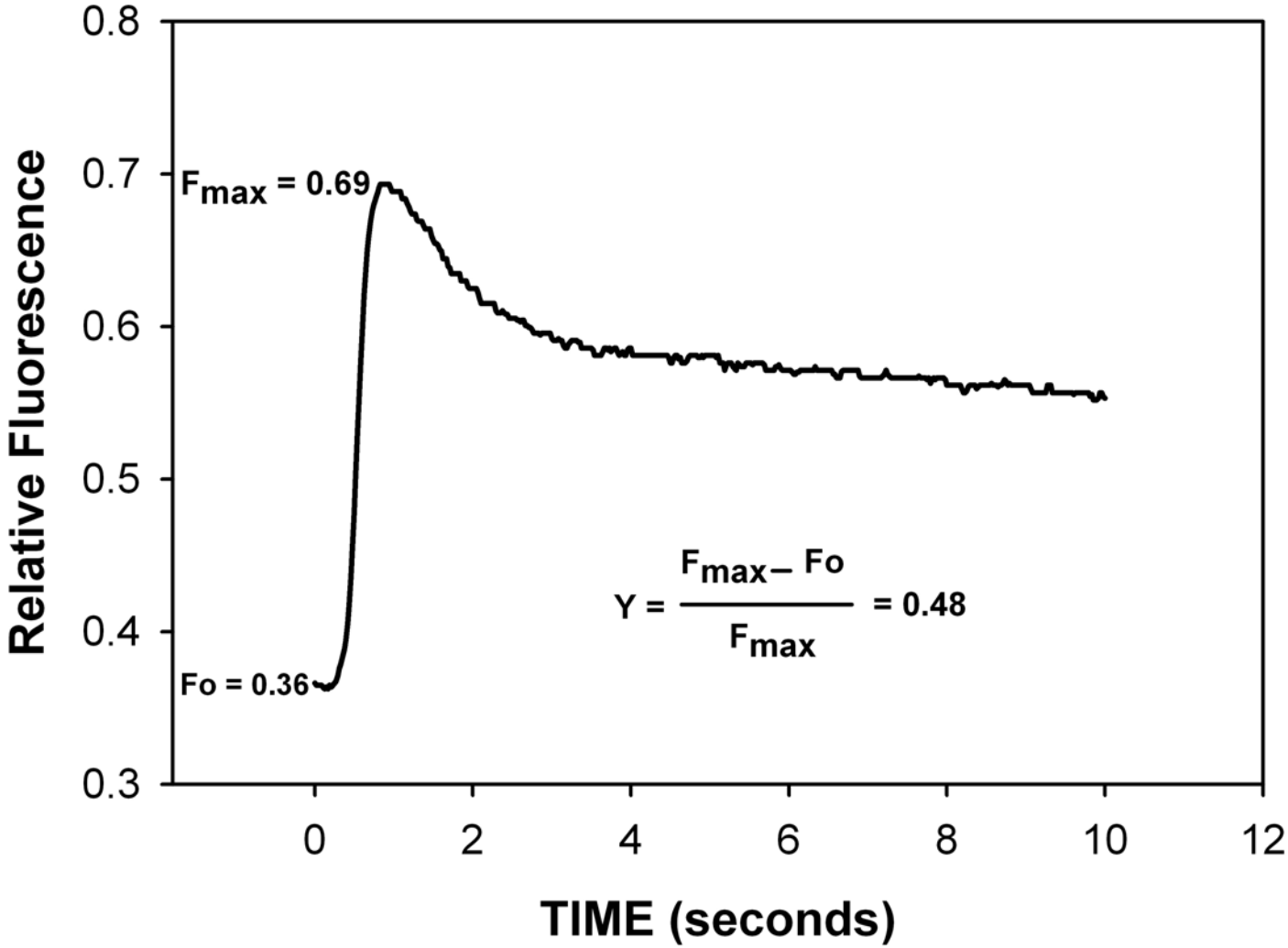
EPA
United States Environmental Protection Agency
EPA 816-H-02-003
January 2002

CLEAN WATER ALGAE

The Photosynthetic Membrane



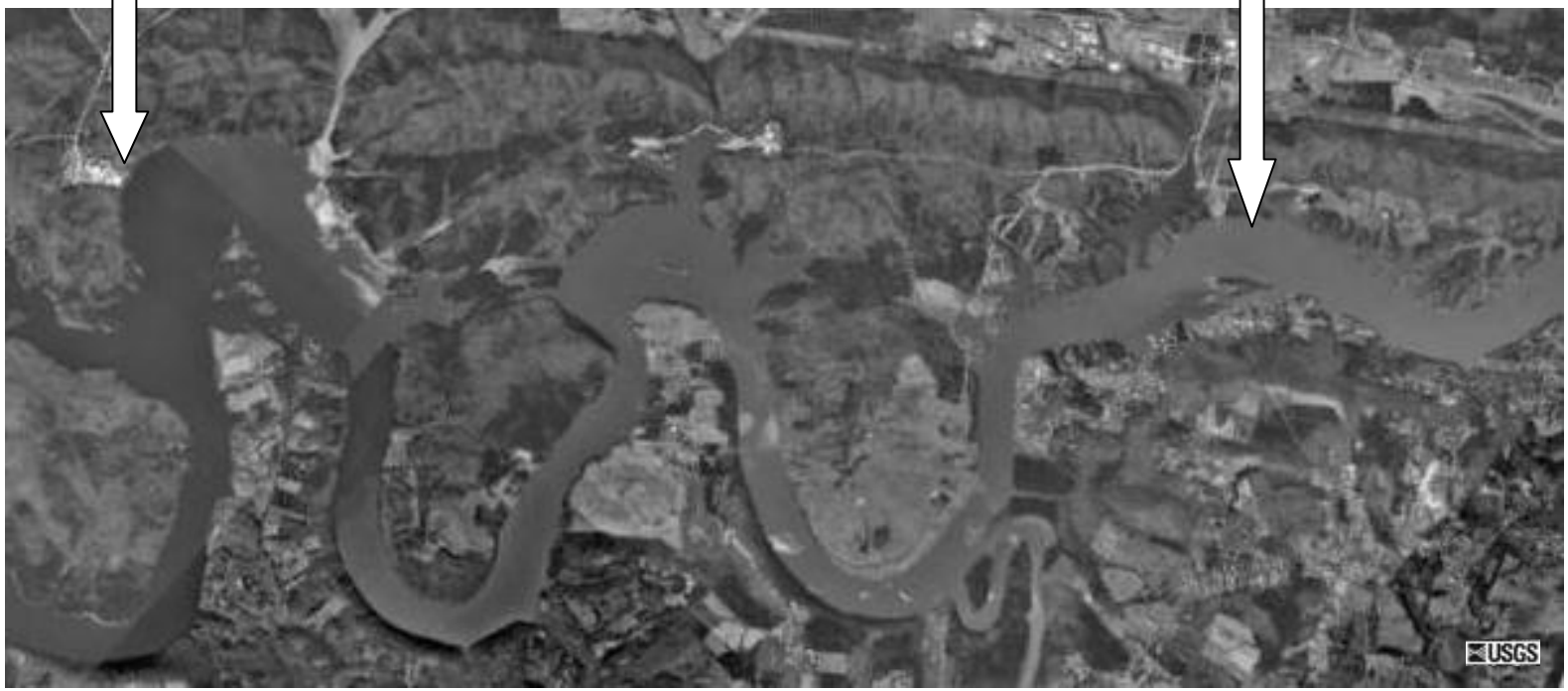
Typical Fluorescence Induction Curve from Naturally-Occurring Algae in Untreated Clinch River Water



Real-World Conditions

AquaSentinel Monitoring Station

Drinking Water Supply for Oak Ridge, TN

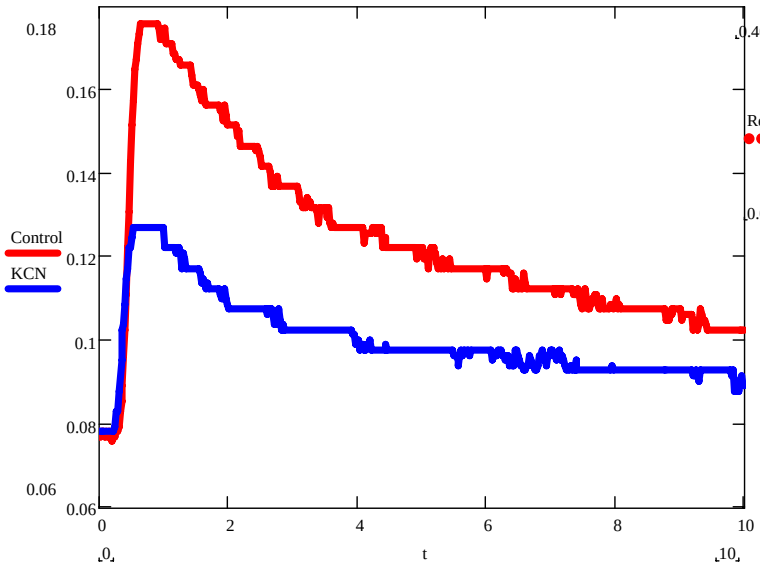


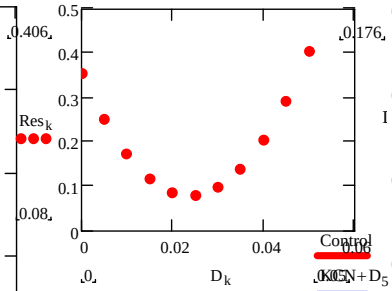
CLINCH RIVER/MELTON HILL LAKE, OAK RIDGE, TN

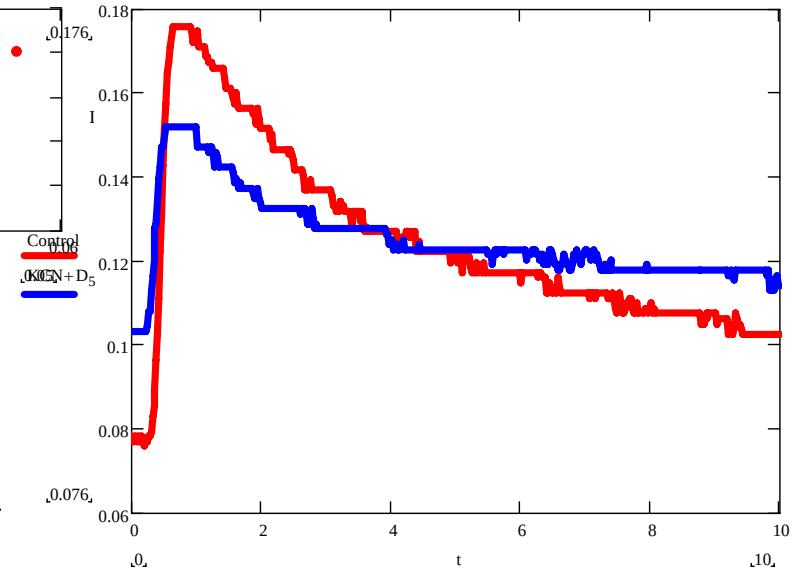
Clinch River Monitoring Station - ORNL

KCN Data Analysis

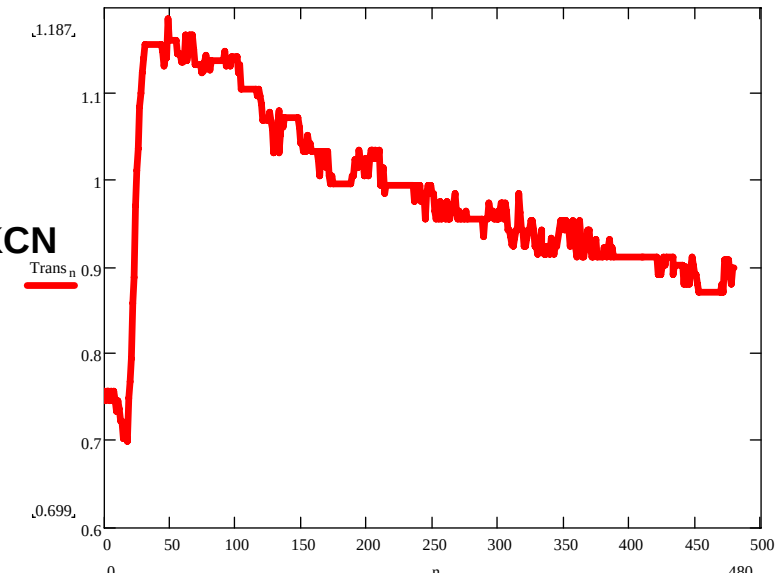
10 ppm



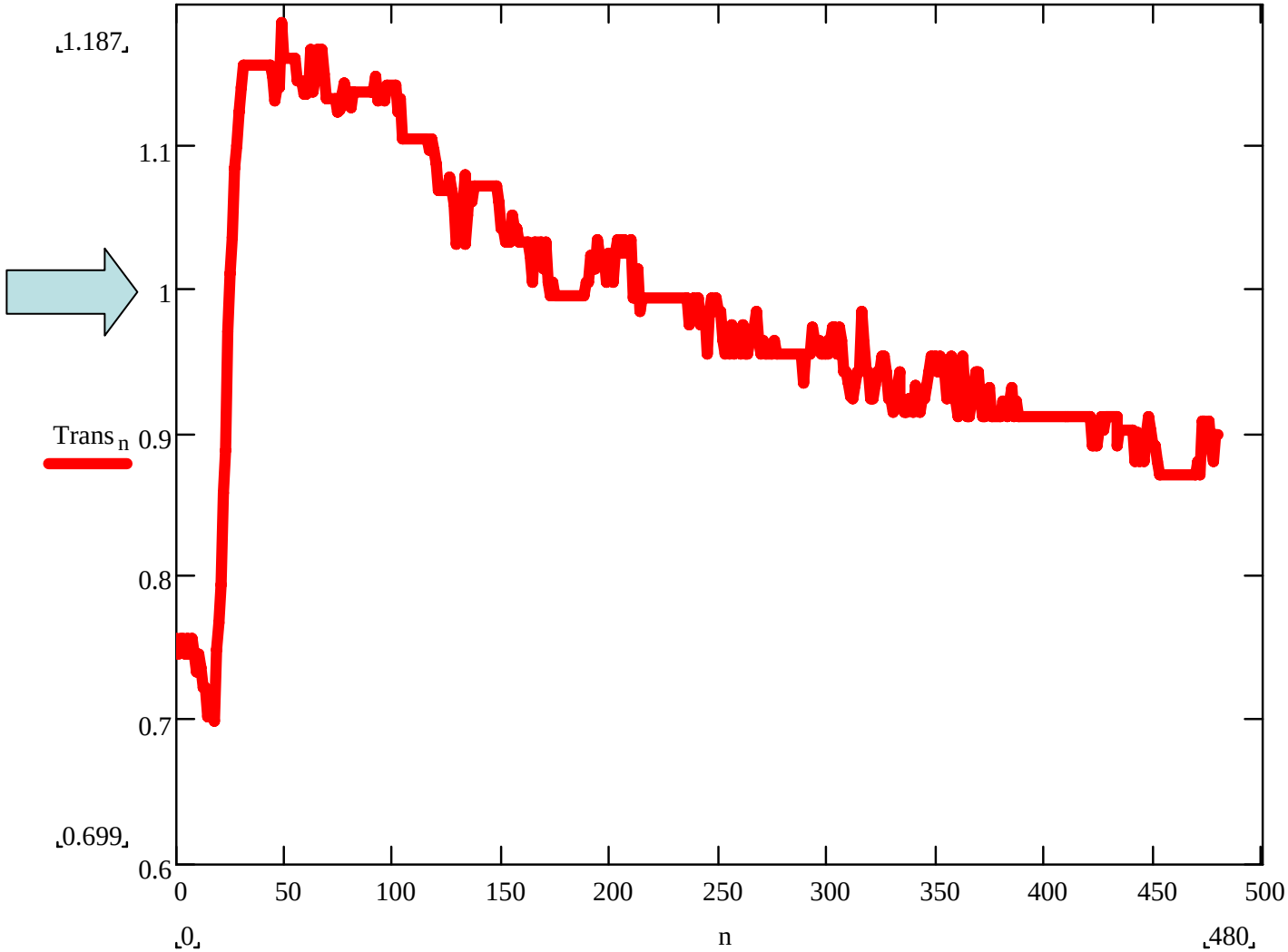




Transformation Data Set for KCN

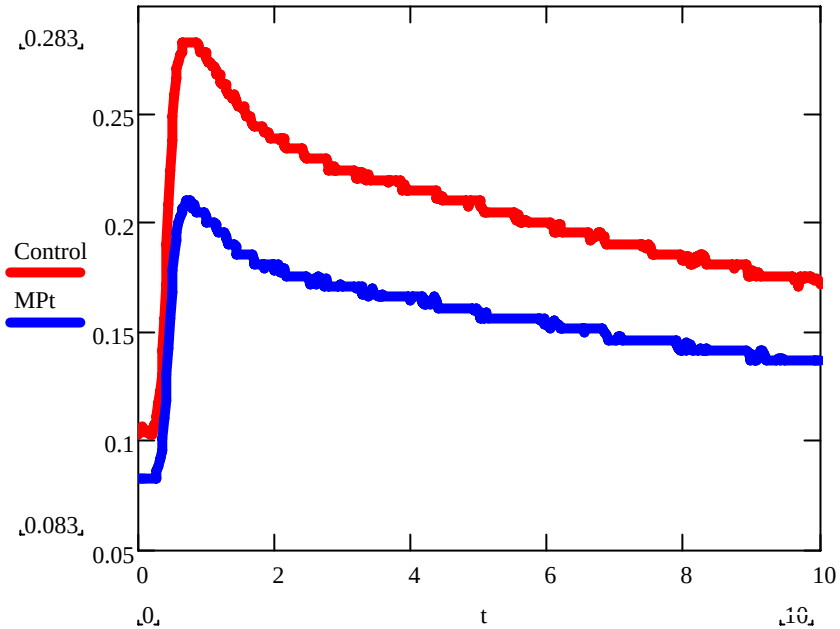


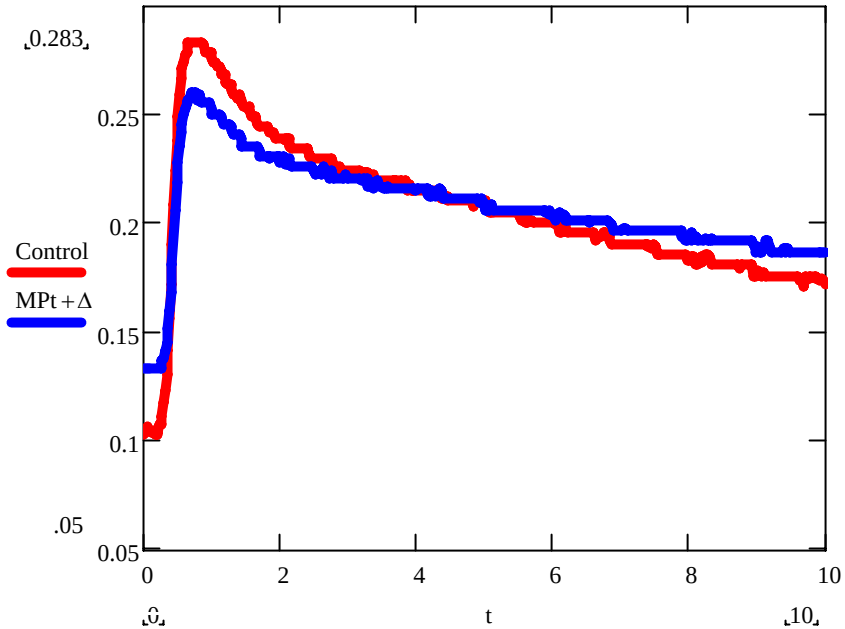
Transformation Data Set for KCN



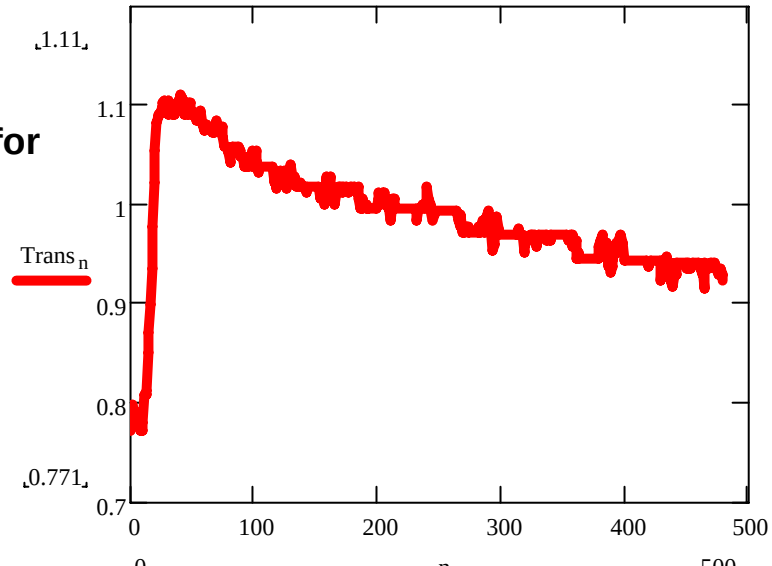
Methyl Parathion Data Analysis

4 ppm

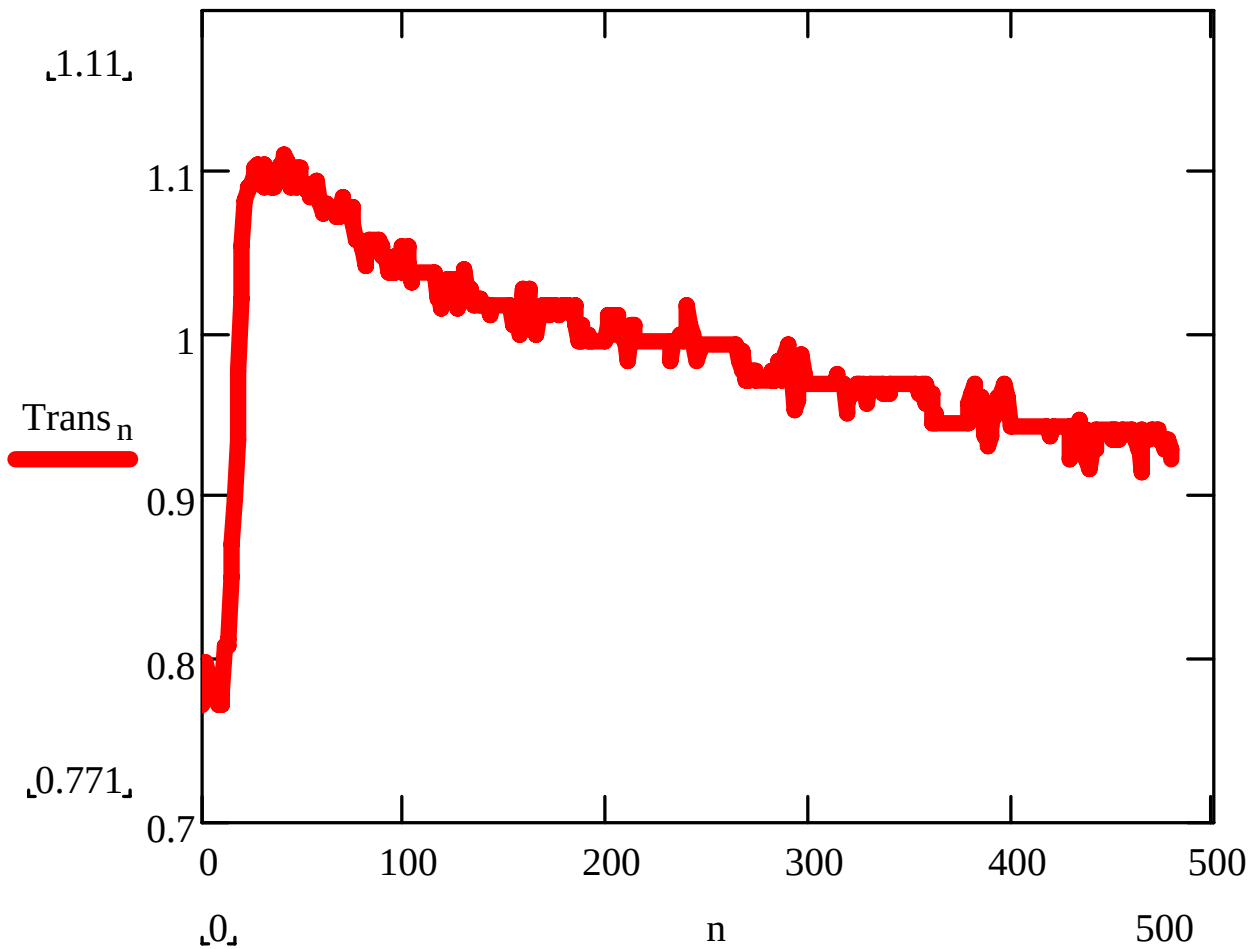




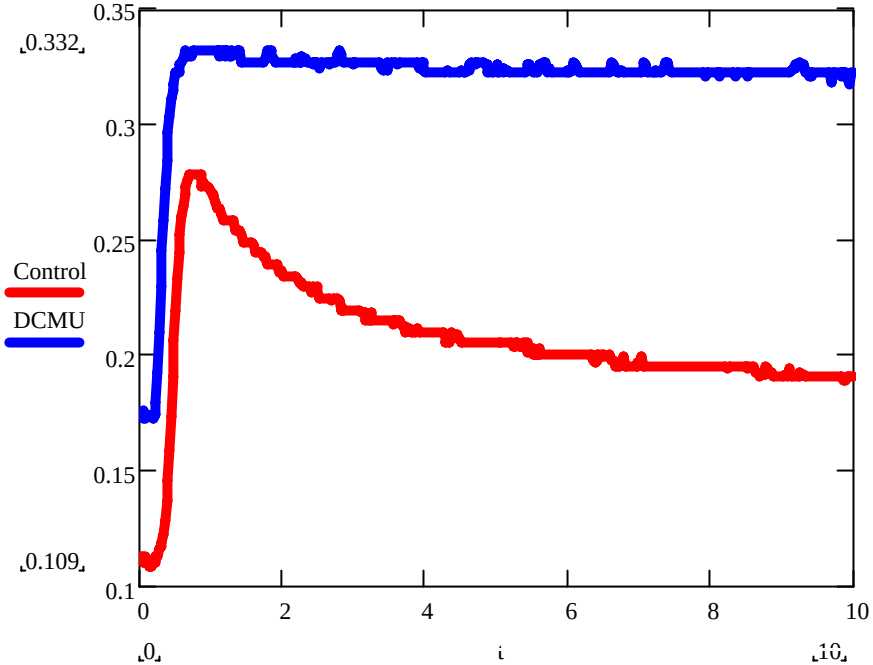
Transformation Data Set for Methyl Parathion

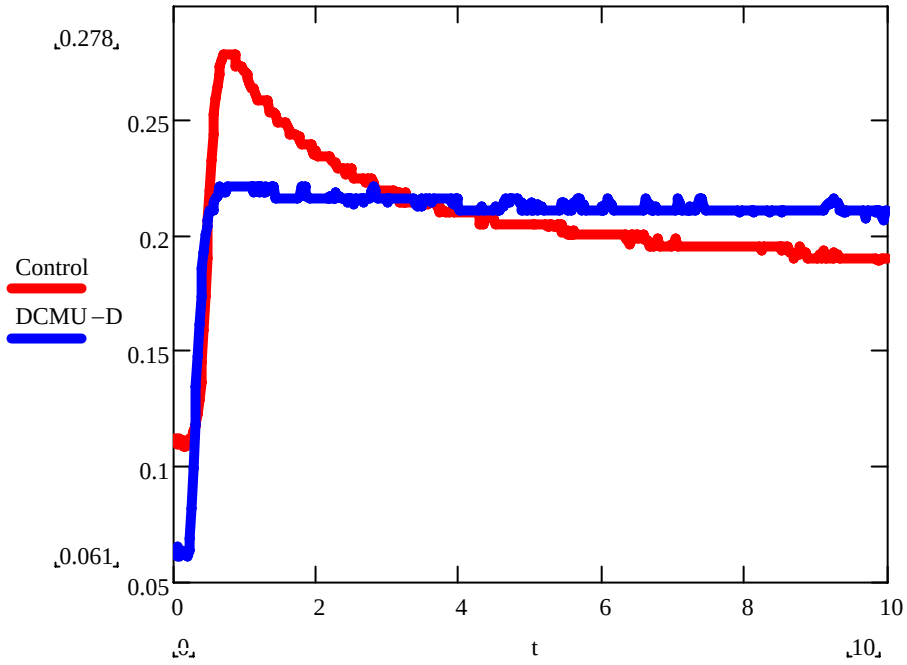


Transformation Data Set for Methyl Parathion

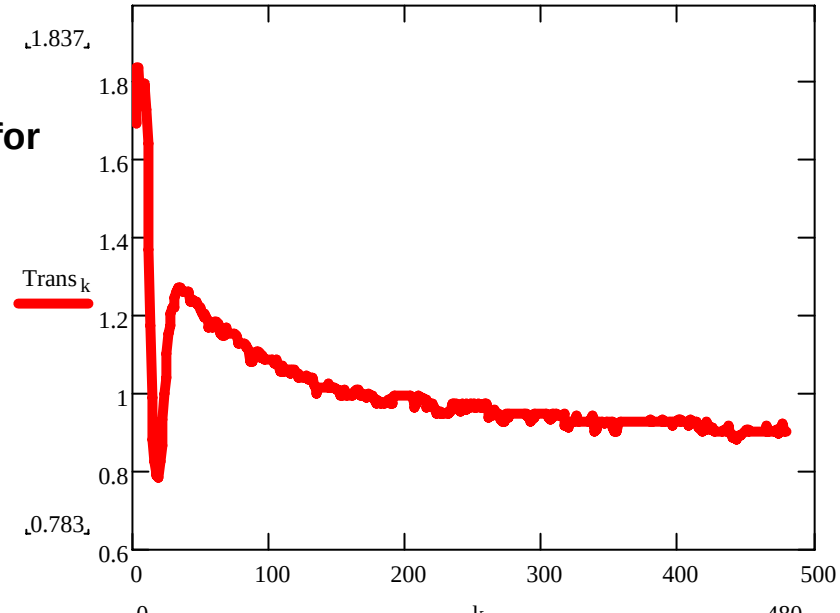


DCMU Data Analysis – 1 ppm

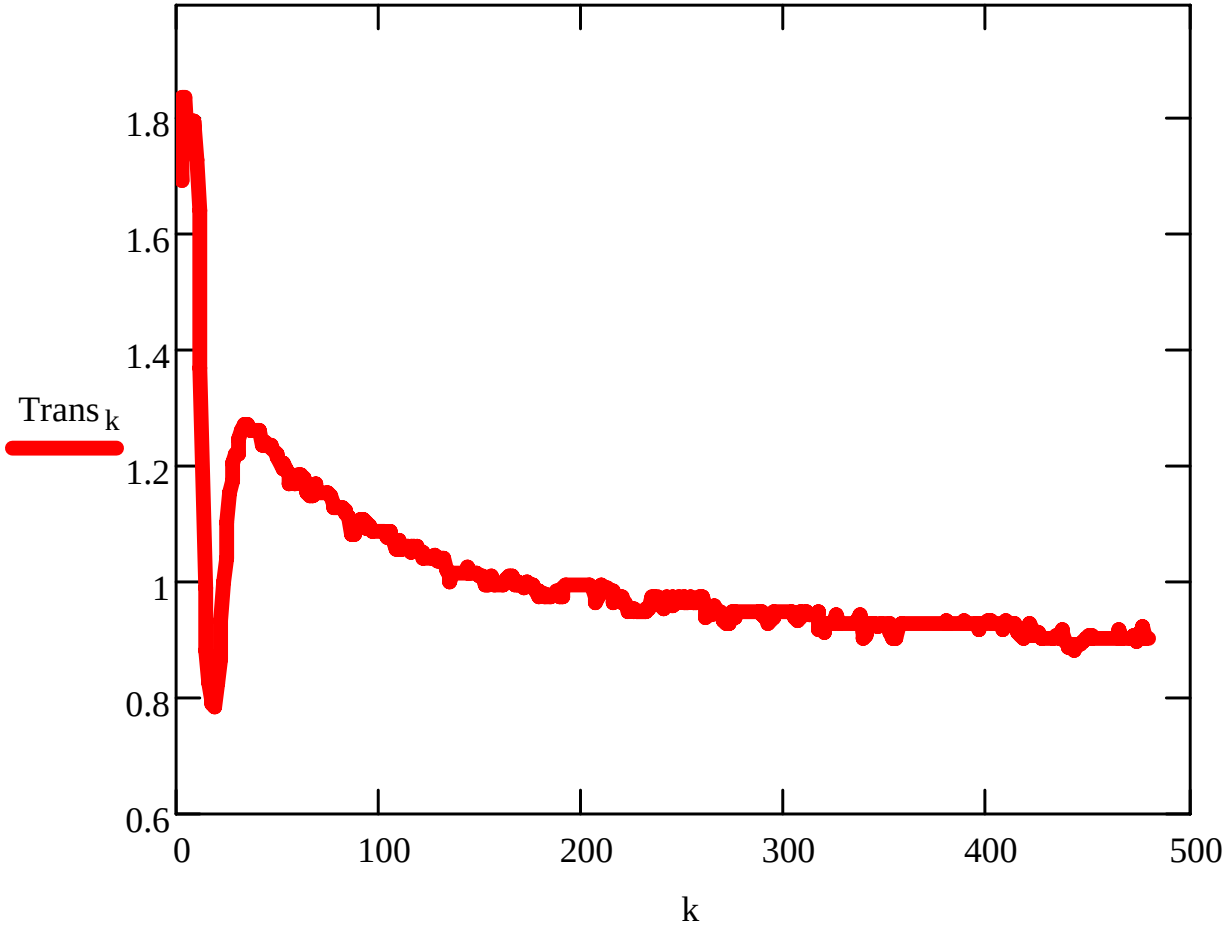




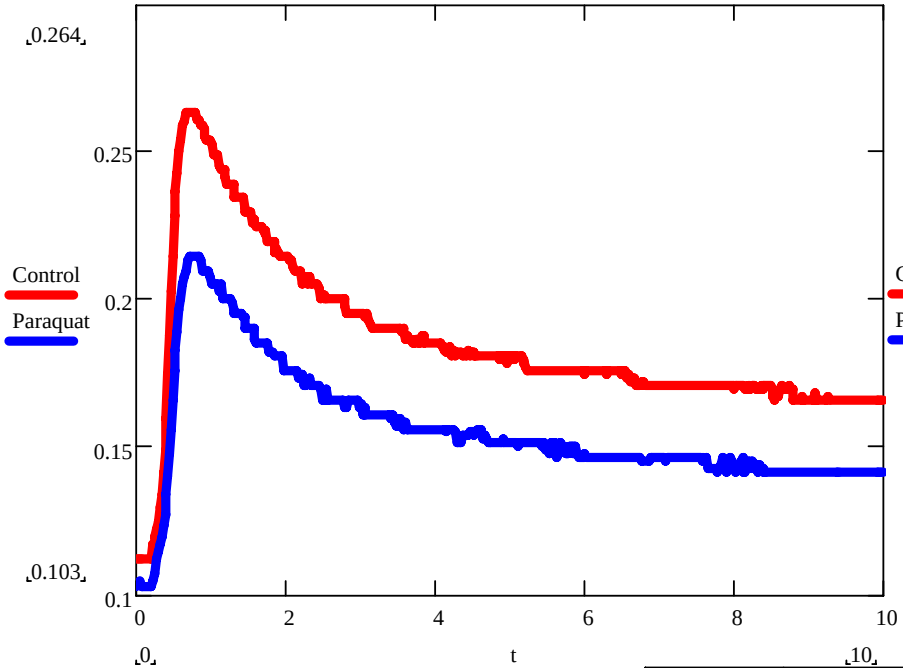
Transformation Data Set for DCMU

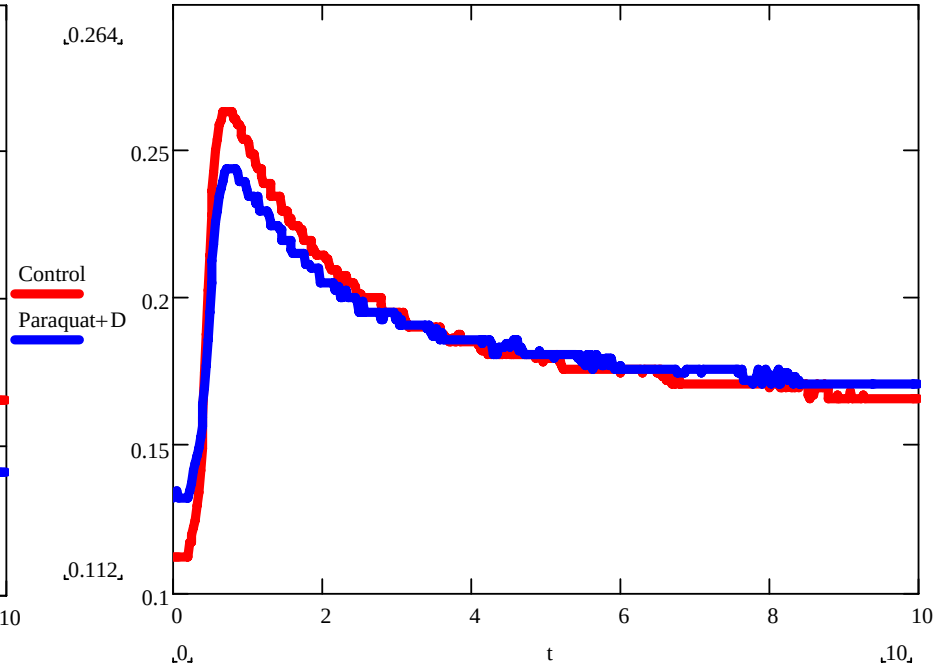


Transformation Data Set for DCMU



Paraquat Data Analysis – 0.1 ppm





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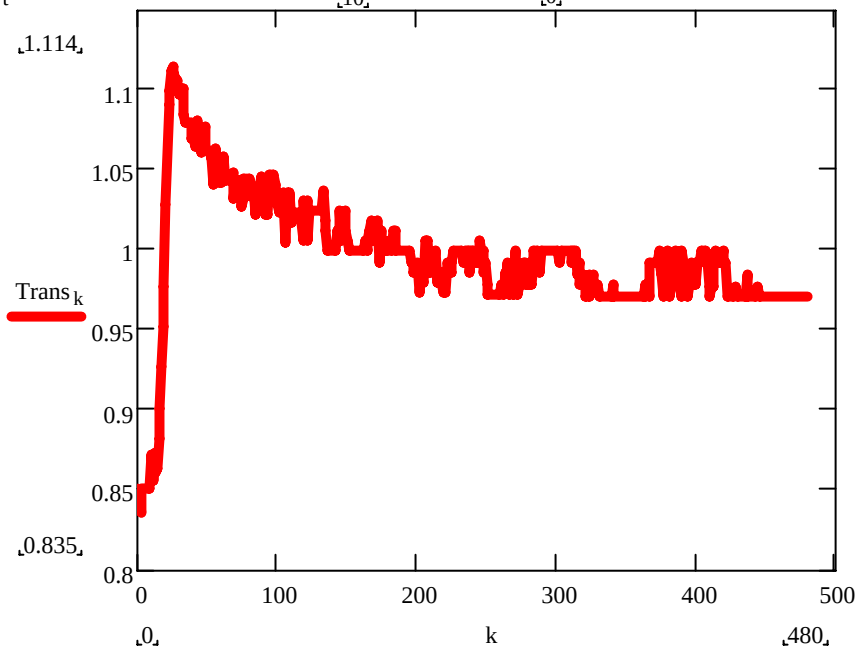

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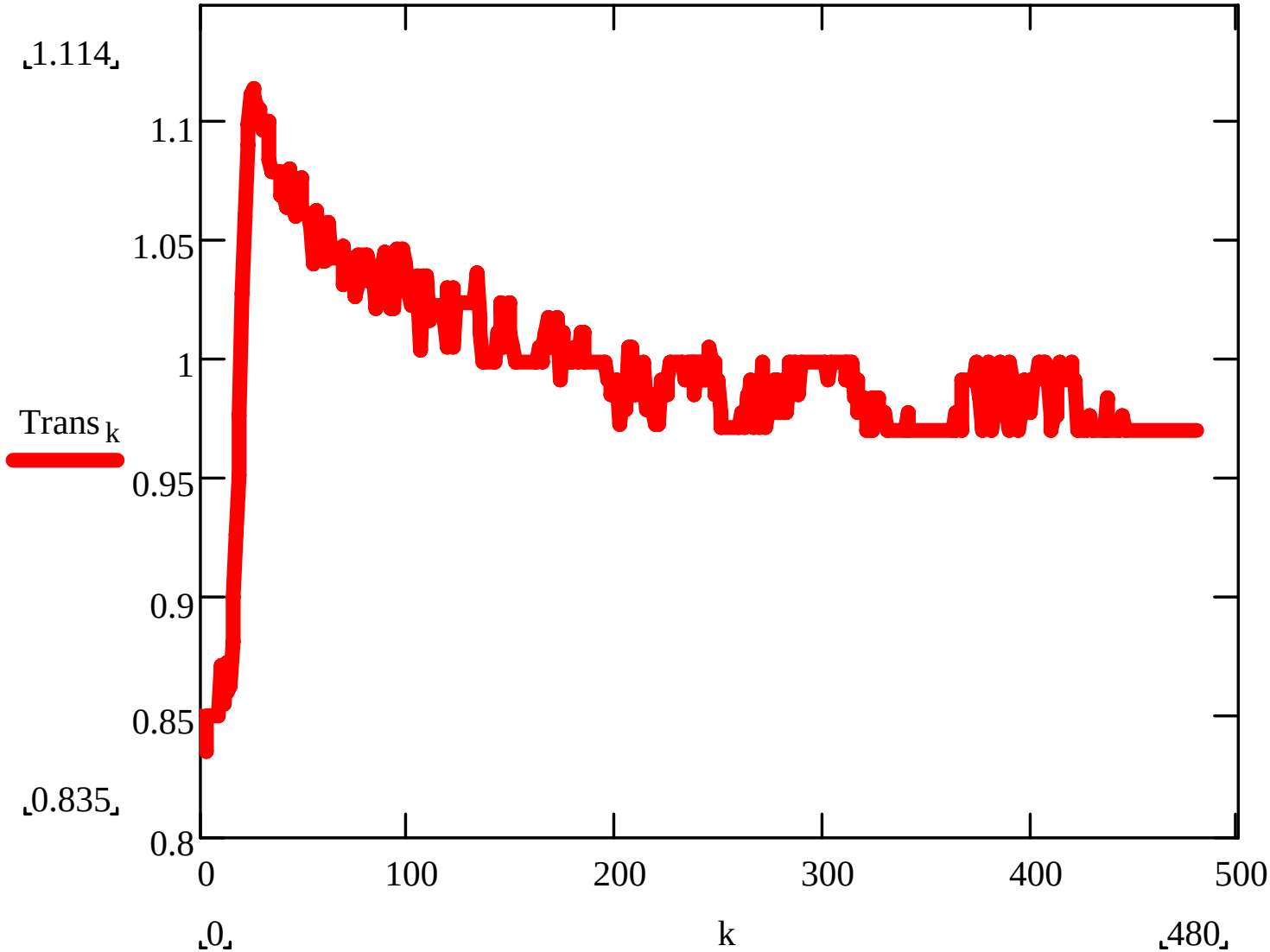
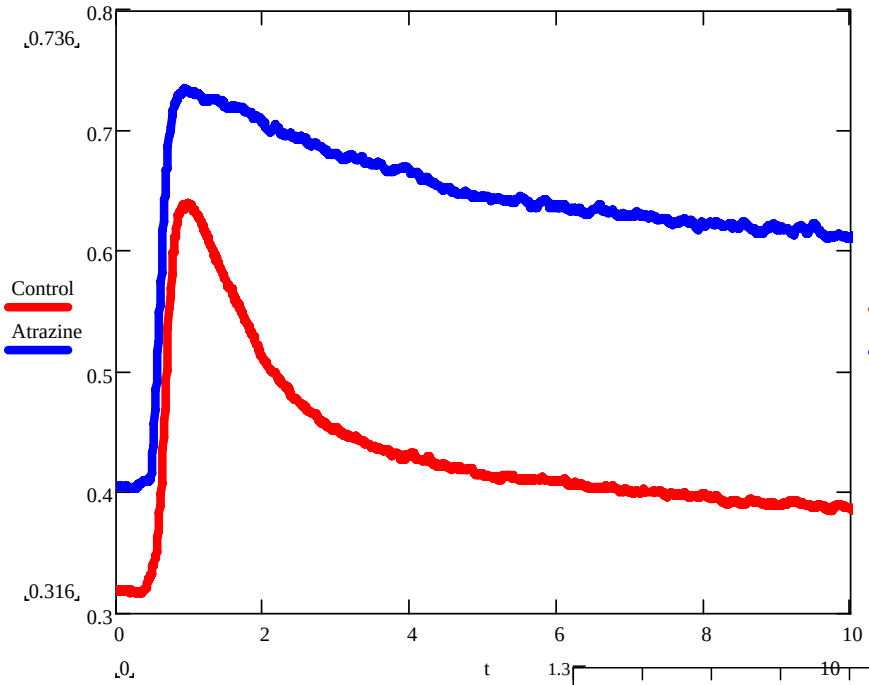
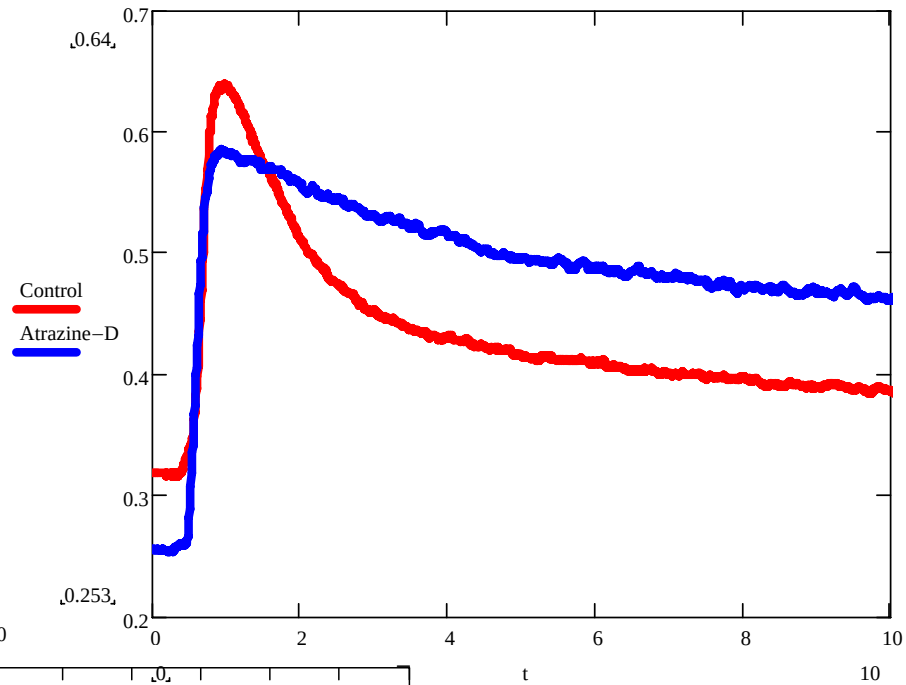
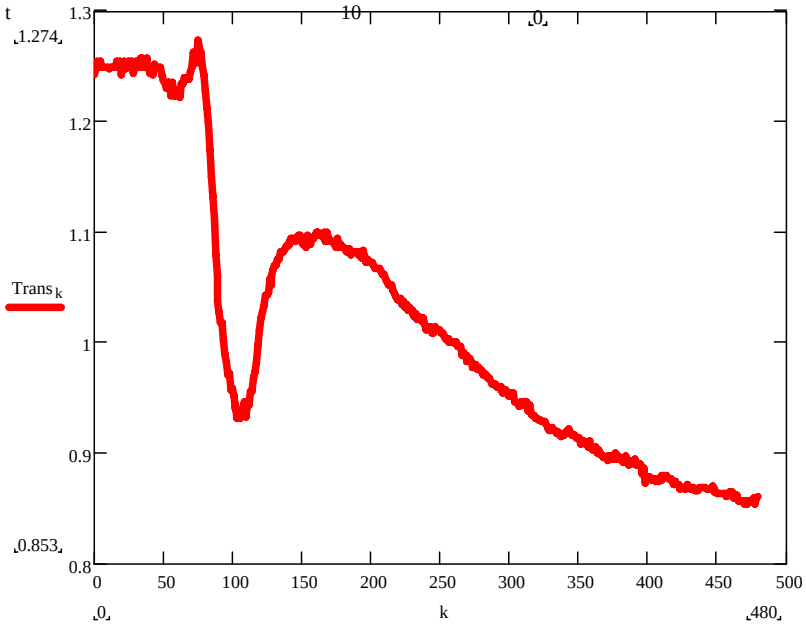


Atrazine Data Analysis – 0.3 ppm

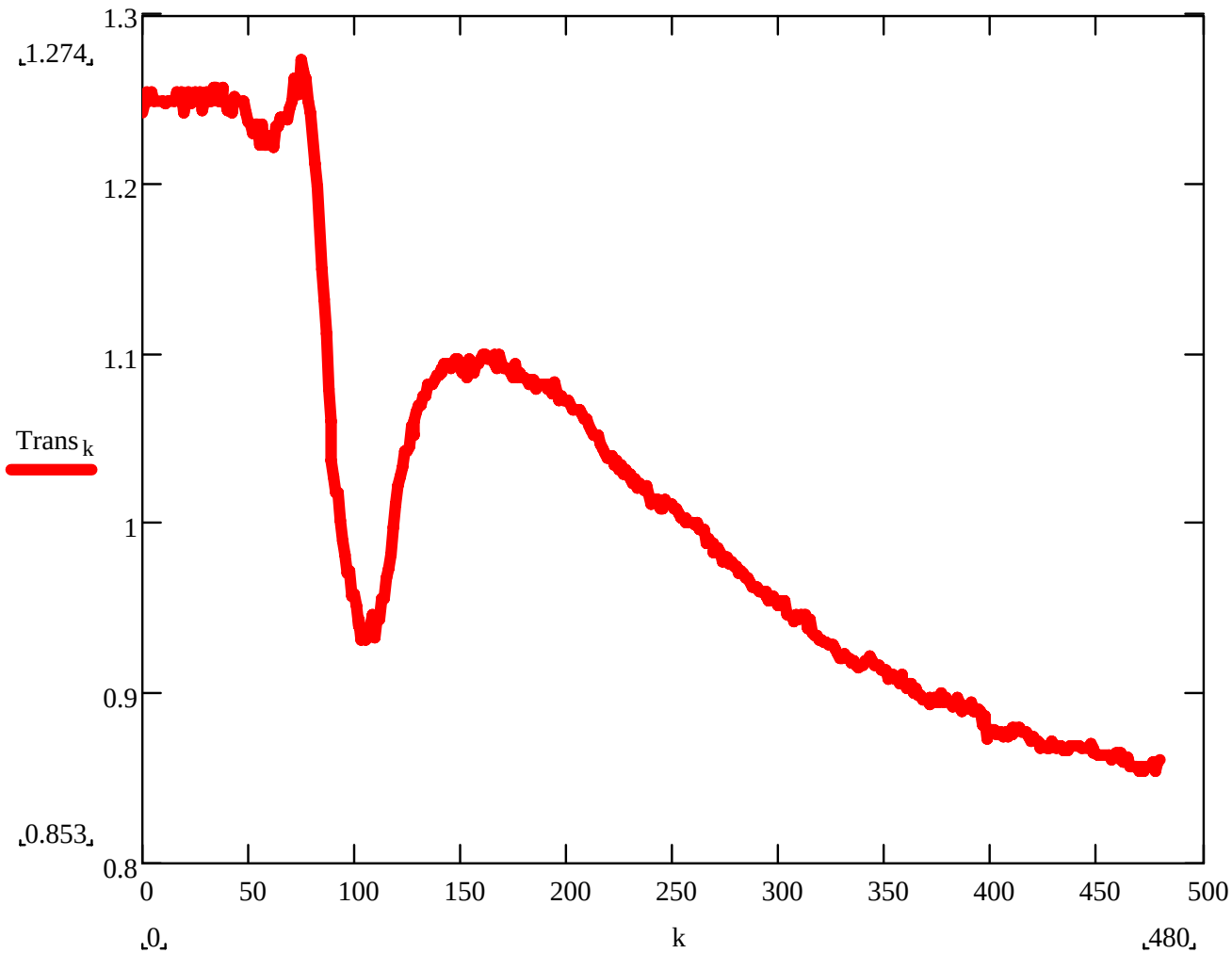




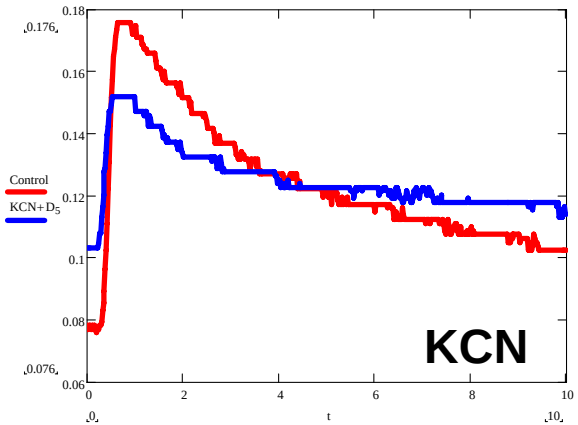
Transformation Data Set for Atrazine

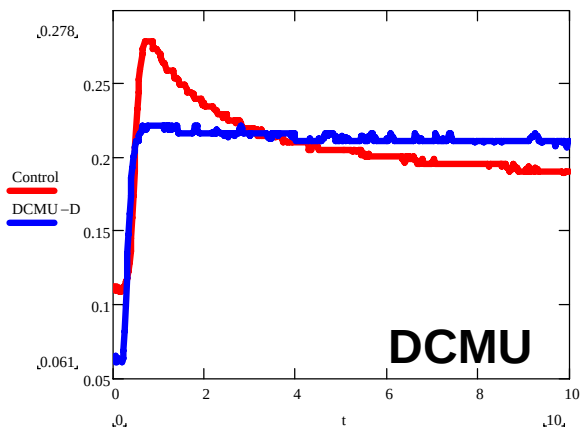


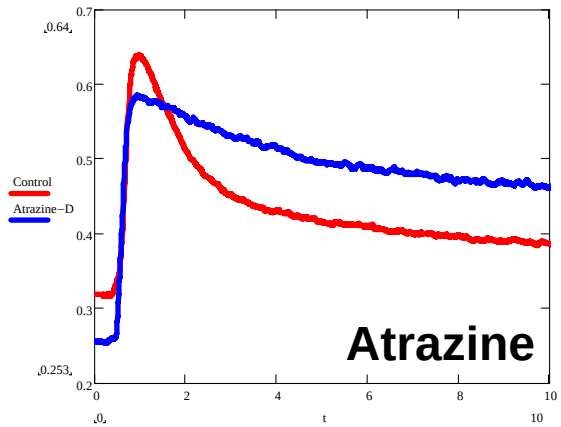
Transformation Data Set for Atrazine

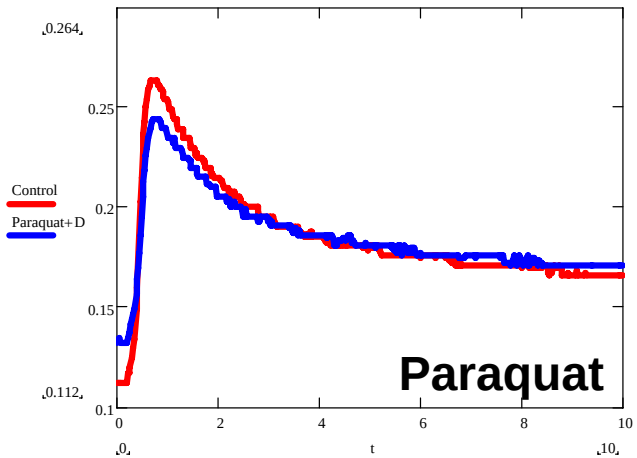


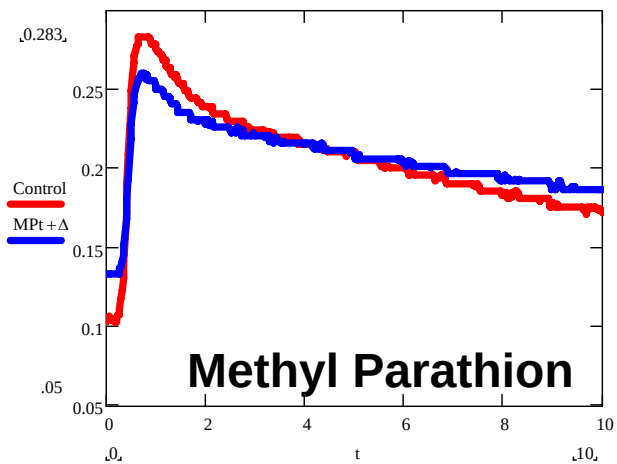
Summary of Toxin Data + Differential Offset Analysis



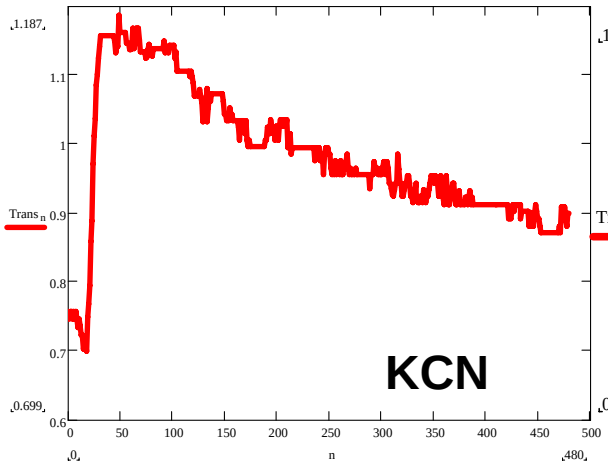


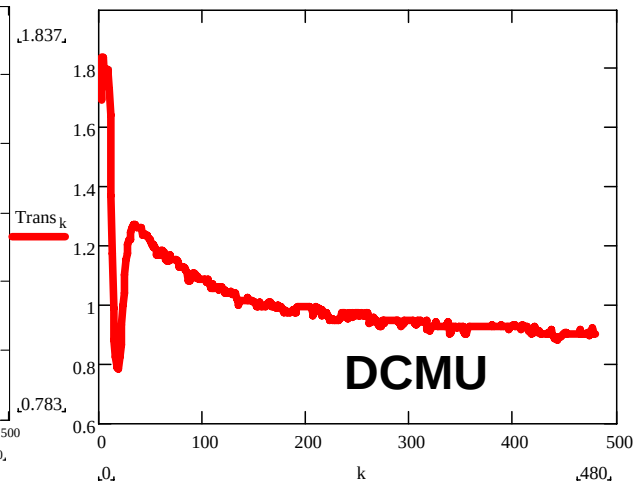


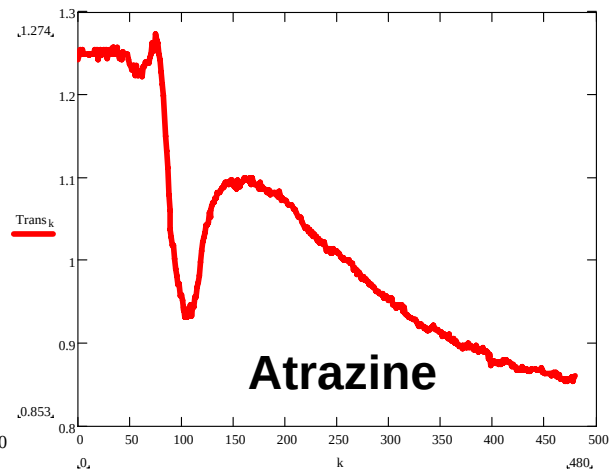


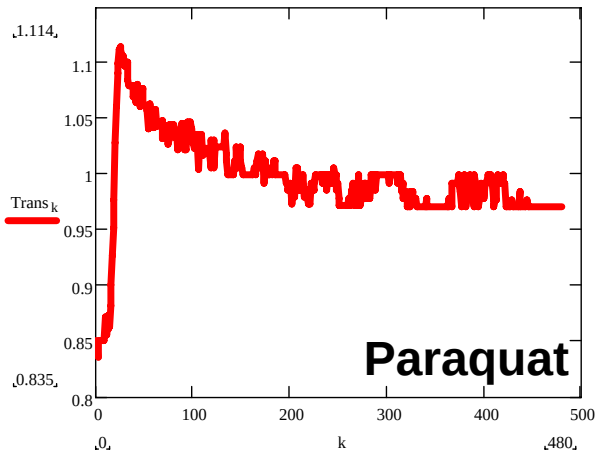


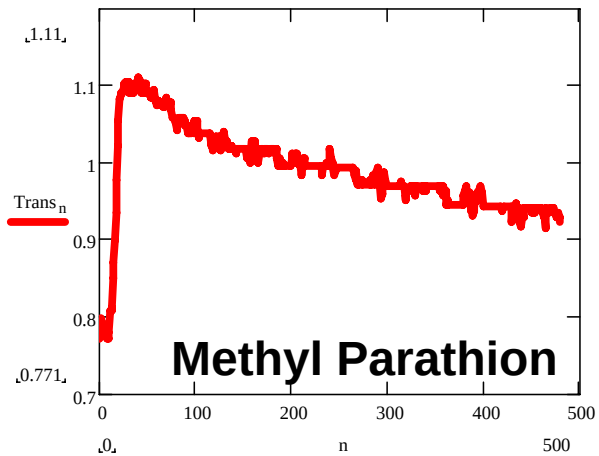
Summary of Toxin-Specific Transformation Data Sets









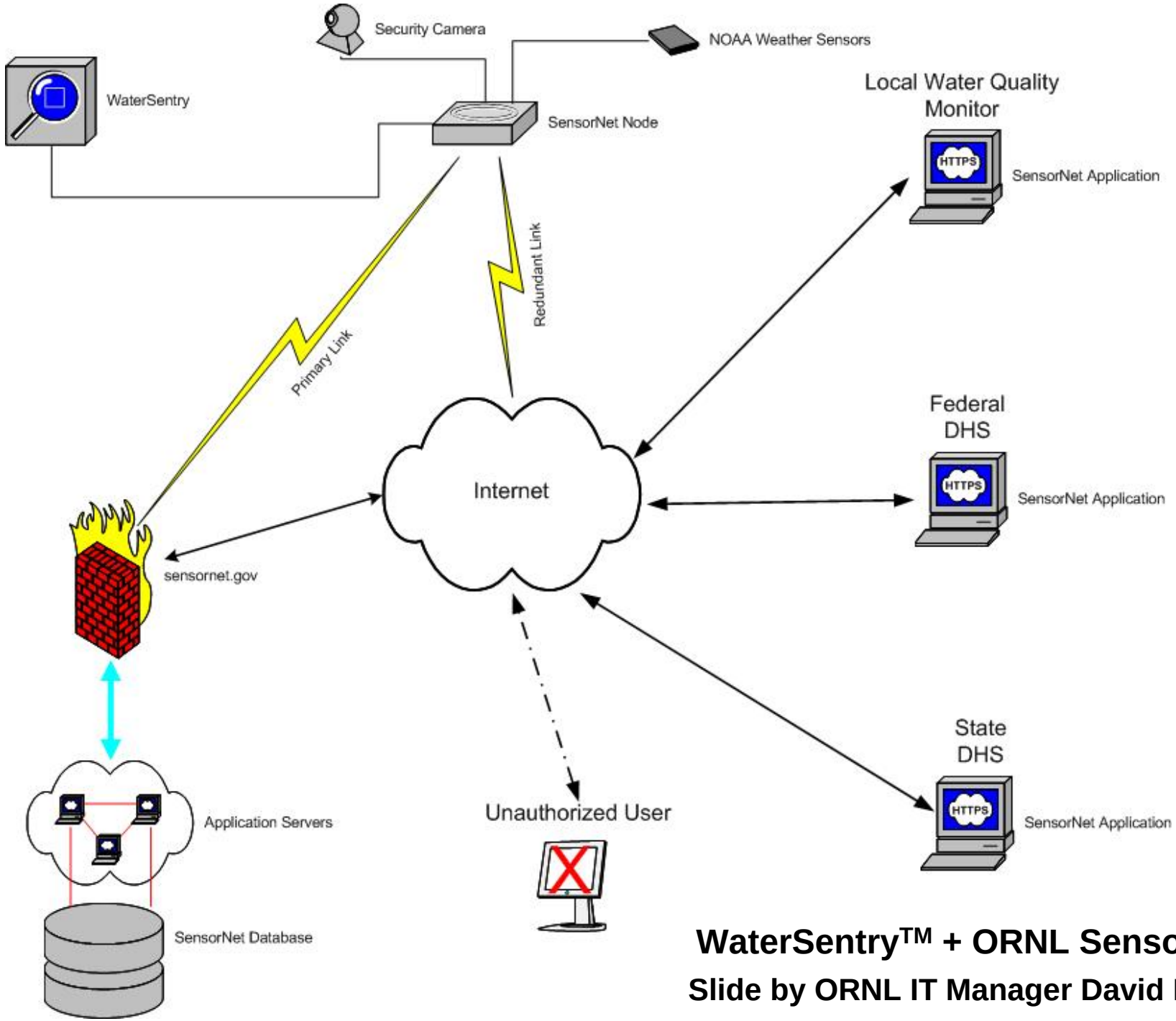


Conclusions

--Photosynthetic fluorescence induction is a real-time sentinel assay for measuring algal physiology.

--Toxins that are harmful to humans alter fluorescence induction.

--The specific alteration of fluorescence induction may correlate with the chemical nature of the toxin.



WaterSentry™ + ORNL SensorNet

Slide by ORNL IT Manager David E. Hill