WP7: Modelling

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Centre for Ecology & Hydrology
NATURAL ENVIRONMENT RESEARCH COUNCIL

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Overview

What is the workpackage?

Introduce PROTECH model

Outline the proposed methodology

What is the workpackage?

Interpretation and forecasting lake sensitivity to environmental change

Aim: To predict the sensitivity of lake phytoplankton to environmental change

Timing

Gantt Chart — Start Date: 1 October 2012 — Duration: 60 Months — End Date: 30 September 2017

WP	Tasks	Year 1				Year 2				Year 3				Year 4				Year 5			
	month of project activities	1 - 2 - 3	4 - 5 - 6	7 - 8 - 9	10 - 11 - 12	1 - 2 - 3	4 - 5 - 6	7 - 8 - 9	10 - 11 - 12	1 - 2 - 3	4 - 5 - 6	7 - 8 - 9	10 - 11 - 12	1 - 2 - 3	4 - 5 - 6	7 - 8 - 9	10 - 11 - 12	1 - 2 - 3	4 - 5 - 6	7 - 8 - 9	10 - 11 - 12
WP1	**RS Algorithm Development**																				
D1.1	Space-time variability in lake optical properties								D1.1												
D1.2	Intercomparison and benchmarking of algorithms								D1.2		D1.2										
D1.3	Ensemble algorithm for global scale operation										D1.3										
D1.4	Extend ARC-Lakes LSWT data set								D1.4												
WP2	**Algorithm Operationalisation**																				
D2.1	Automated data processing Chain											D2.1									
D2.2	Consistent MERIS and Sentinel 3 data sets																D2.2				
D2.3	Operational Global Lakes Observatory													D2.4							
D2.4	Archived Data dissemination																				D2.4
D2.5	LSWT time series 1991-2007																				D2.5
WP3	**Climatic & Nonoclimatic Drivers**																				
D3.1	Selection of sentinel lakes	D3.1																			
D3.2	Datasets of long term trends in climatic variables			D3.2																	
D3.3	Characterisation of landcover/land use trends									D3.3											
D3.4	Modelling run off, sediment & nutrient inflow												D3.4								
D3.5	Hydromorphological alteration assessment							D3.5													
WP4	**Data Integration & Uncertainty Budgets**																				
D4.1	QA'd intercomparable and documented datasets								D4.1				D4.1								
D4.2	Measures of uncertainty on lake observations								D4.2												
D4.3	Uncertainties with catchmen and climate drivers		D4.3						D4.3		D4.3		D4.3								
D4.4	Measures of uncertainty on EO products												D4.4								
WP5	**Detecting Spatial and Temporal Patterns**																				
D5.1	Inventory of lake condition > 1000 global lakes												D5.1								
D5.2	Indentification of long term patterns of change																	D5.2			
D5.3	Identification of clusters of common signals																	D5.5			
D5.4	Identification of non conforming lakes																	D5.6			
WP 6	**Attributing Causes of Lake Response**																				
D6.1	Causes of coherence for different senssed lakes characteristics																				D6.1
D6.2	Causes of phenological change																				D6.2
D6.3	Factors controlling cyanobacterial blooms																				D6.3
D6.4	Assessment of factors controlling CDOM																				D6.4
WP 7	**Interpretation and forecasting Lake sensitivity**																				
D7.1	The identification of lake types vulnerable																				D7.1
D7.2	Cyanobactria risk under a range of scenarios																				D7.2
WP 8	**Apply Data for Lake Management**																				
D8.1	Stakeholder requirements and research capabilities	D8.1						D8.1					D8.1								D8.1
D8.2	UK wide understanding of change in lake condition	D8.2						D8.2					D8.2								D8.2
D8.3	Future threats to lakes at a global scale																				D8.3
D8.4	A sustainable future for Globolakes																				D8.4
Project Meetings (T = Teleconference; M = meeting)																					
	GloboLakes Team)	M	T	T	T	M	T	T	T	M	T	T	M		T	T	T	M	T	T	M
	Project Advisory Board	M				M				T			M					T			M
Dissemination of Outputs																					
DO.1	Project Web Site	DO.1																			
DO.2	News Letters	DO.2				DO.2				DO.2				DO.2				DO.2			DO.2
DO.3	Publications																				
Impact Plan																					
DI.1	Project launch	DI.1																			
DI.2	End User Workshops	DI.2											DI.2								DI.2
DI.3	Partners Workshop Calibration	DI.3							DI.3				DI.3								DI.3
DI.3	Partners Workshop Validation												DI.4				DI.4				DI.4
DI.4	Secondments				DI.5					DI.5								DI.5			

KEY — Workpackage effort — D1.1 — Timing of individual components and month of deliverable, i.e. D1 (e.g. start, mid or end quarter)

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What is the workpackage?

Objectives:

7.1: To test the sensitivities of generic lake types to different drivers of change (climate and non-climate)

7.2: To predict the future response of phytoplankton in different landscape settings e.g. develop regional maps of future cyanobacteria risk

PROTECH

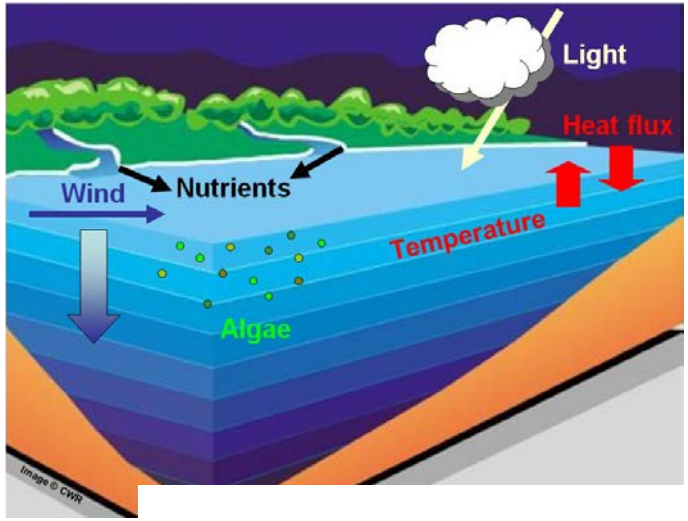
(Phytoplankton RespOnses To Environmental CHange)

Language: Fortran77

History: It was developed over the last two decades in CEH by C.S. Reynolds, A.E. Irish and J.A. Elliott

Publications: Over 40 peer-reviewed publications and over 30 commissioned reports

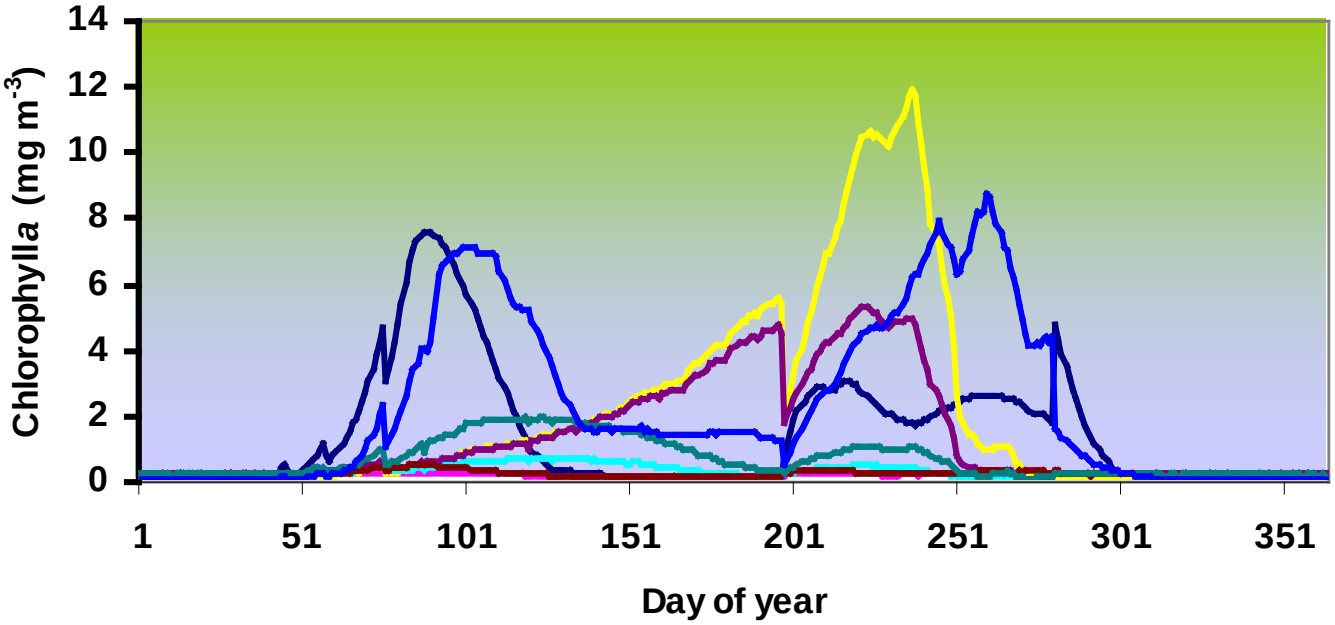
PROTECH



PROTECH

Up to 8 phytoplankton species
• 1 zooplankton group

Community simulation



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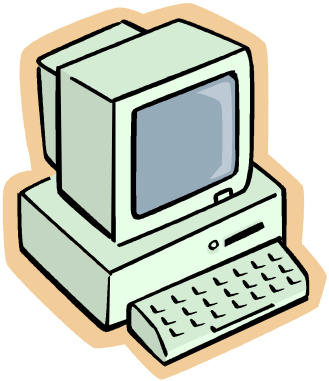
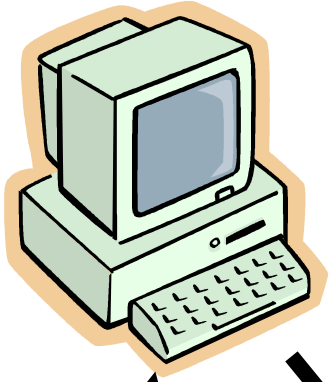
Proposed methodology

Present day



Regional Climate Model



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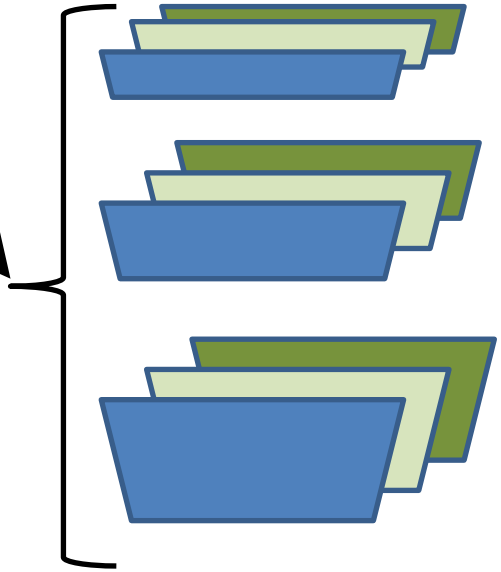

Lake types

Weather scenarios

Cloud

Wind

Air temperature

Flow

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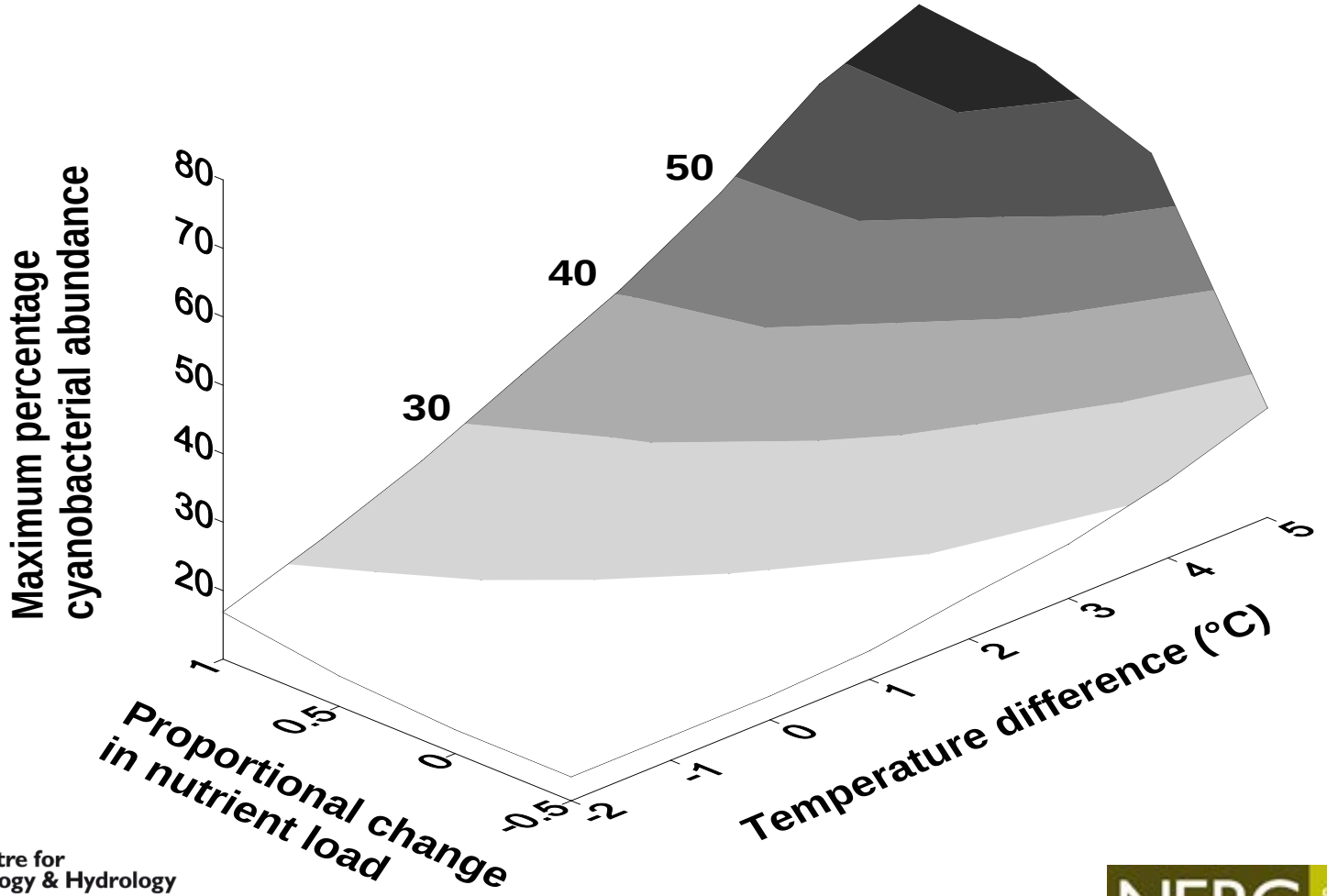
Proposed methodogy

Response surface



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Proposed methodology

Use response surfaces (total chlorophyll, bloom timing and cyanobacteria biomass) to characterise sensitivity

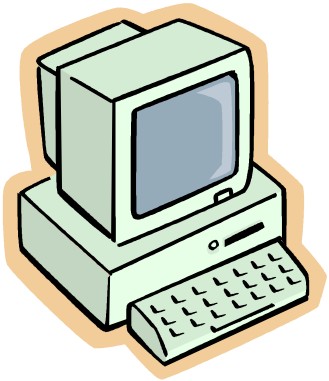
Lake types that are close to observed lakes can be used to compare model outputs

Finally, repeat method for climate change RCM drivers (e.g. IPCC A1, A2 and B2 scenarios)

Proposed methodology

FUTURE (2070-2100)

Regional Climate Model



Weather scenarios

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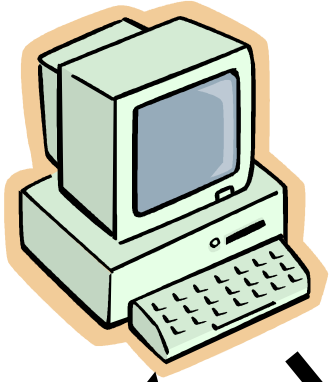

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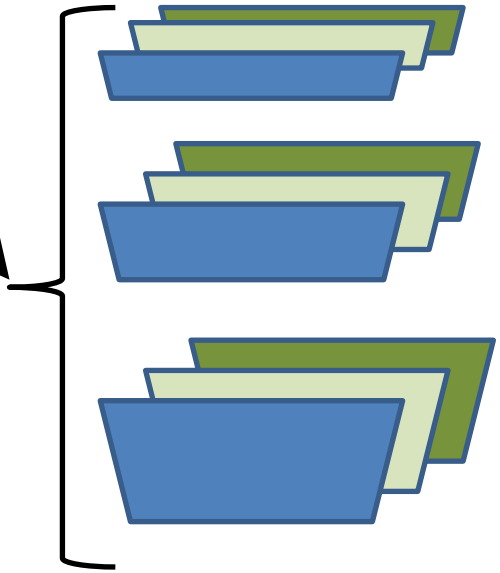

Lake types

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Deliverables

D7.1: For each region, the identification of lake typologies particularly vulnerable to climate change

D7.2: Regional maps of cyanobacteria water quality risk under a range of scenarios