

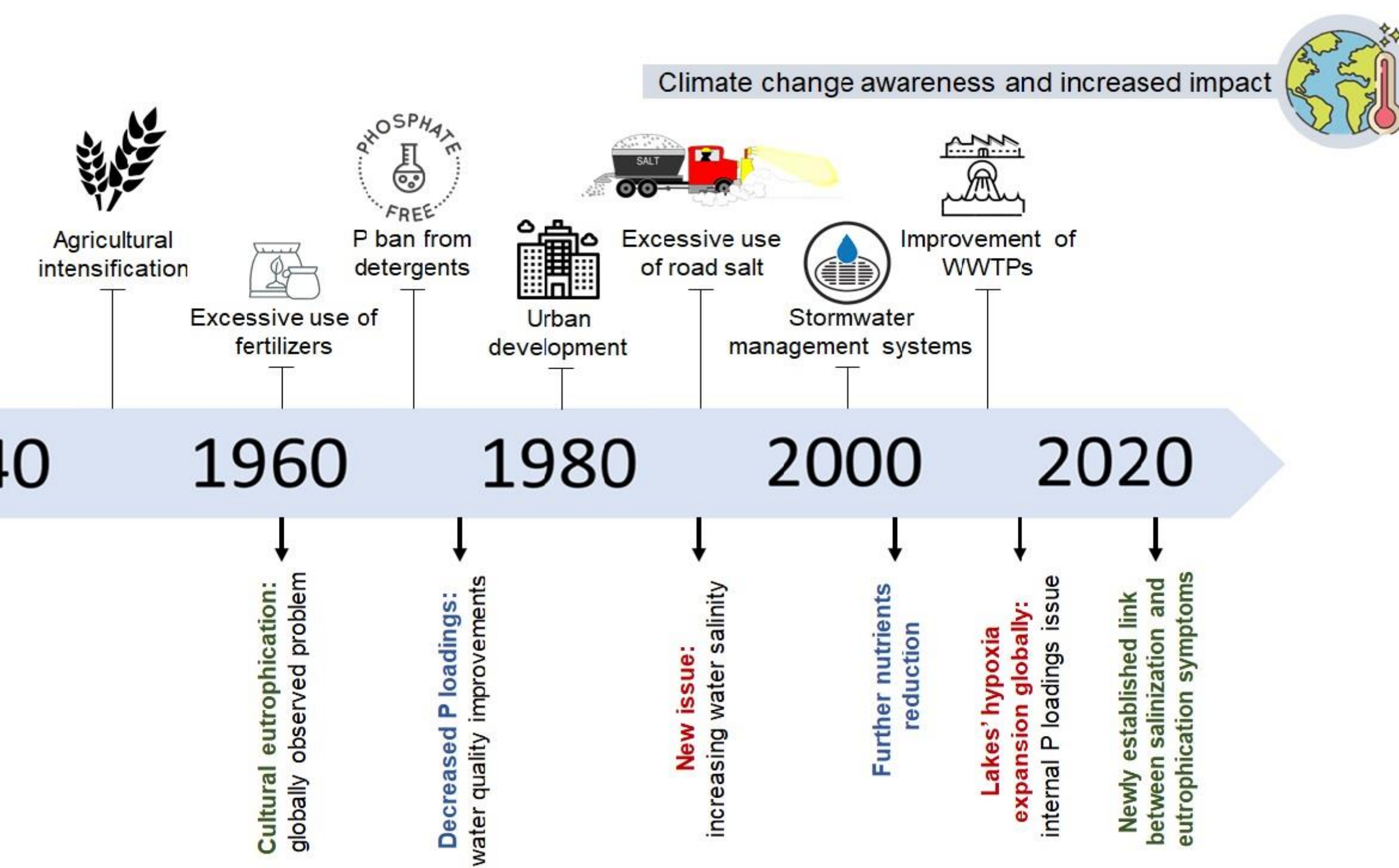
Salinization intensifies eutrophication symptoms in freshwater lakes of North America

Jovana Radosavljevic¹, Stephanie Slowinski¹, Bowen Zhou¹, Fereidoun Rezanezhad¹, Lewis Alcott¹, Mahyar Shafii¹, Chris T. Parsons¹ & Philippe Van Cappellen¹

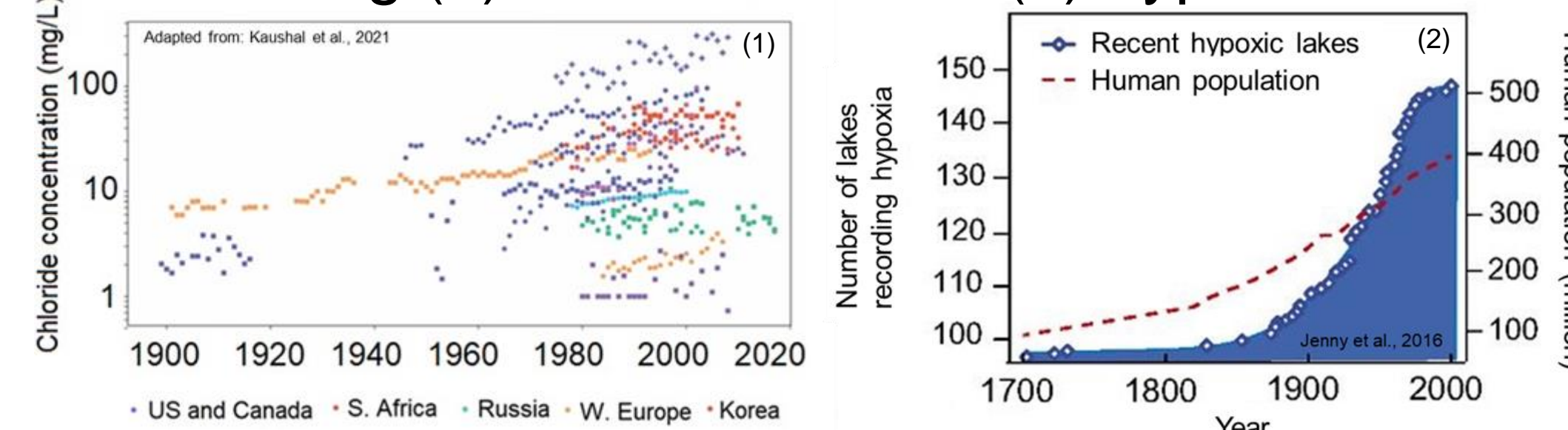
¹Ecohydrology Research Group, University of Waterloo, Waterloo, Ontario, Canada

²Environment and Climate Change Canada, Canada Center for Inland Waters, Burlington, Ontario, Canada

Motivation & Objective

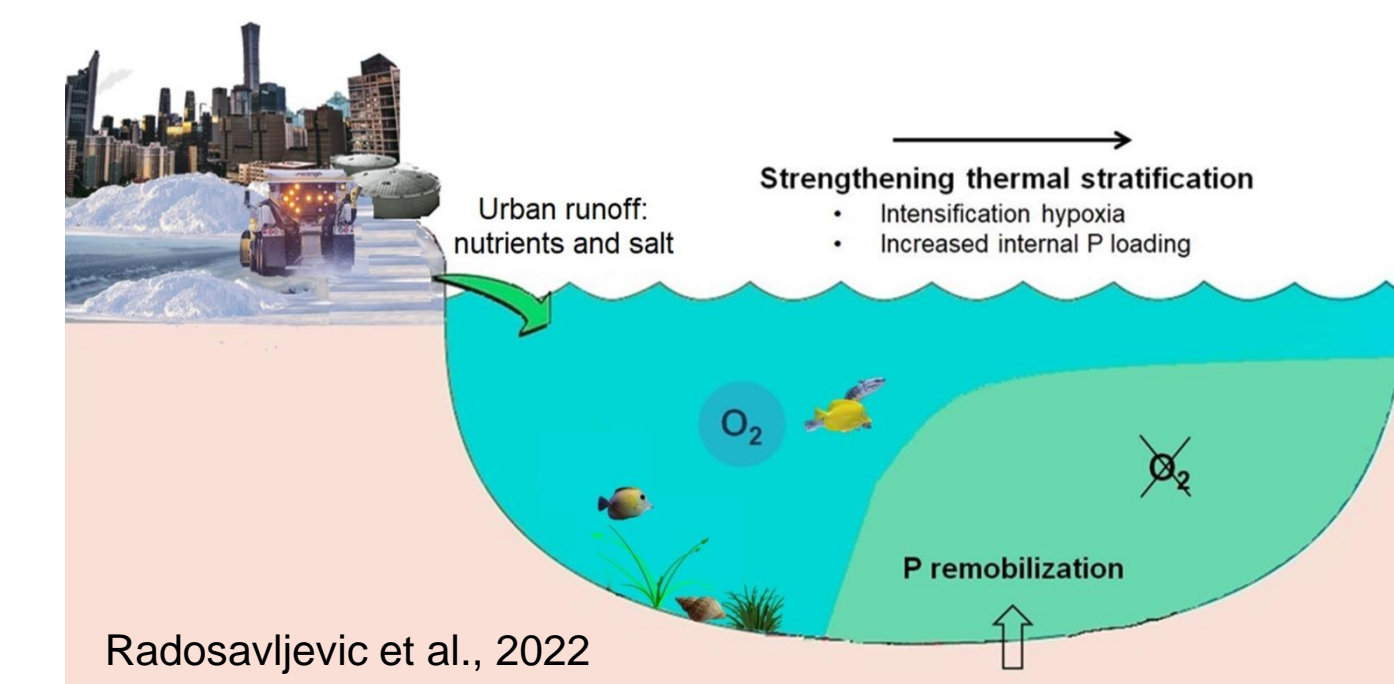


Recent global trends (lakes): Increasing (1) salinization and (2) hypoxia



- Salinization → cold climate urban regions are most vulnerable due to excessive use of the road salt.
- Negative effects of elevated salinity in lakes:
 - impairs ecosystem health
 - modifies water chemistry
 - increases thermo-stratification and promotes anoxic conditions → affect nutrient cycling

- Eutrophication → due to external phosphorus (P) enrichment of freshwater lakes.
- Eutrophication symptoms:
 - occurrences of harmful algae
 - oxygen depletion (hypoxia or anoxia)
 - P remobilization from sediments (i.e., internal loading)
- Salinization amplifies eutrophication symptoms

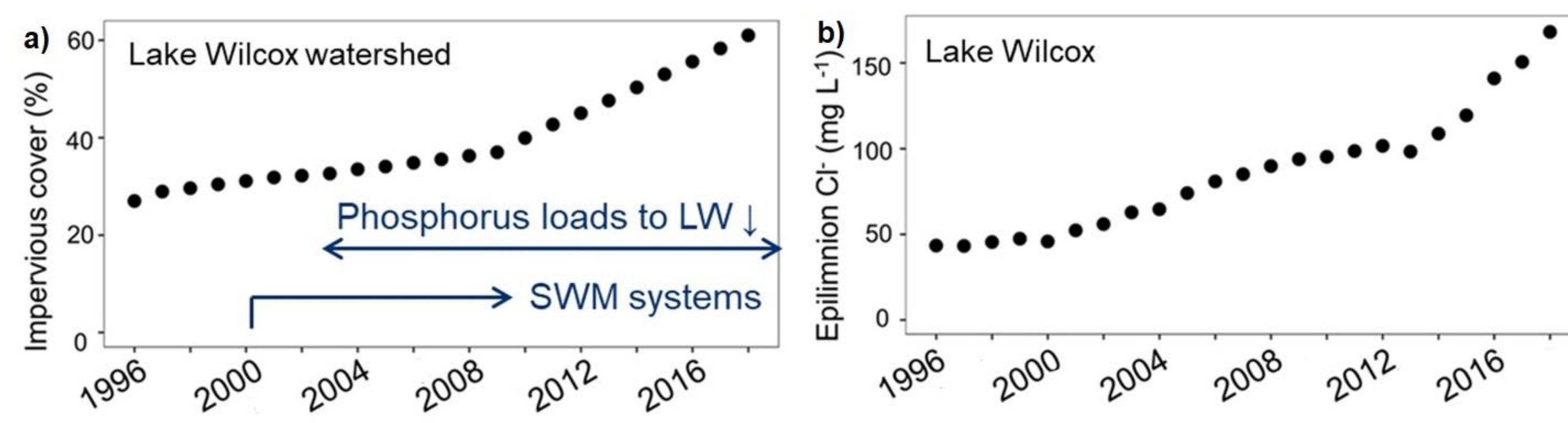


Objective:
Assessing impact of salinization on eutrophication symptoms of freshwater lakes across North America

Findings

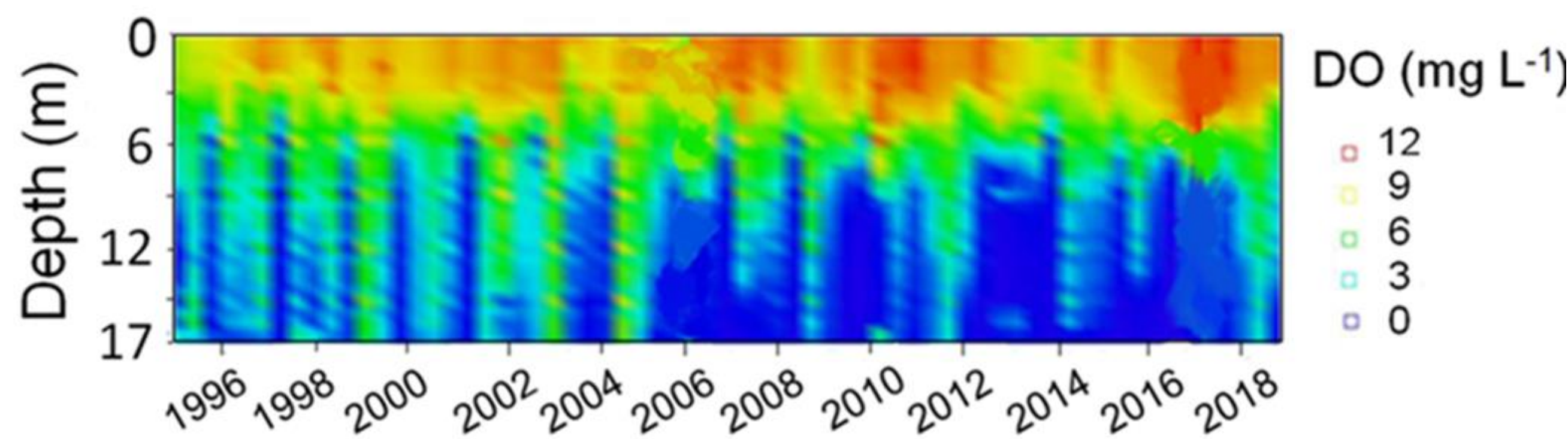
➤ Comprehensive analysis of eutrophication symptoms in Lake Wilcox (Ontario, Canada)

➤ Salinization correlates with urbanization



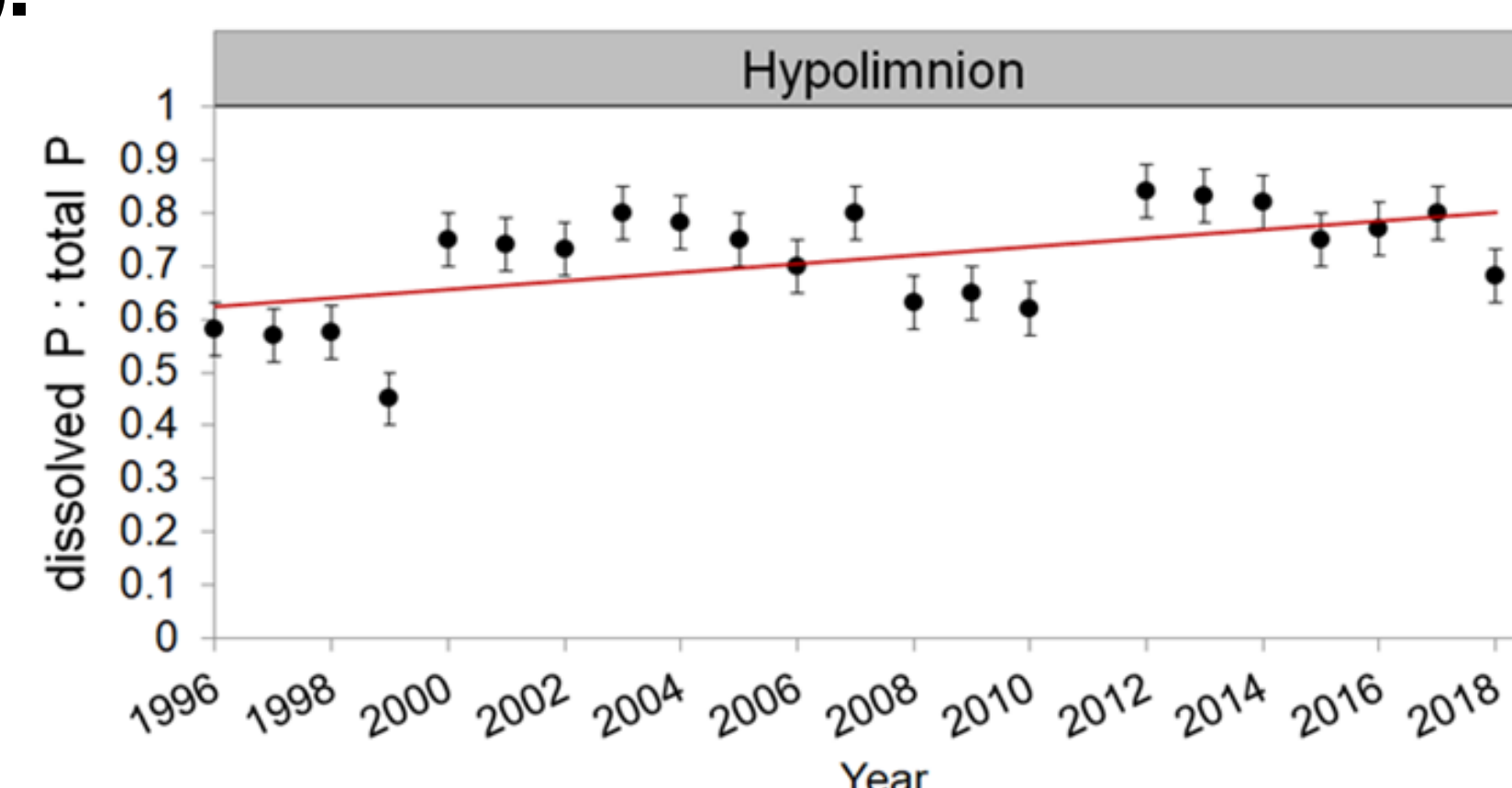
Timeseries of increasing of imperviousness in the Lake Wilcox watershed (a) and concentrations of chloride in Lake Wilcox from 1996 to 2018 (b).

➤ Rising salinity promotes water column stratification (Brunt-Väisälä frequency) → lengthening anoxic periods from 2005 on



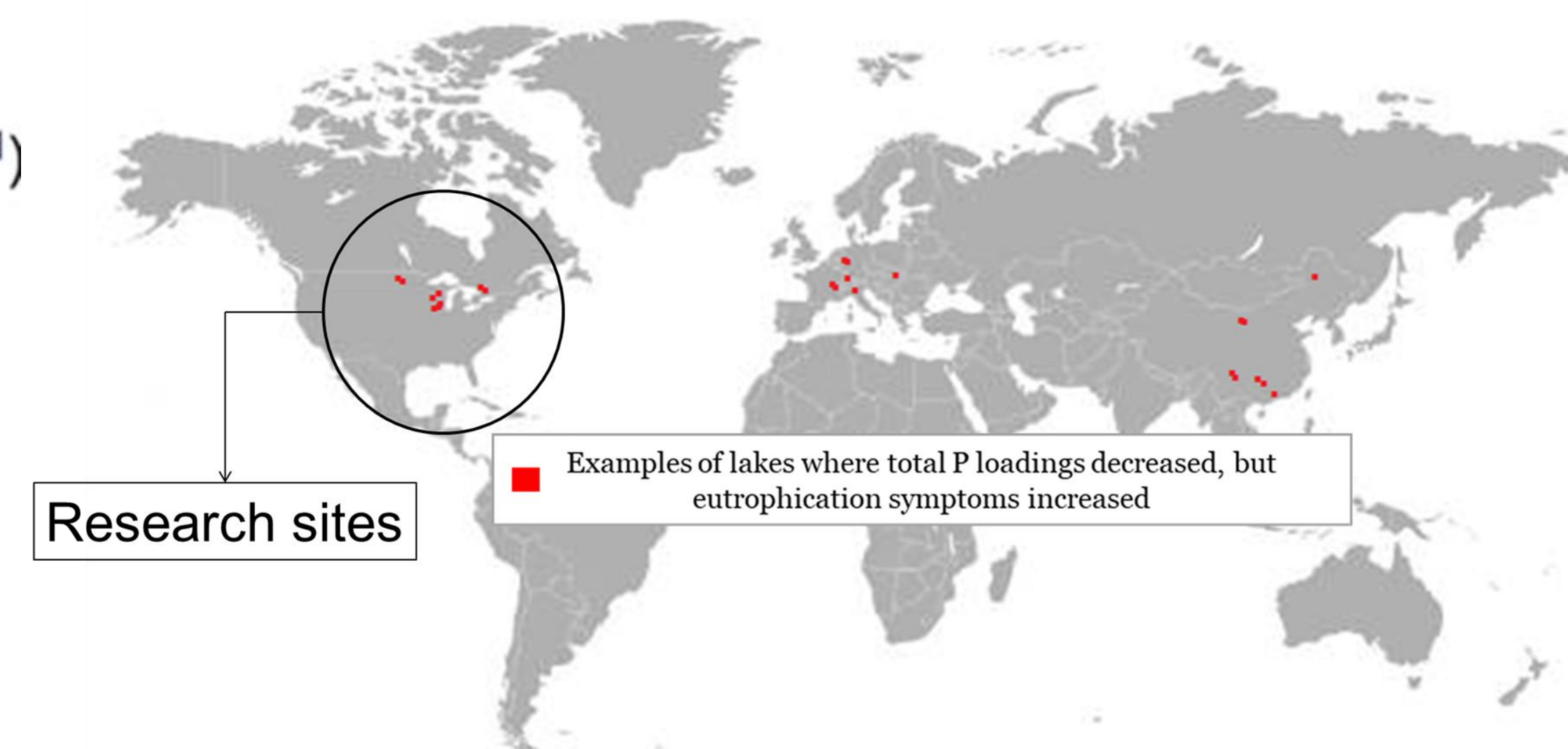
Heat map showing changes with depth and time in water column dissolved oxygen (DO).

➤ Anoxic conditions favor P remobilization from sediments: increased contribution of bioavailable dissolved inorganic phosphorus (DIP) to total P (TP).

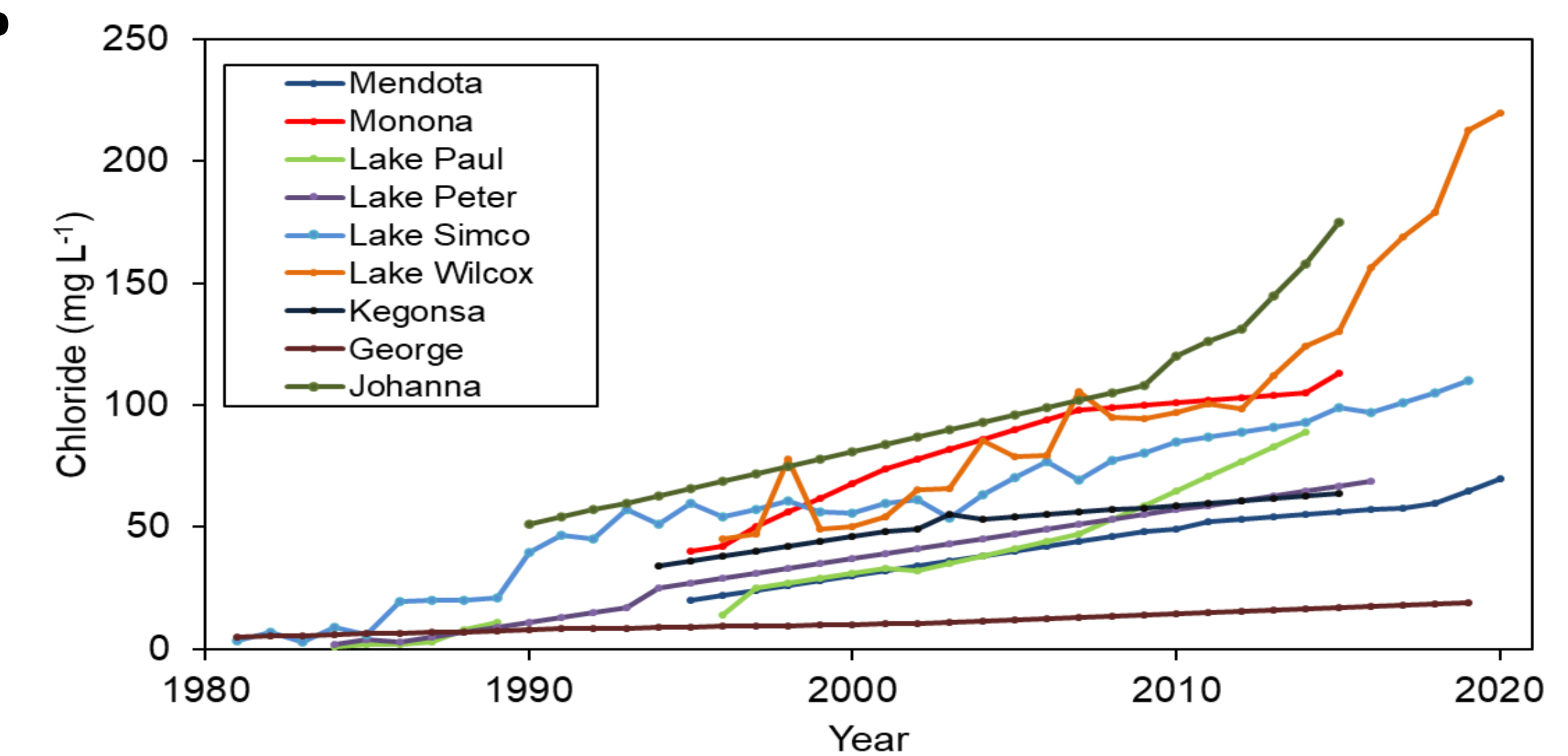


Time series of DIP:TP ratios hypolimnion.

➤ Lower P external inputs, yet, in many lakes, eutrophication symptoms persist

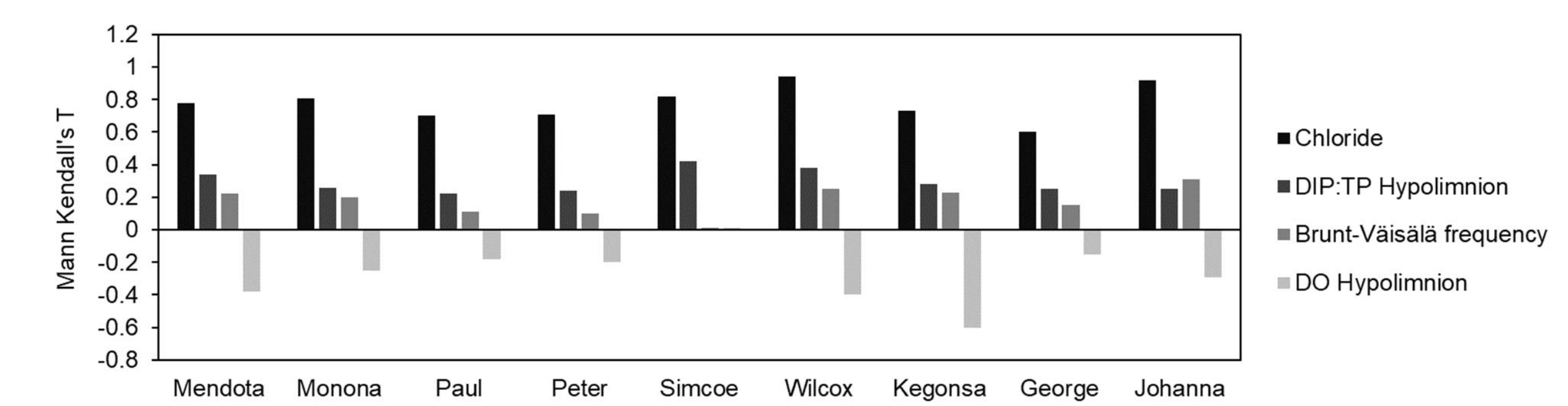


➤ Temporal increase in lake salinization due to excessive use of road salt



Time series of chloride concentrations.

➤ Salinization amplifies stratification → eutrophication symptoms in freshwater lakes of North America



Trend analysis for North American lakes.