When is Simple Good Enough? Identifying regions in the Gulf of Saint Lawrence with a complicated relationship between depth and oxygen.

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Abstract

INTRODUCTION: Oxygen concentration is a fundamental feature of ocean health. Over the last few decades, autonomous underwater gliders have become a powerful tool for measuring oxygen concentration, as well as many other oceanographic variables. Although more efficient than traditional methods, these gliders still require considerable resources to operate. It is therefore crucial that they focus on regions where the variables being measured are least understood.

Our work serves to identify regions in the Gulf of Saint Lawrence that are worst explained by simple statistical models. These regions offer natural targets for future missions, and their identification should help oceanographic researchers make better use of their limited resources.

METHODS: We first divide the gulf into rectangular bins, then fit several models of varying complexity to describe the relationship between depth and oxygen concentration within each bin. More specifically, we fit linear (simple) and spline (complex) models, both either with or without an effect that differs across missions (a proxy for time). Finally, we compare the goodness-of-fit between simple and complex models and plot the results.

RESULTS: We successfully identify regions that are substantially better explained by a complicated model than a simple one. Equally importantly, we identify regions where simple and complex models have similar explanatory power. Both the simple and complex regions tend to group together into macro-regions that are more easily targeted by future missions.

CONCLUSIONS: Our work separates regions of the Gulf into those with simple or complex relationships between oxygen concentration and depth. This helps oceanographic researchers devote resources to areas with more opportunity for discovery, thereby making more efficient use of limited glider time and expediting the rate of new discoveries.

Methods

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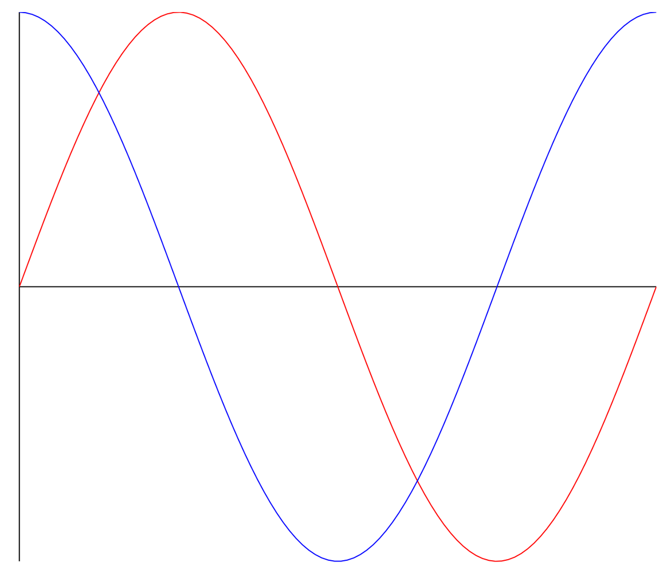

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