Progress on geographically-isolated simulation (geo-runs)

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Modeling Working Group Quarterly Review

08/09/2017

Introduction

1. Geo-runs: Keep the nutrient loading constant at the TMDL level everywhere, except for a specific geographic location where N-load increased by 1 million pounds annually, P-load by 0.1 million pounds and sediment by 50 million pounds (if needed), respectively; to determine the change in DO 25th percentile in each segment-designated use.
2. The geo-locations are above or below fall line, which can be further divided into tidal fresh and non-tidal fresh regions (if needed) for each major basin.
3. Loading source include non-point source and point source (if needed), respectively.
4. In total we may have several hundred scenarios to run.
5. We have to do this with the final version of the WQSTM model, but we will have limited time to accomplish the task.
6. The solution is to use the Amazon cloud.

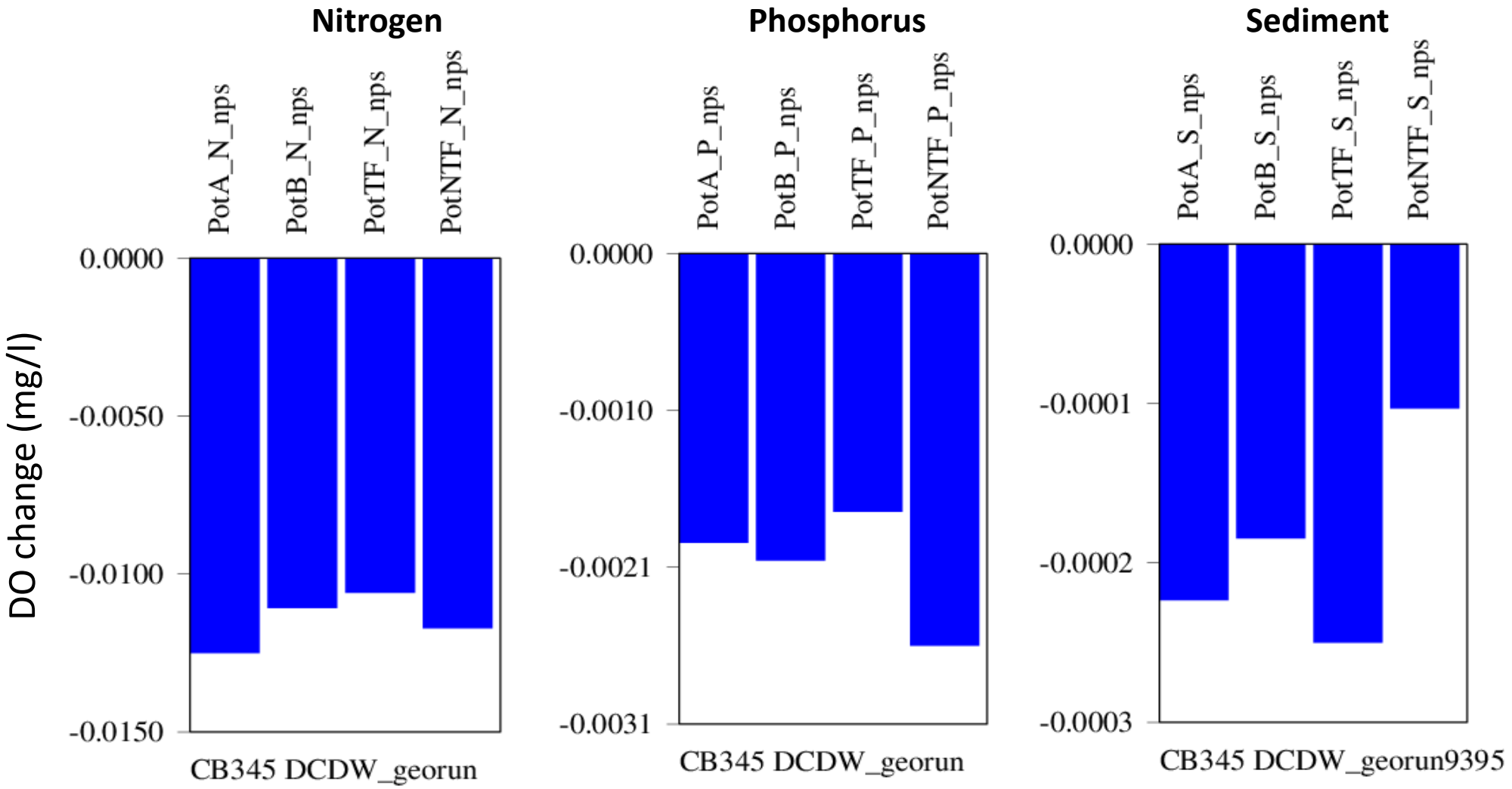
The cloud

1. Provide “unlimited” (satisfactory) computation power for this case.
2. Each node has 36 processors.
3. Run all the scenarios simultaneously, each on a single processors (ca, 2-3 weeks).
4. The present task is to implement the WQSTM on the cloud and conduct test run.

Test run

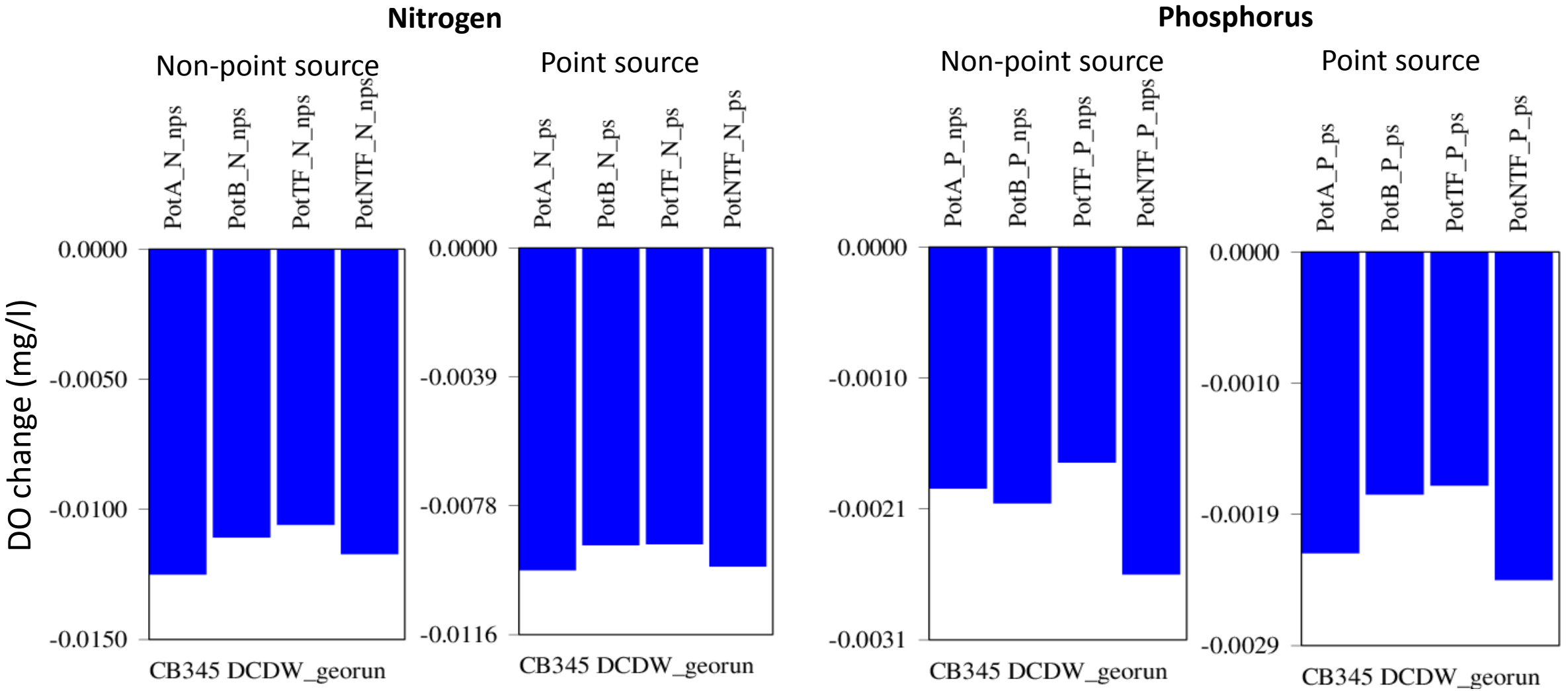
1. Code: Beta 4
2. Test major basin: Potomac River.
3. Geographic locations: Above/Below fall line; Tidal fresh/Non-tidal fresh.
4. Source: Non-point source and point source, respectively.
5. Elements: N, P and Sediment.
6. In total: 25 scenarios including base case (Beta4_WIP2).

Element and geographic comparison of non-point source loading



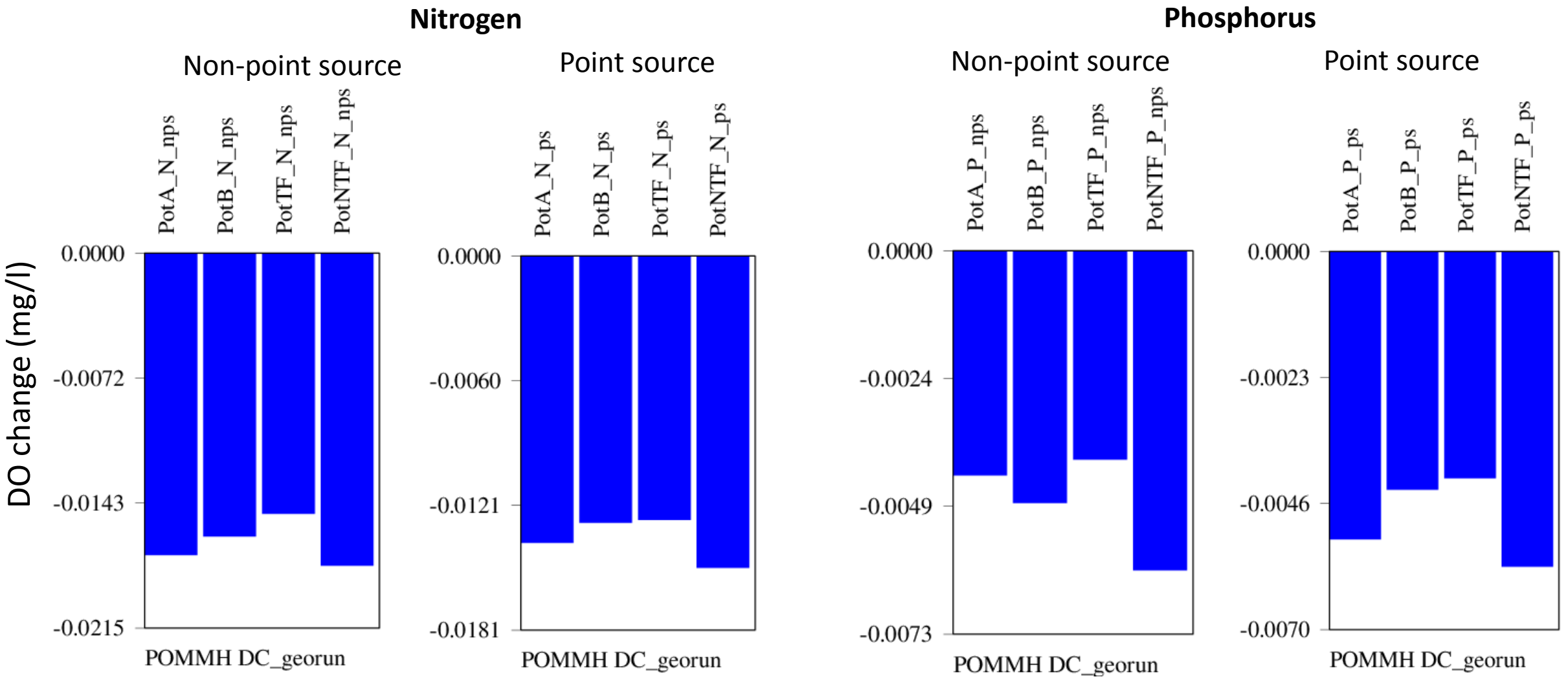
P is ca. 20% of N; Sediment is ca. 2% of N

Point source versus non point-source



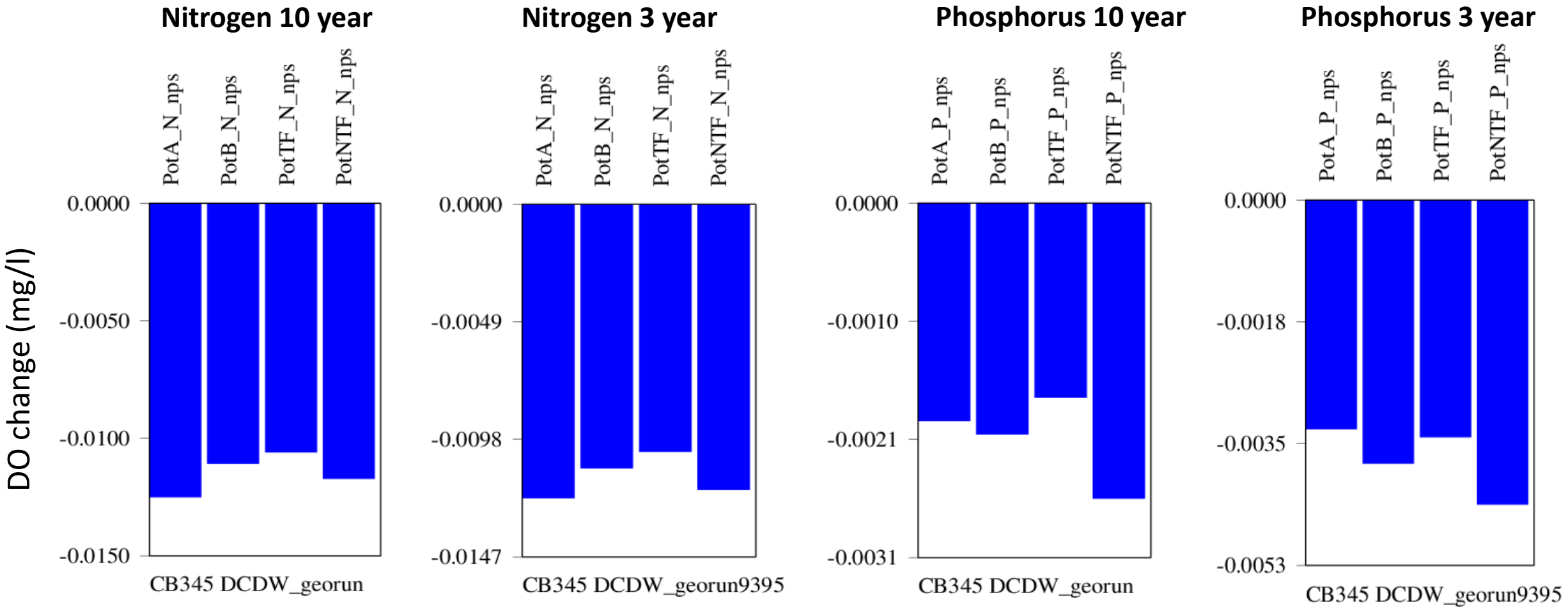
N point source is ca. 20% lower than non point source, but P is about the same.

Local response in Potomac deep channel



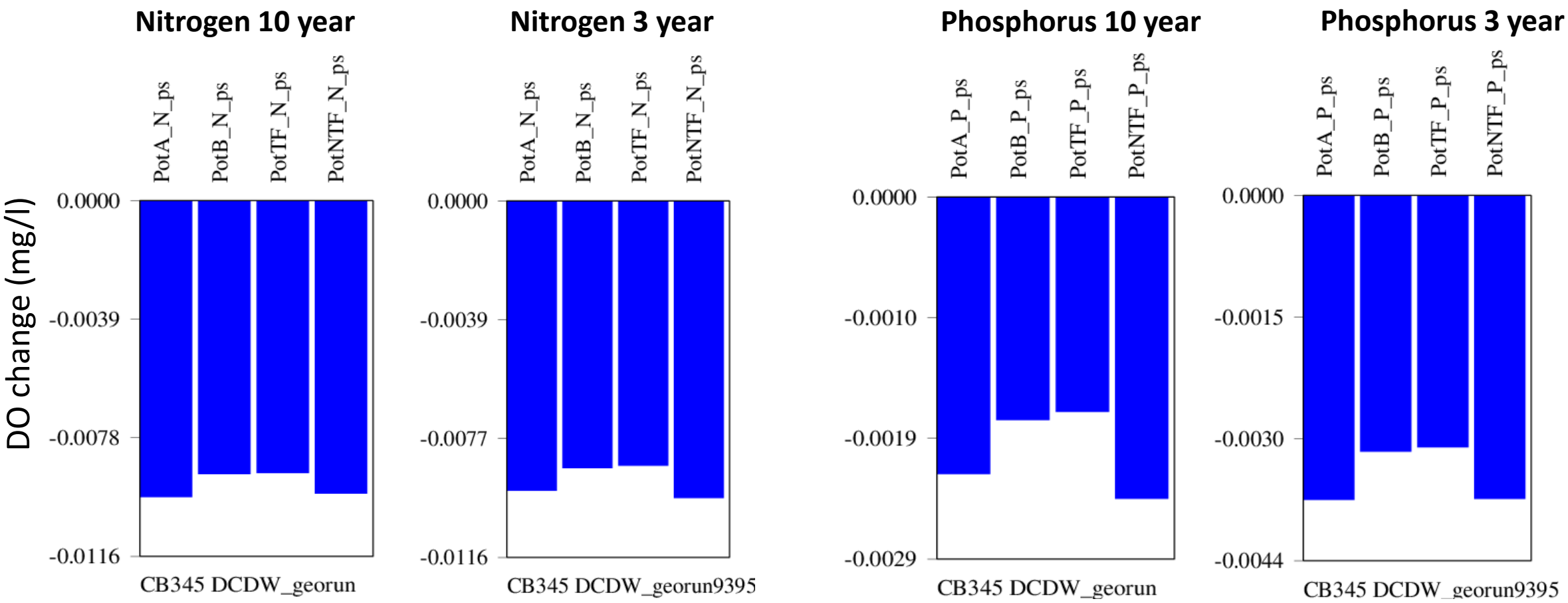
N is ca. 40% higher than in the main stem, P more than double

Non-point source comparison between 10-year and critical period (1993-1995) method



N is similar, P is ca. 80% higher in the critical period than over 10 years.

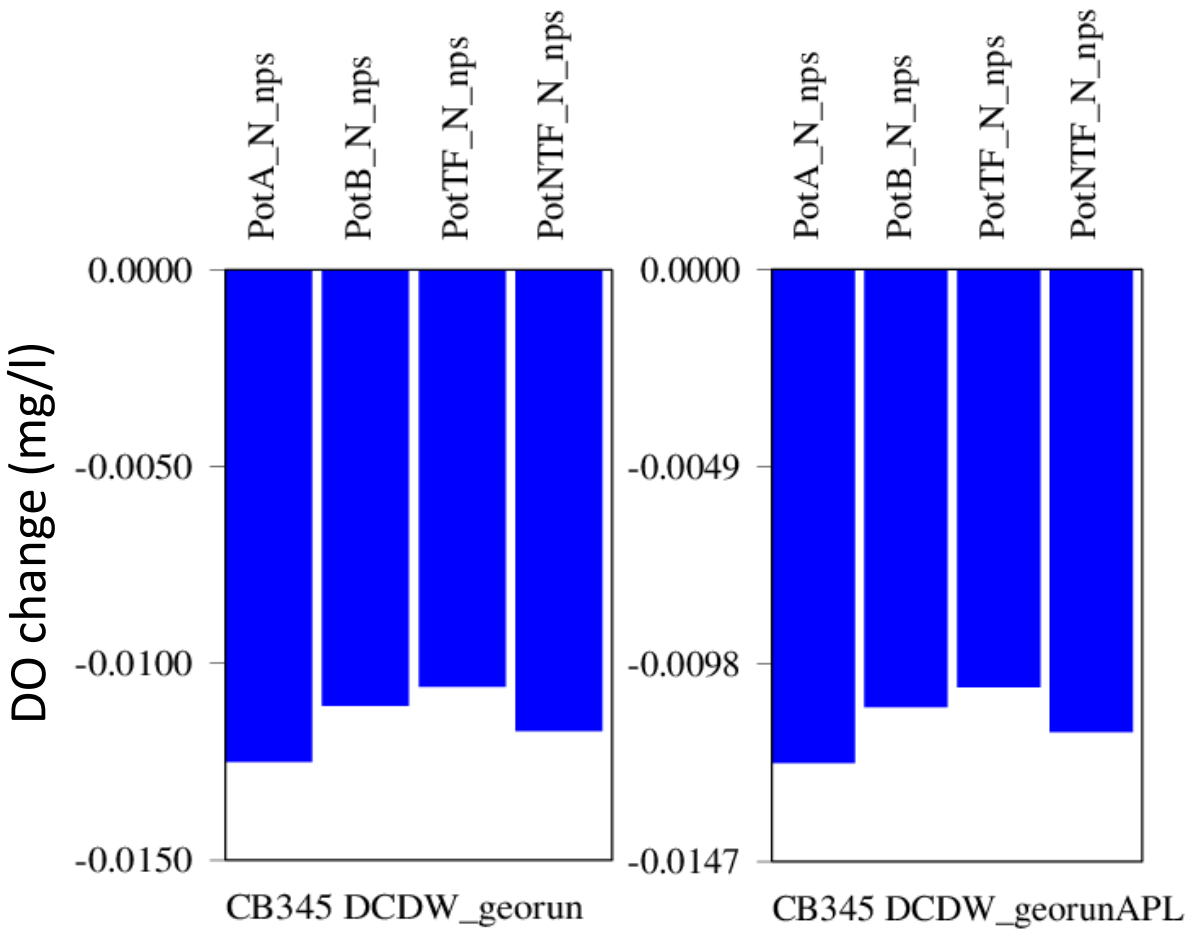
Point source comparison between 10-year and critical period (1993-1995) method



N is similar, P is ca. 80% higher in the critical period than over 10 years.

Non-point source comparison between hourly and daily data method

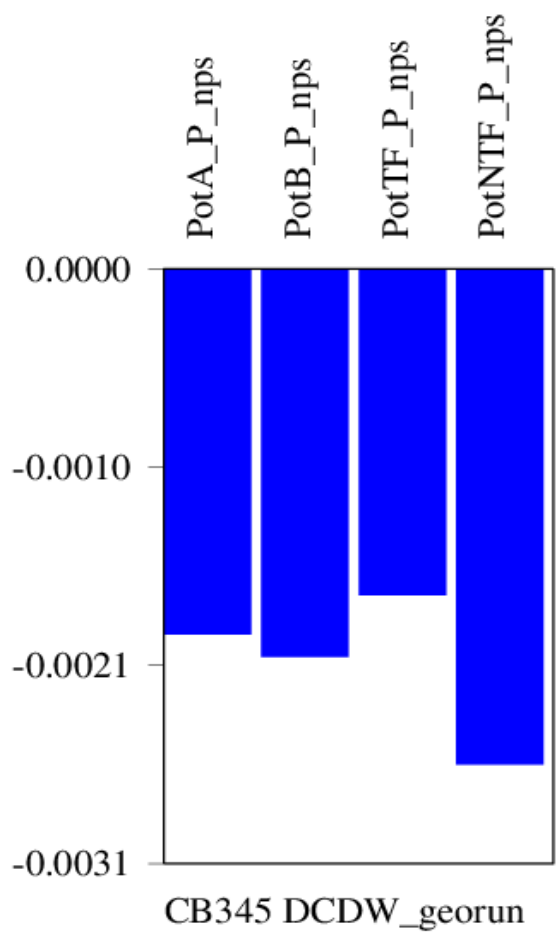
Nitrogen hourly



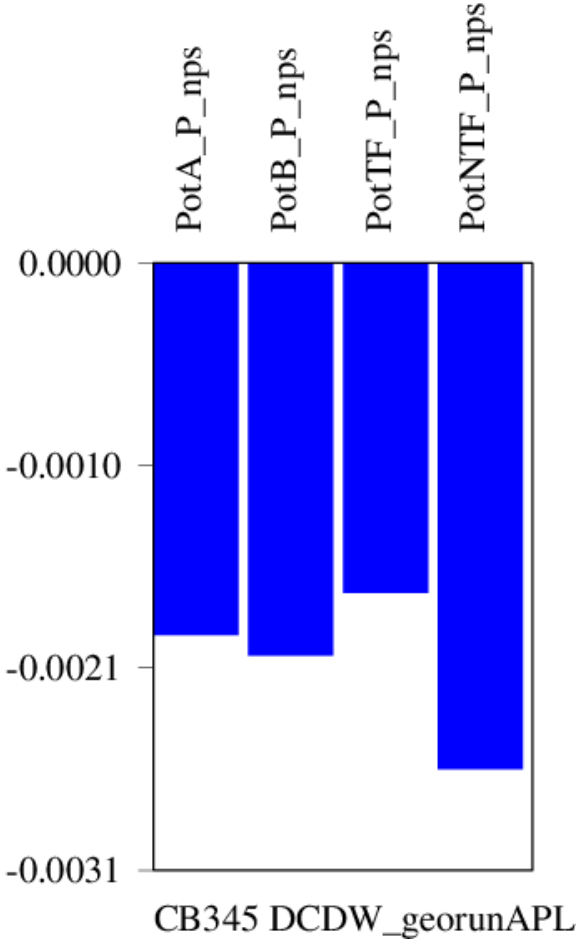
Nitrogen daily

Quite similar.

Phosphorus hourly

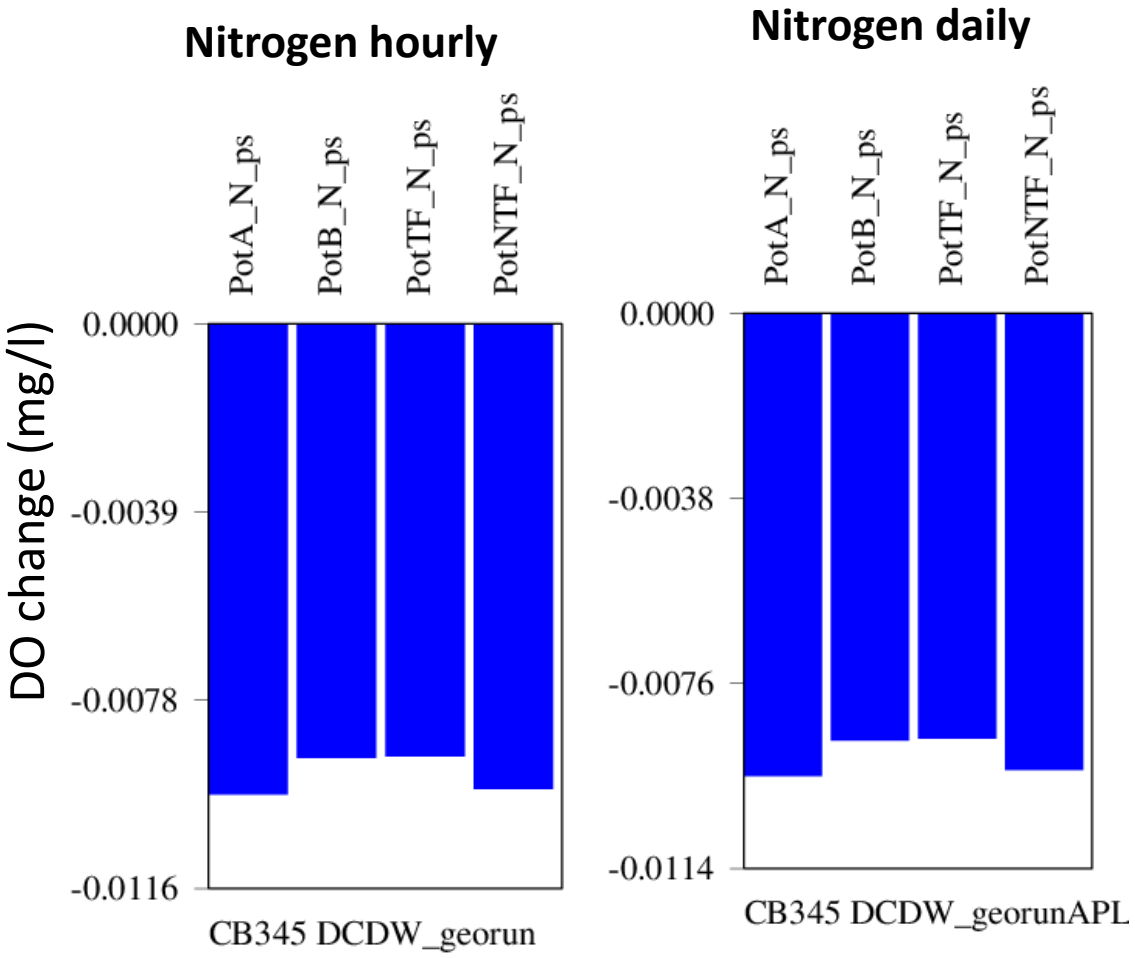


Phosphorus daily

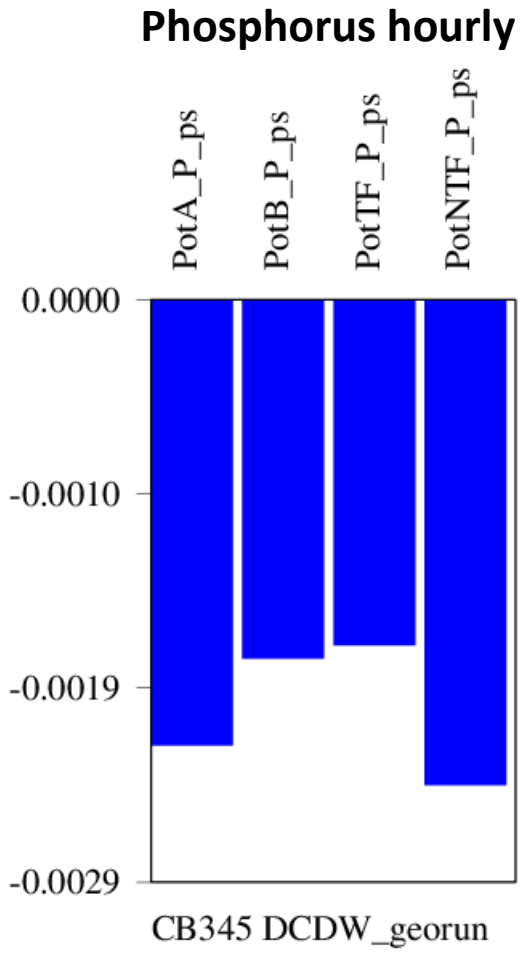


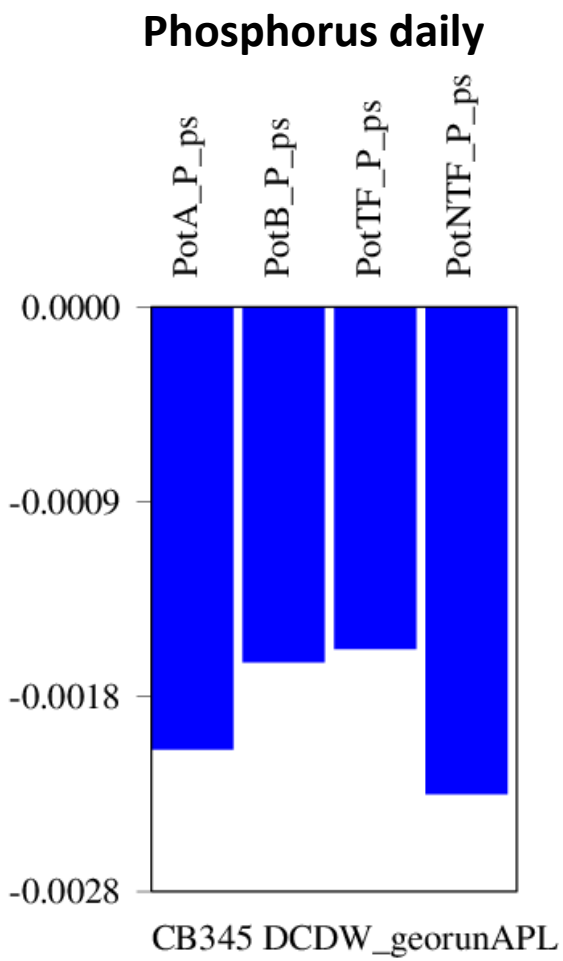
Quite similar.

Point source comparison between hourly and daily data method



Quite similar.





Quite similar.

Summary

Factors determining geo-runs:

- **Management needs.**
- **Sensitivity to load.**
- **Deadline.**
- **Computation power.**

Operation:

- **Daily data based analysis?**
- **N, P?**
- **Major basins and major costal segments?**