**Model-data assessment of Scotian Shelf carbon dynamics: A spatially varied and biologically active system**

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**Transport Processes**

- **Fig. 1:** Map of Atlantic Canada outlining the model domain. The red star indicates the location of STN 2. Observation points indicate observations from a CARIOCA buoy located at STN 2 (1999-2014) and the blue line indicates the model output at the same location (1999-2014).

- **Fig. 2:** Seasonal cycle of surface pCO2 at STN 2 (location indicated by red star in Fig. 3). Red points indicate observations from a CARIOCA buoy located at STN 2 (1999-2014) and the blue line indicates the model output at the same location (1999-2014).

- **Fig. 3:** Top panel shows transects from the Atlantic Condor vessel (location shown in Fig 5; Feb - July 2018) and bottom panel shows modelled weekly snapshots across the shelf and throughout the year.

**Biological Processes**

The Scotian Shelf is characterized by a large spring bloom that occurs rapidly in late-March/early-April, as noted by chlorophyll in Fig 2. The spring bloom is reflected by a dramatic drawdown of pCO2 (Fig 3). After the spring bloom, the seasonality of the pCO2 is dominated by temperature changes.

**Numerical Model**

- **Fig. 4:** Map of Atlantic Canada outlining the model domain. The red star indicates the location of STN 2. Observation points indicate observations from a CARIOCA buoy located at STN 2 (1999-2014) and the blue line indicates the model output at the same location (1999-2014).

**Motivation**

- Continental shelves are thought to disproportionately contribute to global air-sea CO2 fluxes.
- Continental shelves are also highly dynamic, with many factors controlling carbon dynamics, both internally (e.g., biological processes) and externally (e.g., transport onto, off of or along the shelf).

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**Questions**

- **How are biological processes impacting the carbon dynamics on the Scotian Shelf?**

- **How are transport processes impacting the carbon dynamics on the Scotian Shelf?**

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**Summary**

- Scaling up one station does not explain the entire Scotian Shelf since both biological and transport processes are playing important roles in Scotian Shelf carbon dynamics.
- Our model helps to interpret observations and mechanistically understand the pCO2 dynamics.
- Next steps will investigate into the more persistent spatial variability observed throughout the year.