

Using the VLIZ ICOS station measurements to assess the carbonate chemistry of the Belgian part of the North Sea



Coraline Leseurre¹, Hannelore Theetaert¹, Michiel T'Jampens¹,

Silke Verbrugge¹, Tom Van Engeland¹ and Thanos Gkritzalis¹

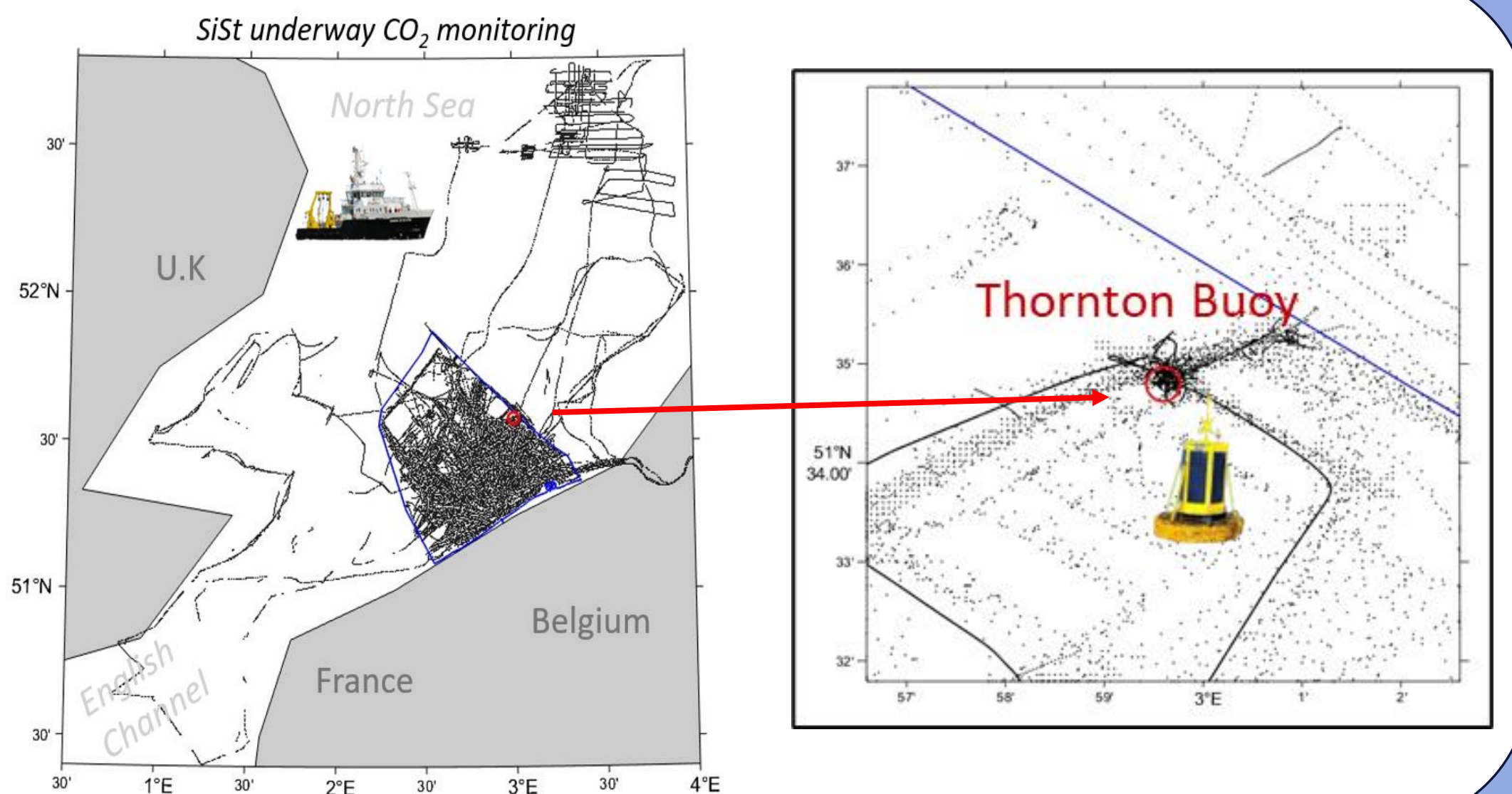
¹Flanders Marine Institute, VLIZ, Oostende, Belgium

hannelore.Theetaert@vliz.be, coraline.Leseurre@vliz.be

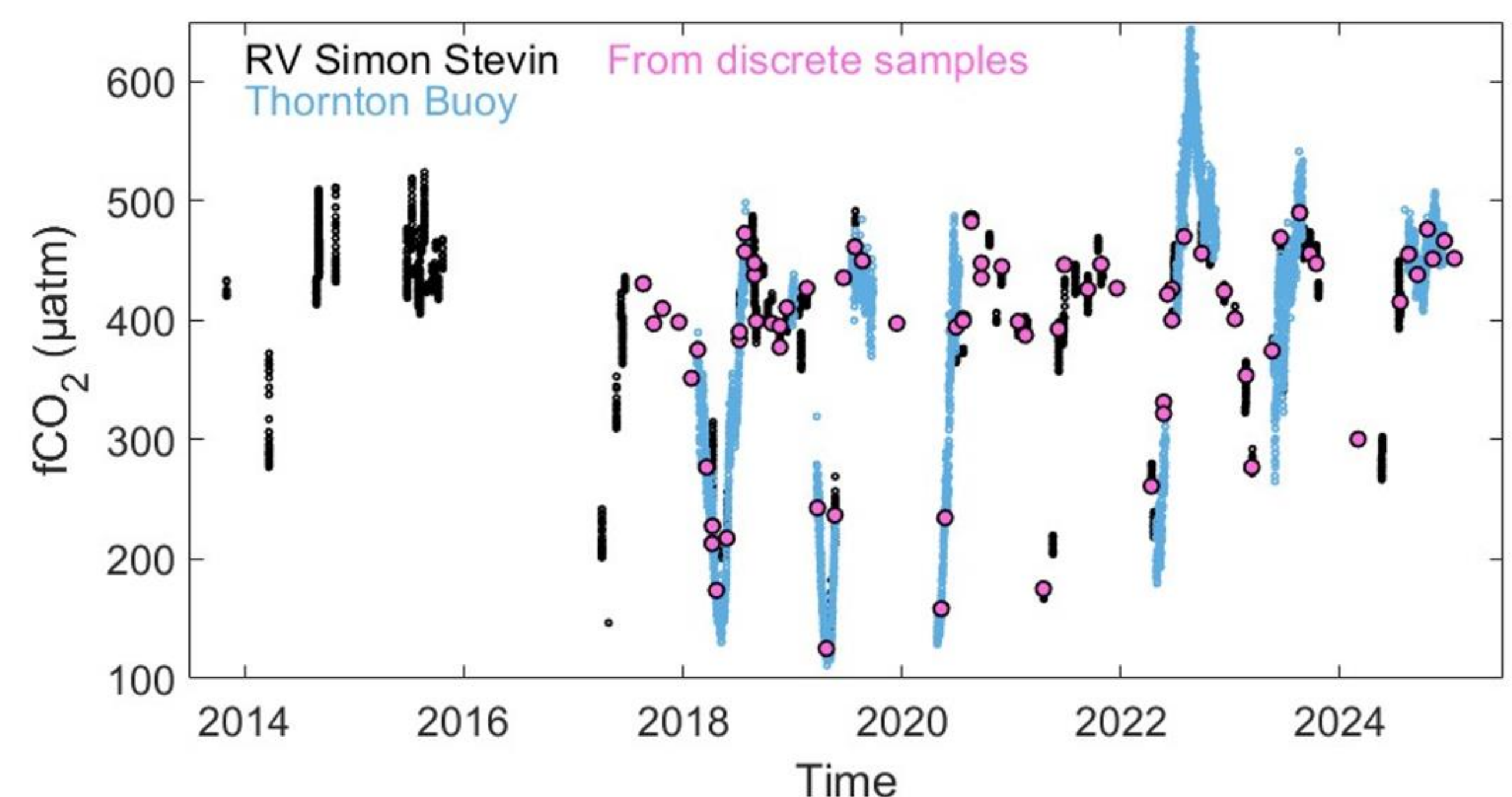
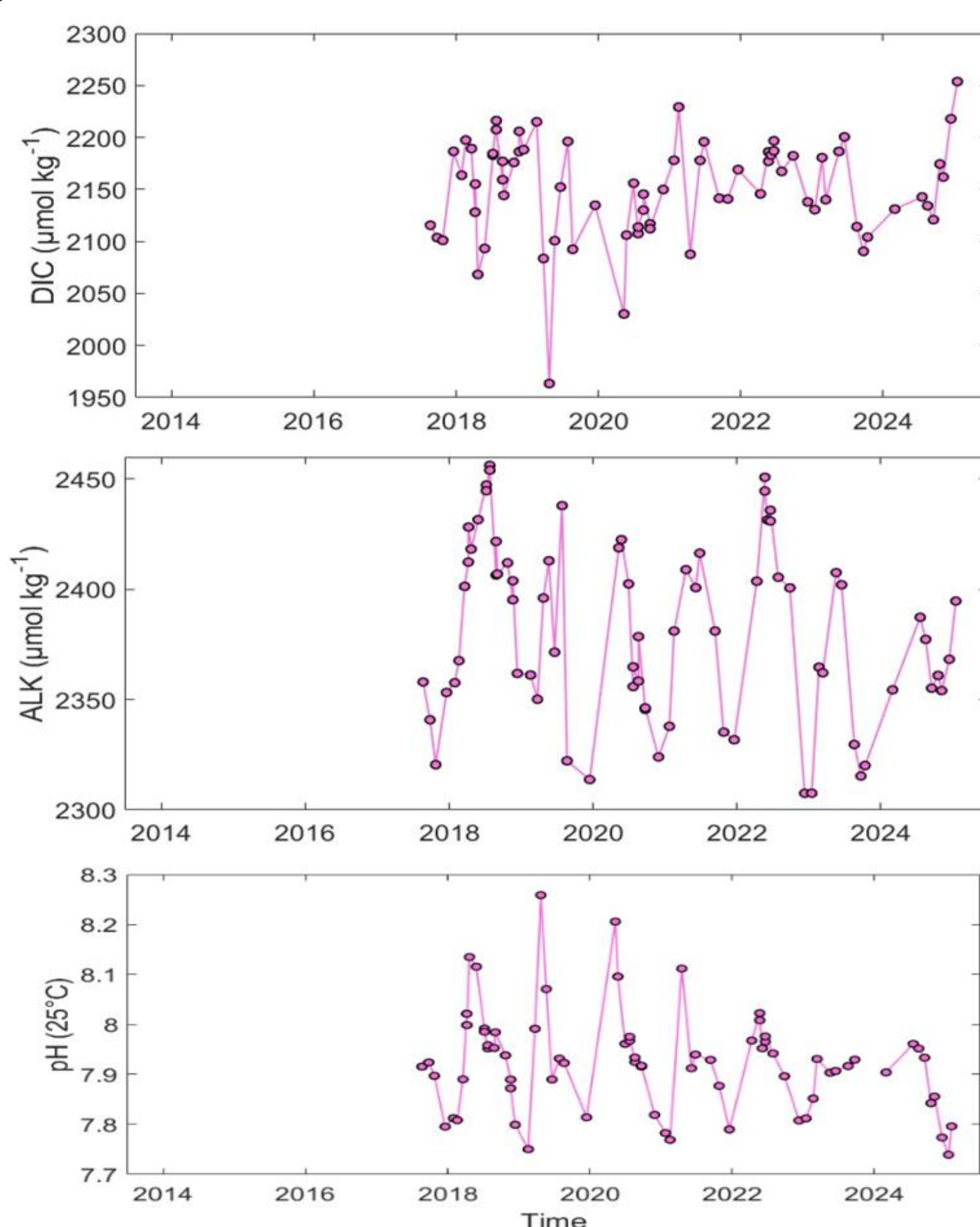


Background and objectives

- Over the last 8 years VLIZ has collected data from discrete samples (pH, Dissolved Inorganic Carbon (DIC), Total Alkalinity (TA or ALK)) and two ICOS coastal stations,
 - BE-SOOP-Simon Stevin
 - BE-FOS-Thornton Buoy (seawater CO₂ concentration).
- These data are an invaluable source to identify how the carbonate chemistry and air-sea carbon fluxes can be used to determine whether the coastal environment acts as a source or sink of CO₂ and assess the acidification state.
- More specifically, we will present the temporal evolution of pH, DIC, TA, seawater CO₂ concentration and air-sea CO₂ fluxes from the gathered data since 2014.

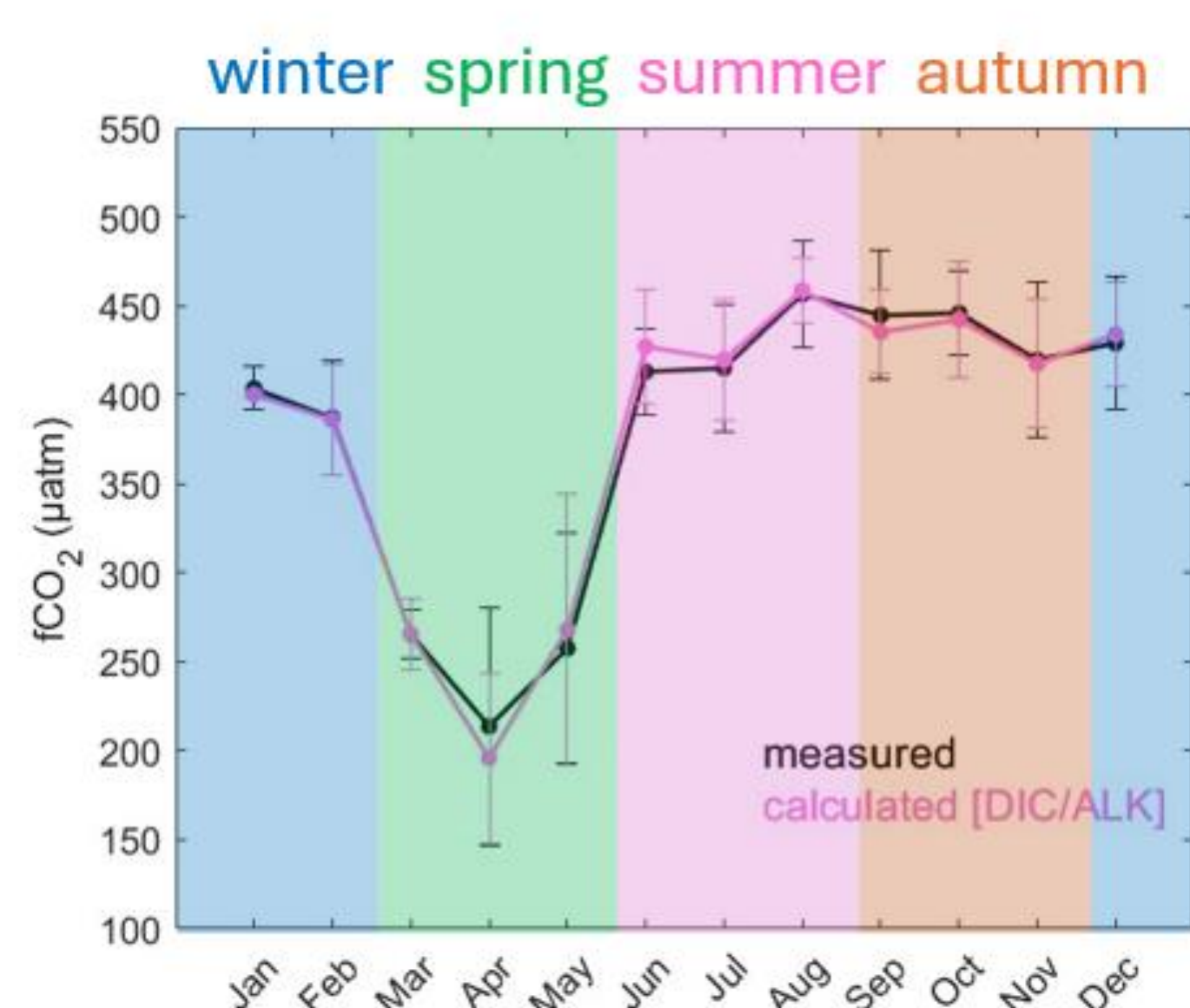


Results from the discrete samples and measurements of RV Simon Stevin and Thornton buoy



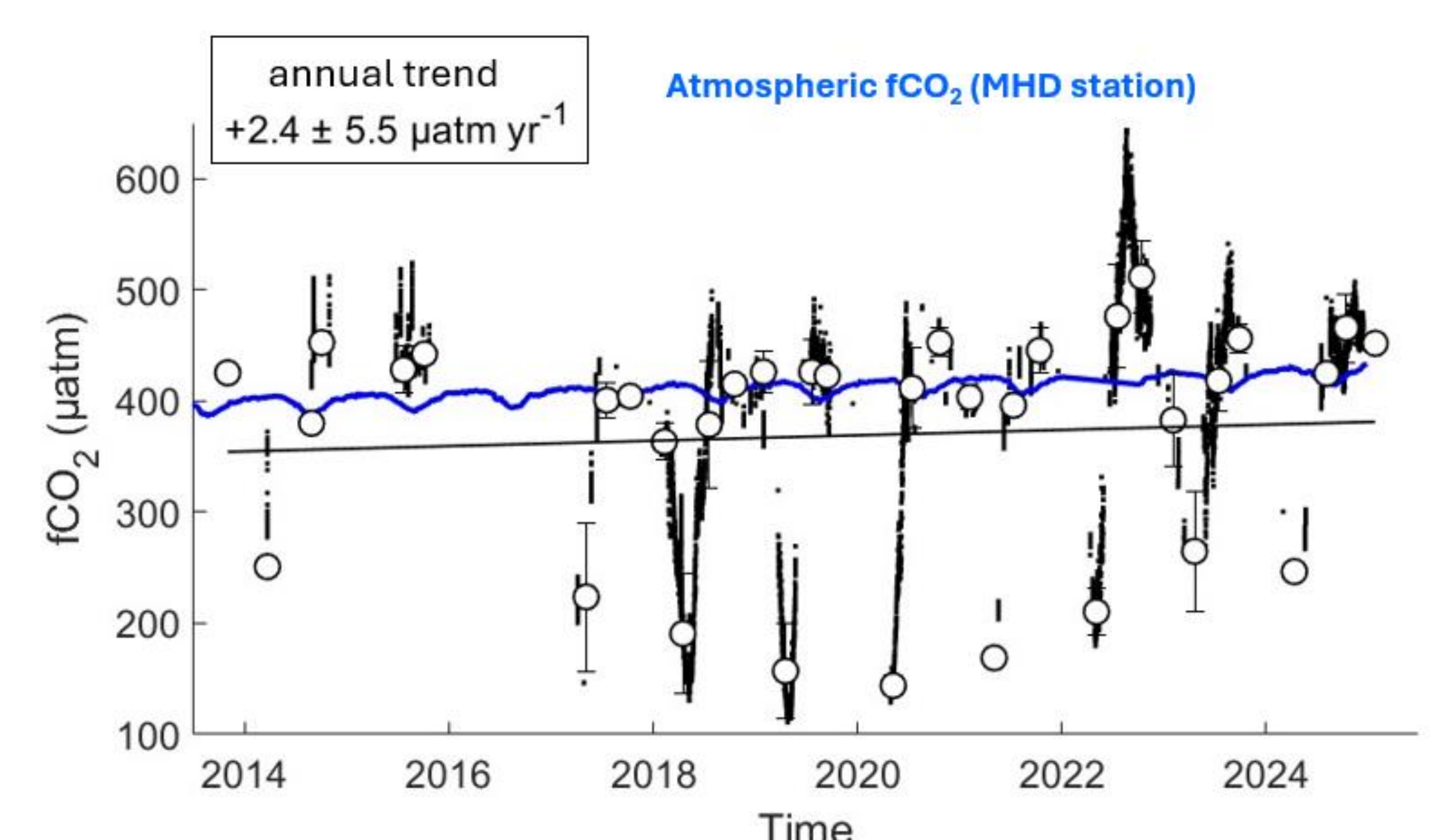
- Since 2013 (semi-)continuous time series of sea surface fCO₂ measurements with RV Simon Stevin
 - Since 2018 increase of the temporal resolution through the Thornton Buoy
 - Since 2017 monthly discrete samples for DIC, TA and pH. CO2SYS is used for calculation of fCO₂ from DIC and TA
- General good agreement between the measured fCO₂ and the calculated fCO₂
- High Seasonal and/or inter-annual variability of fCO₂

Seasonal and annual variability in the Belgium part of the North Sea (Thornton buoy)



- Lowest fCO₂ in **spring** during the productive season
- Annual – fCO₂ increase → high uncertainty + very high seasonal variability (**spring**)
- fCO₂ (sea) < fCO₂ (atm)
- More difficult to evaluate annual and seasonal trends over the covered period (2017-2024)

CONTINUATION IS IMPORTANT



Methods of data collection

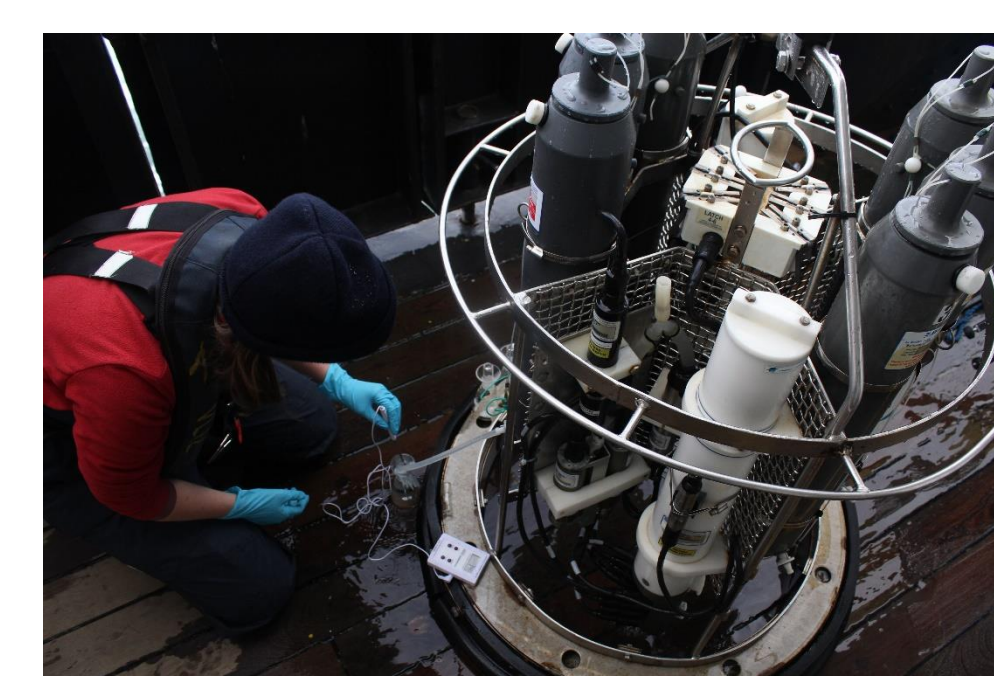
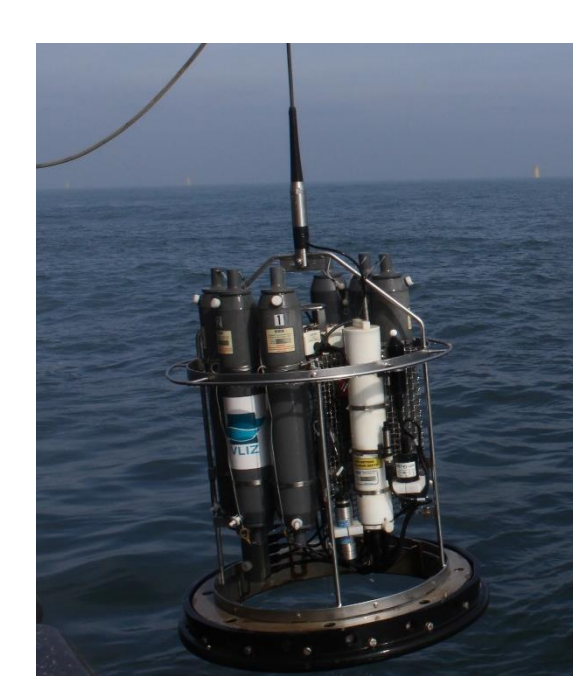


BE-FOS-Thornton Buoy



BE-SOOP-Simon Stevin

Measure CO₂ insitu with sensors or instruments on the VLIZ ICOS stations
Both ICOS Class 1 Ocean Station



Take discrete samples for pH, DIC and TA with Niskin bottles attached to the carousel with a conductivity, temperature and depth sensor. This to calculate fCO₂ but also to constrain the carbonate system in the North Sea
Analysis of the samples in the lab