ICOS

INTEGRATED CARBON OBSERVATION SYSTEM

NATIONAL STATION NETWORK SWEDEN

Östergarnsholm marine ecosystem

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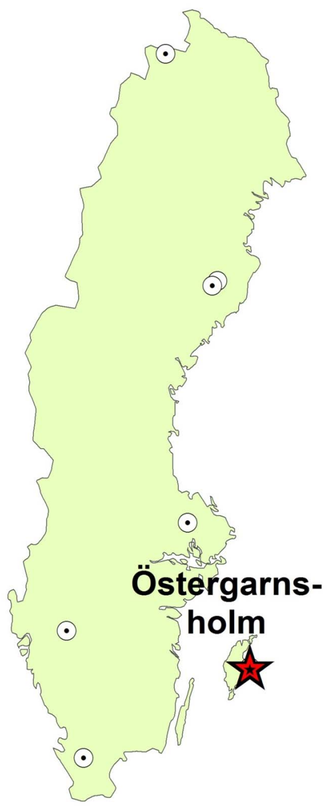
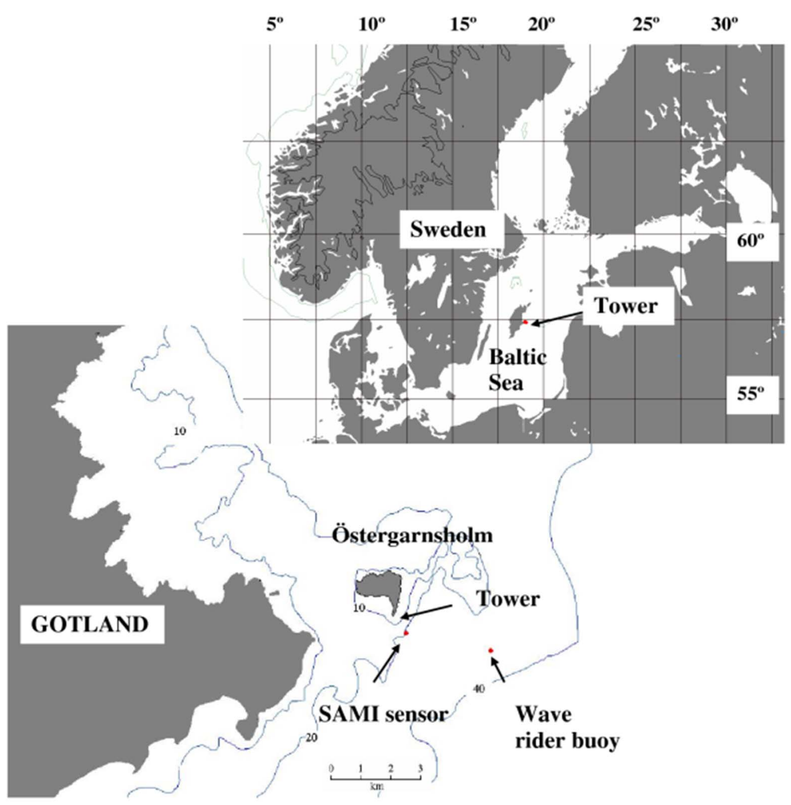
Östergarnsholm (57° 25' N, 18° 59' E) is a land based marine ICOS station, operated by Uppsala University. The ICOS activities are centered around a 30 m tall tower, located on a small island 4 km from the east coast of Gotland, and two buoys.

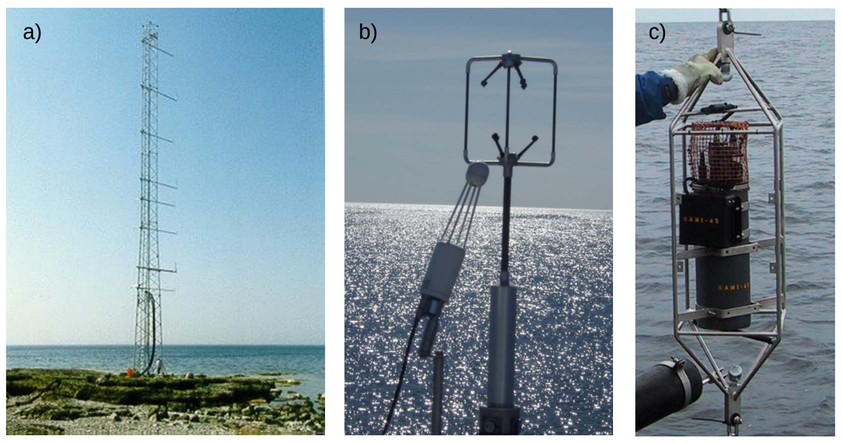
The Östergarnsholm site has been running semi continuously since 1995 with the aim to study the marine atmospheric boundary layer. A 30 m tall tower is situated around 1 m above sea level on the southernmost tip of the small flat island Östergarnsholm. Two buoys are located 1 km (SAMI sensor) and 4 km (Wave rider buoy) southeast of the tower, respectively.





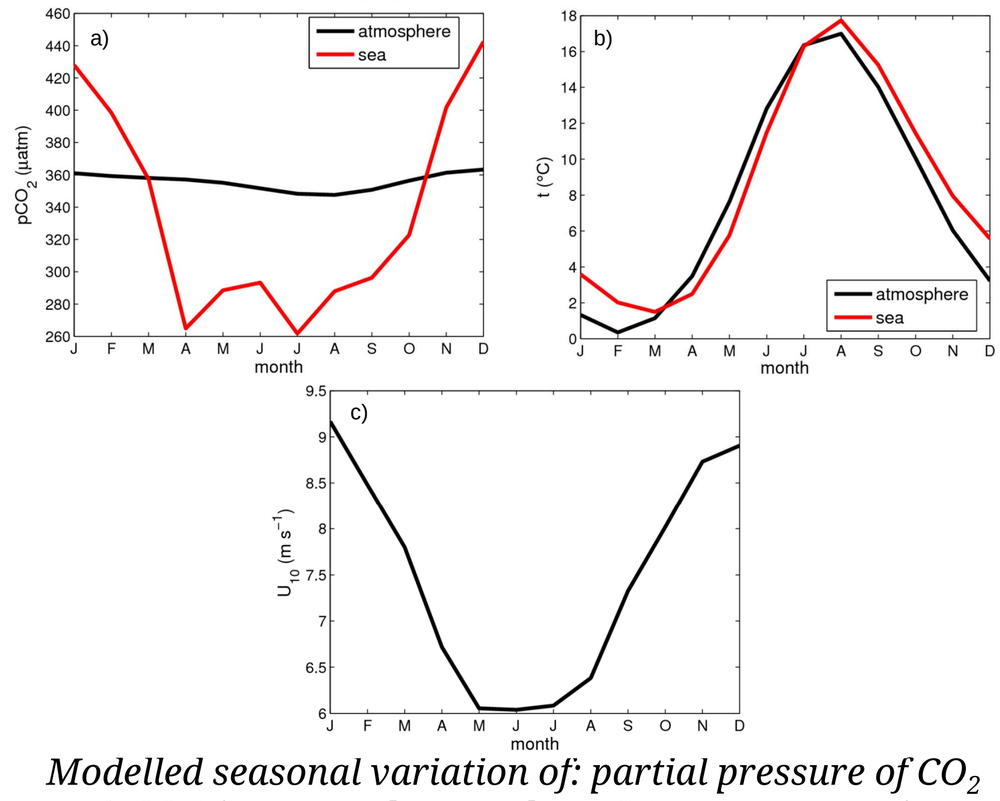
Map of the measurement site, showing the location of the tower and the two buoys.

The tower is equipped with instruments measuring profiles of wind, temperature, CO_2 and humidity, and turbulent fluxes of momentum, heat, water vapor and CO_2. Presently, also precipitation, air pressure, and incoming solar radiation is measured at the site. The Wave rider buoy, operated by the Finnish Meteorological Institute, measures wave parameters and water temperature at 0.5 m depth. CO_2, water temperature, oxygen, and salinity is measured at 4 m depth by a SAMI sensor and a Seabird. Furthermore, aerosols are continuously measured in an additional 10 m tall tower operated by Stockholm University.



The 30 m tower (a), flux measurements of carbon dioxide and water vapor (b), SAMI sensor (c).

When measuring atmospheric components in a small semi enclosed sea like the Baltic Sea, only data with winds from a restricted sector will be undisturbed by land. At Östergarnsholm, open sea conditions are valid for wind directions from a sector of 80°-210° [1]. Due to large heterogeneity of CO_2 in the water surface near the coast, the surface buoy represents the footprint of the tower for winds from the sector 80°-160° [2].



Modelled seasonal variation of: partial pressure of CO_2 (pCO_2) in atmosphere and sea (a), temperature in atmosphere and sea (b), 10 m mean wind speed (c).

The carbon cycle represented by the Östergarnsholm site shows a strong seasonal variation with marine carbon uptake from April to October, and emissions from November to March. The cold water in spring and summer gives dominantly stable atmospheric stratification during April to July. Despite low winter temperatures, the sea surrounding Östergarnsholm have ice free conditions throughout the year. Higher rates of cyclonic activity in winter results in higher wind speeds in winter than in summer.

[1] U. Högström et al. (2008). *Boreal Environ. Res.* **13**, 475-502.

[2] A. Rutgersson et al. (2008). *J. Marine Syst.* **74**, 1381-394.

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