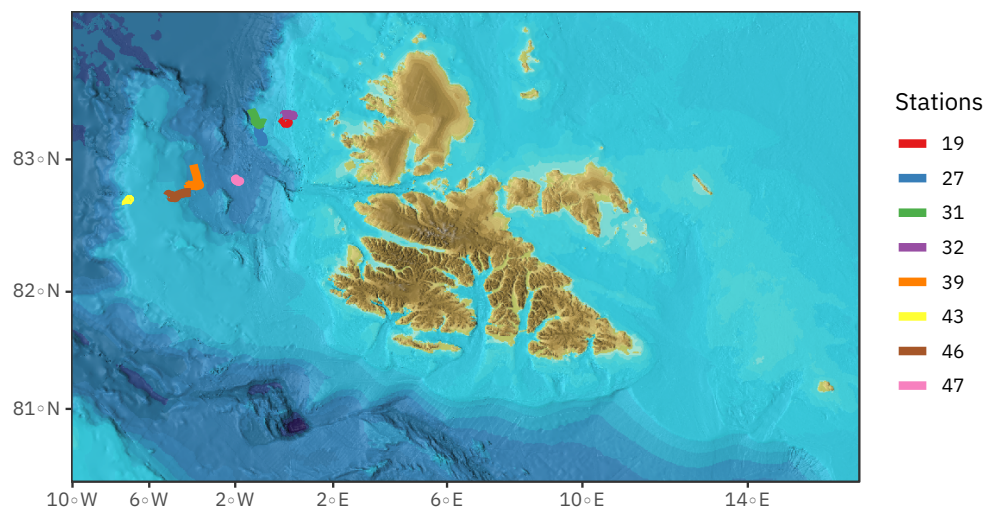


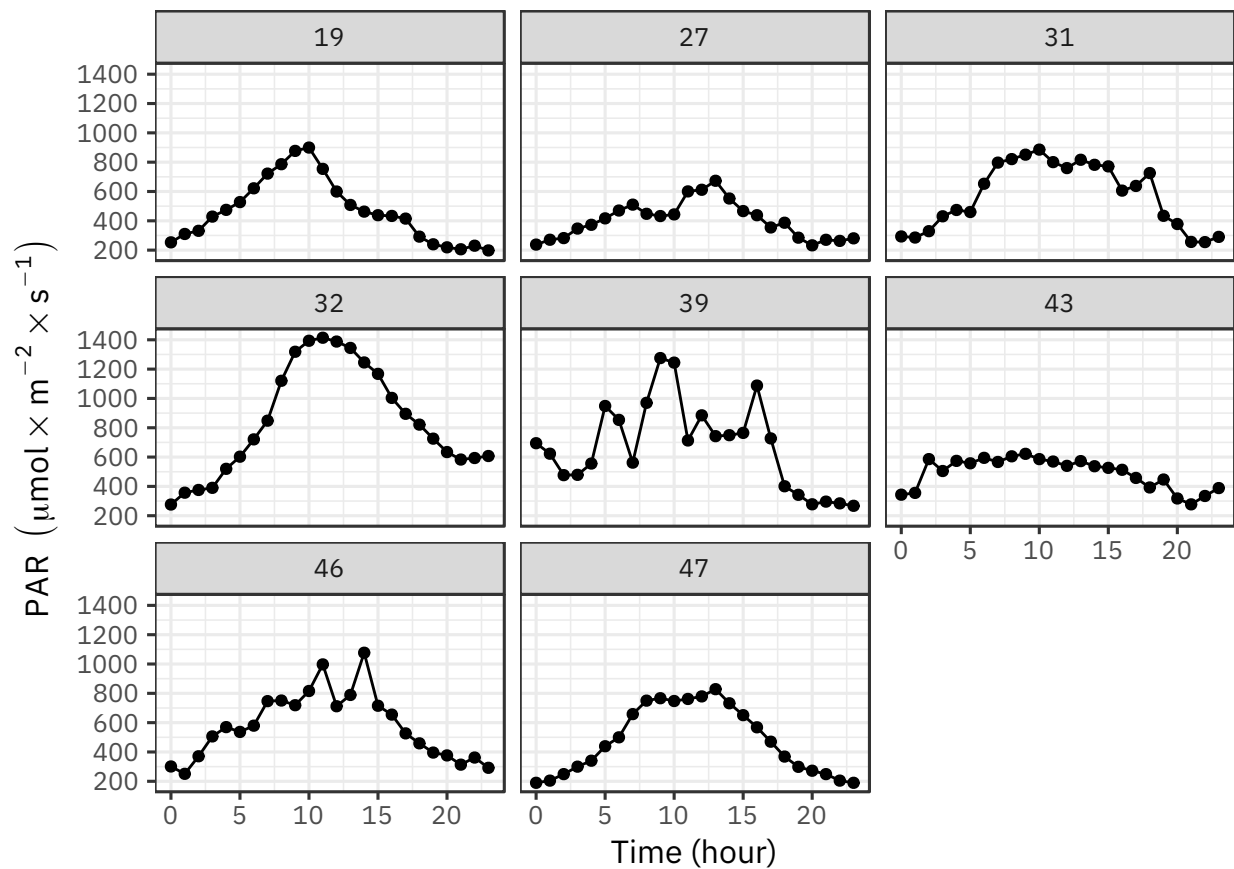
# Appendix

## Sampling locations



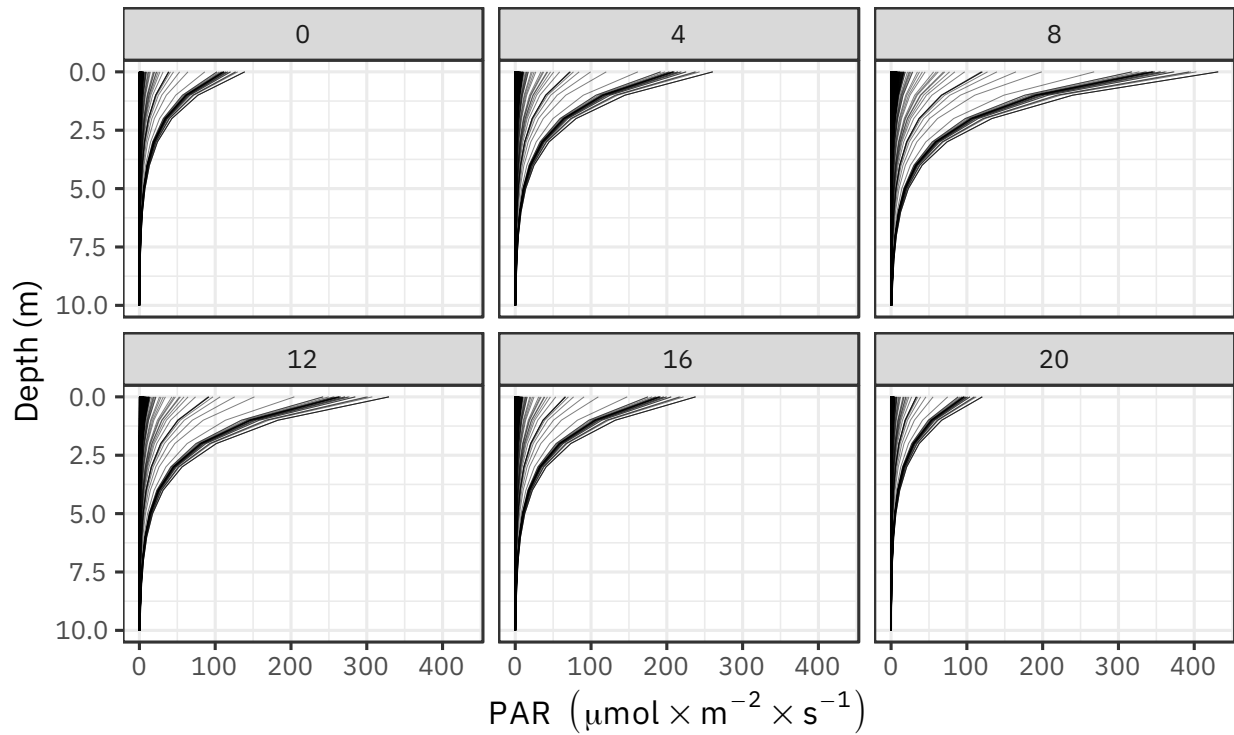
**Supplementary Fig. 1:** Locations of the ice stations sampled during the Transsiz expedition. Bathymetry data from the International Bathymetric Chart of the Arctic Ocean (IBCAO, v3.0).

## Incident light



**Supplementary Fig. 2:** Hourly photosynthetic active radiation (PAR) measured at each station with a pyranometer installed onboard the ship. Numbers on top of the gray boxes identify the stations.

## Propagating light in the water column



**Supplementary Fig. 3:** Propagated photosynthetic active radiation (PAR) in the water column at station 19 using ROV transmittance data. At this station, a total of 1561 transmittance values were measured by the ROV. Numbers on top of the gray boxes identify selected hours of the day. For visualization, data is plotted only between 0 and 10 meters.

## PvsE curves

Two different models based on the original definition proposed by (Platt et al., 1980) were used depending on the situation.

### Model with photoinhibition

When apparent photo-inhibition was present, a model including two exponential was fitted (equation 1).

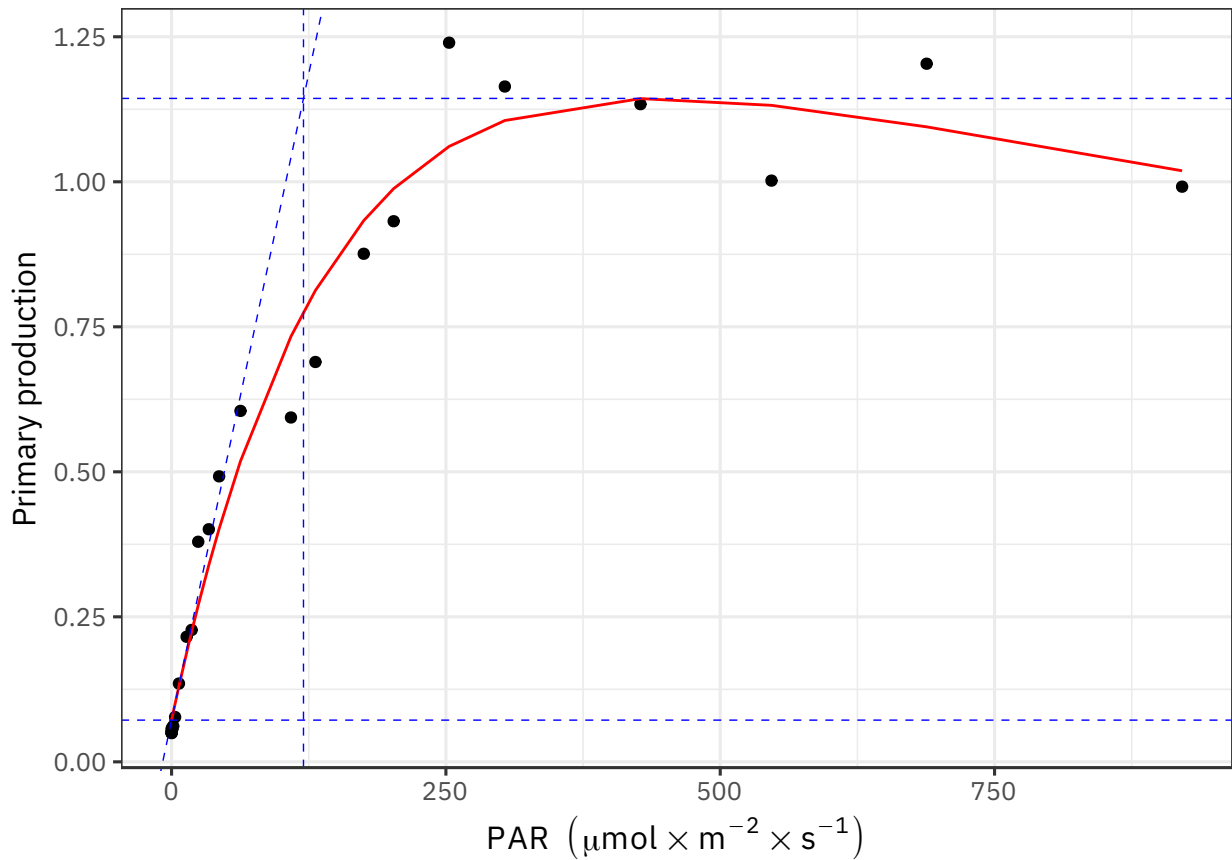
$$p = ps \times (1 - e^{-\alpha \times \frac{PAR}{ps}}) \times e^{-\beta \times \frac{PAR}{ps}} + p0 \quad (1)$$

### Model without photoinhibition

When no apparent photo-inhibition was present, a model including only one exponential was fitted (equation 2).

$$p = ps \times (1 - e^{-\alpha \times \frac{PAR}{ps}}) + p0 \quad (2)$$

The non-linear fitting was done using the Levenberg-Marquardt algorithm implemented in the minpack.lm R package (Elzhov et al., 2013).

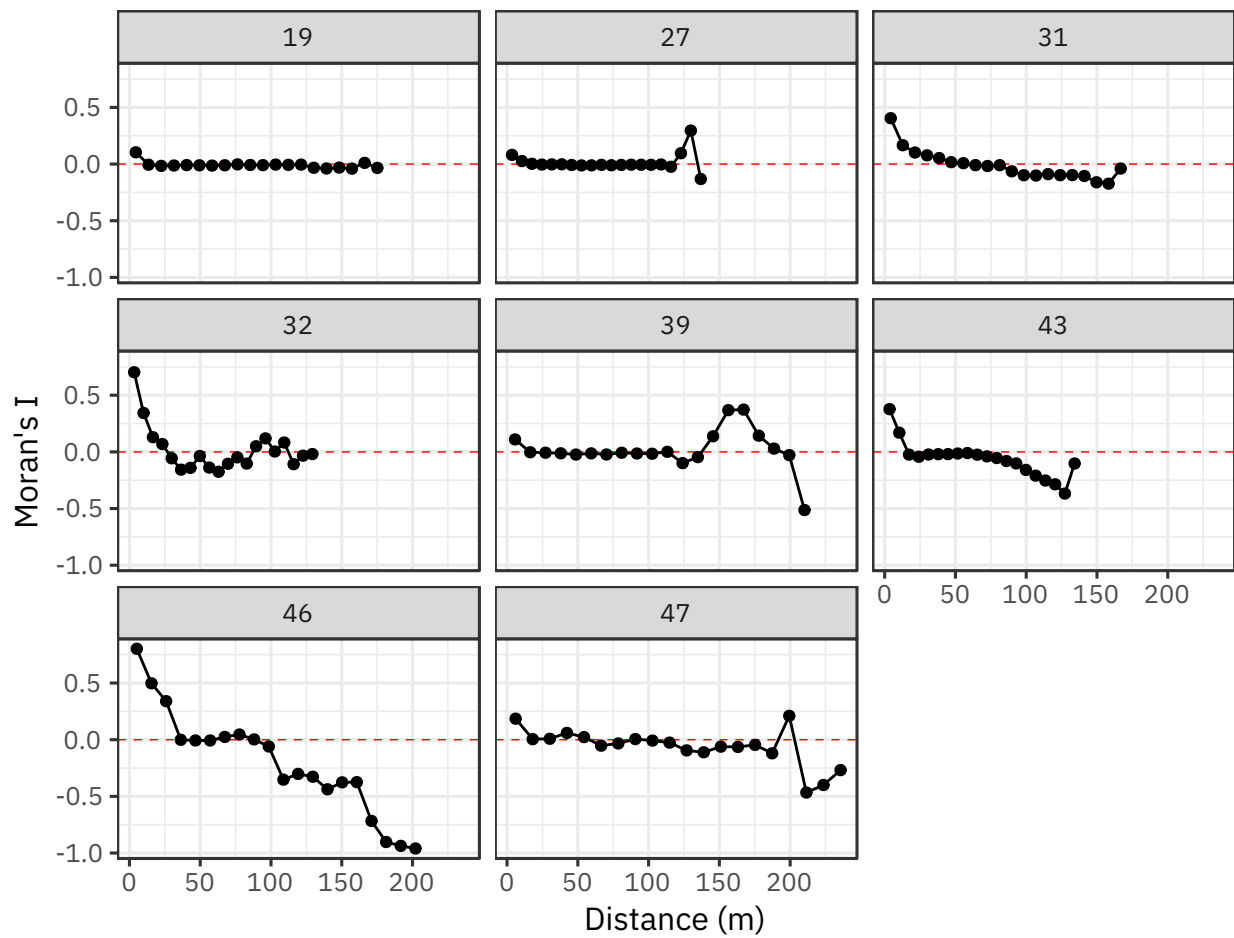


**Supplementary Fig. 4:** Example of fitted PvsE curve using equation 2.

Using photosynthetic parameters derived from PvsE curves, primary production was calculated as:

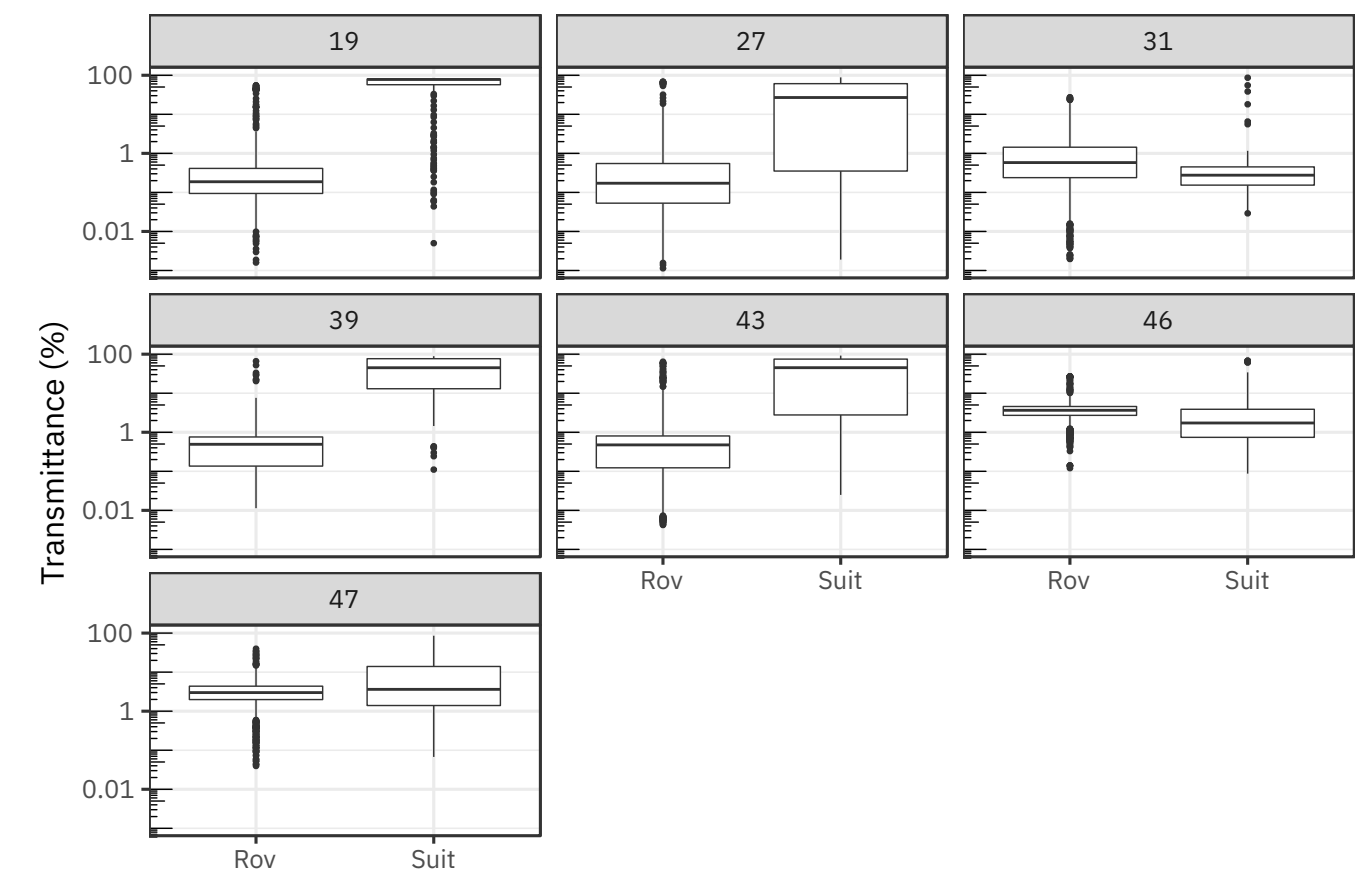
$$\text{Primary production} = ps \times (1 - e^{-\alpha \times \frac{PAR}{ps}}) \quad (3)$$

## Spatial autocorrelation



**Supplementary Fig. 5:** Moran's I calculated from the SUIT transmittances (0<sup>-</sup>).

Extra



**Supplementary Fig. 6:** Boxplots, just an idea for the moment.

	Df	Sum Sq	Mean Sq	F value	Pr(>F)
.\$source	1	3965.49	3965.49	2307.06	0.0000
Residuals	1720	2956.43	1.72		

## References

Elzhov, T. V., K. M. Mullen, A.-N. Spiess, and B. Bolker (2013). *minpack.lm: R interface to the Levenberg-Marquardt nonlinear least-squares algorithm found in MINPACK, plus support for bounds*.