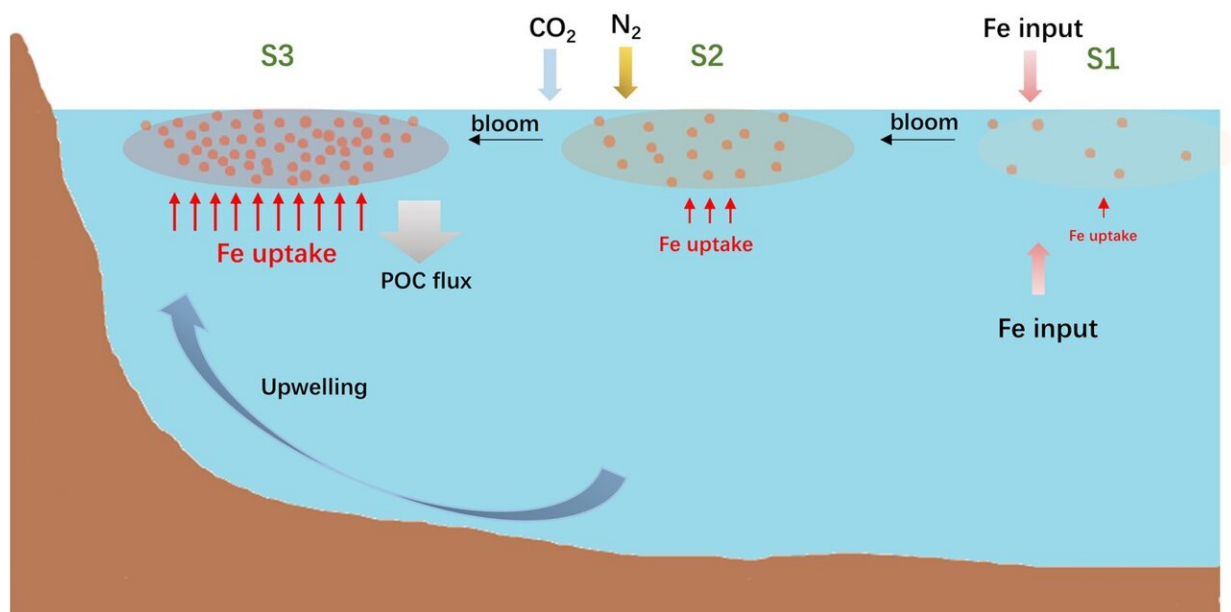


Exploring relationship between iron uptake patterns and cell density in *Phaeodactylum tricornutum*

January 26 2022, by Li Yuan



	Cell density (cells/mL)	Intercellular distance (μm)	Chlorophyll fluorescence intensity (μmol/m ² /s)		
			1 mL water body	"sandwich" structure with 80 mL waterbody	Open oceans
S1	3×10 ³	693.48	-	-	0.01
S2	3×10 ⁴	321.85	-	-	0.12
S3	3×10 ⁵	149.38	-	-	1.19
L	1.6×10 ⁶	85.50	0.024	0.116	6.36
M	3.2×10 ⁶	67.86	0.050	0.146	12.72
H	6.4×10 ⁶	53.86	0.061	-	25.45

Schematic illustration of the bloom process in natural oceans and calculated chlorophyll fluorescence intensity. S1, S2, and S3 represent three stages with

different cell density, during blooms accompanied with huge biomass and large-scale in actual oceans. The intracellular distance was calculated by cell density. Chlorophyll fluorescence intensity in 1 mL water body were measured according to light spectral in Fig. 4. Chlorophyll fluorescence intensity in “sandwich” structure with 80 mL waterbody according to light spectral in Fig. 5. Chlorophyll fluorescence intensity in open oceans with a large scale was calculated using the mathematical model. Credit: DOI: 10.1186/s12915-021-01177-z

Iron concentration limits the growth of phytoplankton in extensive high nutrient low chlorophyll (HNLC) regions of the ocean.

In a number of large-scale in-situ Fe enrichment experiments conducted in well-characterized HNLC regions, [diatom](#)-dominated [phytoplankton blooms](#) were observed, accompanied by a considerable CO₂ drawdown in the ocean surface layer and substantial carbon export to sediments.

A research team led by Wang Guangce at the Institute of Oceanology of the Chinese Academy of Sciences (IOCAS) aimed to elucidate the relationship between [iron](#) uptake pattern and cell density in *Phaeodactylum tricornutum*, a representative marine diatom.

Related findings were published in *BMC Biology*.

"Although the iron uptake rate of diatoms largely determines the magnitude and longevity of diatom blooms, the underlying mechanisms regulating iron uptake remain unclear," said Wang.

The researchers found that [cells](#) could upregulate the iron uptake protein to facilitate iron assimilation under high cell density, and the [chlorophyll fluorescence](#) derived from neighboring cells acted as the signaling factor in this process.

This finding provides novel insights into biotic signal sensing in phytoplankton, which can help to elucidate the underlying mechanisms of marine diatom blooms.

In their another study published in *Algal Research*, the researchers constructed the [ferritin](#) overexpression and silence strains in *Phaeodactylum tricornutum* to explore the role of ferritin in the morphologic transformation.

Results showed that the formation of oval cells was accompanied with enrichment of ferritin in *Phaeodactylum tricornutum*. The ferritin overexpression in marine diatom has a close relationship with morphological transformation from fusiform to ovoid morphotype, after which they enter a resting stage, accompanied by abscisic acid accumulation.

This study improves understanding of molecular processes in diatom resting cells/spores' formation and suggests that ferritin accumulation may improve the sequestration of photosynthetically fixed atmospheric CO₂ into the deep sea.

More information: Xuehua Liu et al, Chlorophyll fluorescence as a light signal enhances iron uptake by the marine diatom *Phaeodactylum tricornutum* under high-cell density conditions, *BMC Biology* (2021). [DOI: 10.1186/s12915-021-01177-z](https://doi.org/10.1186/s12915-021-01177-z)

Xuehua Liu et al, Formation of resting cells is accompanied with enrichment of ferritin in marine diatom *Phaeodactylum tricornutum*, *Algal Research* (2021). [DOI: 10.1016/j.algal.2021.102567](https://doi.org/10.1016/j.algal.2021.102567)

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