Dust as a nutrient source to the N_2-fixing marine cyanobacterium *Trichodesmium*

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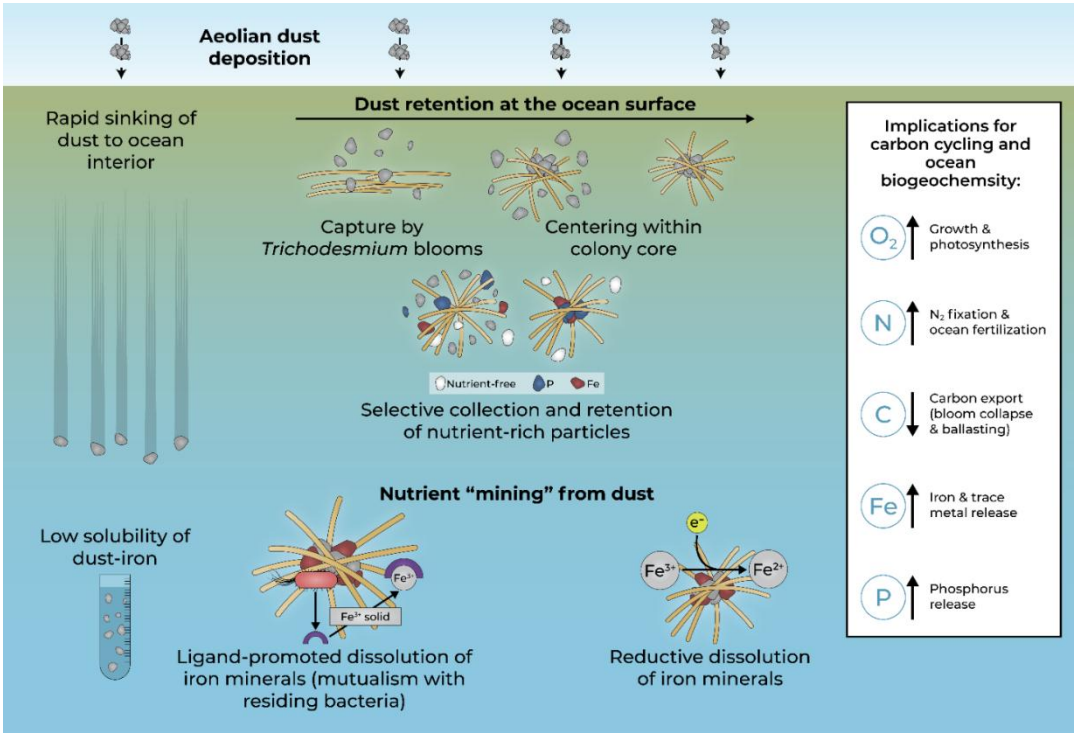
Desert dust is a significant source of the macro and micro nutrients to remote ocean regions. Still, its utilization by phytoplankton is constrained by its rapid sinking and low mineral solubility. This talk will highlight several interdisciplinary studies showing that natural colonies of the ubiquitous cyanobacterium *Trichodesmium Spp.* overcome these constraints by efficient dust capturing and active dust dissolution.

Studying natural *Trichodesmium* colonies from the Northern Red Sea, we discovered several unique adaptive mechanisms for capturing and storing dust particles within the colony core that enable efficient utilization of iron (Fe) from dust. We showed that dust packaging within the colony core is beneficial for uptake, since cell-particle proximity minimizes iron loss by diffusion. We found that *Trichodesmium* can selectively collect and retain Fe-rich dust particles, thus optimizing Fe supply. We discovered that *Trichodesmium* and its associated bacteria act together to increase availability of dust-bound iron, where bacteria secrete Fe-binding molecules that promote dust dissolution and *Trichodesmium* provides dust and optimal physical settings for dissolution and uptake. Over the last years we expanded our research to phosphorus and added new disciplines and techniques such as molecular biology, organic chemistry, high resolution imaging and micro-electrodes. I will show selected findings from these ongoing studies.

Trichodesmium is predicted to flourish in the warmer, more acidic, and "dustier" future ocean. The mechanistic understanding gained by our research on its ability to utilize dust as a nutrient source will enhance our capacity for predicting the ocean's operation modes in the face of global change and its impact on the atmosphere and climate.



Schematic illustration of the challenges associated with dust as a nutrient source to marine phytoplankton (left), the solutions *Trichodesmium* employs for utilizing nutrients from dust (center) and the implications for ocean productivity and biogeochemistry (right).