Abstract for an Invited Paper
for the APR09 Meeting of
The American Physical Society

Recent Results from Iron Enrichment Experiments: Implications for Geoengineering

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The oceans play a key role in cycling carbon and are responsible for about half the photosynthesis on the planet. Ice core records tie to changes in marine production changes in climate and recent experiments suggest iron availability covaries with marine production over the last several glacial-interglacial transitions. Several open ocean iron enrichment experiments have recently been conducted to test this linkage directly and findings from these groundbreaking experiments will be presented. Together these results unequivocally demonstrate the pivotal role iron plays in controlling community structure and growth and the uptake of CO_2 in major ocean regions. The combustion of fossil fuels has increased atmospheric carbon dioxide approximately 100 ppm above preindustrial levels and has become a major environmental concern. The question of purposeful iron fertilization to control climate is gaining considerable attention partly due to the results of these experiments and the fact that iron is inexpensive and can leverage massive carbon uptake. In addition, the resultant blooms of phytoplankton reduce ocean acidification. What remains to be tested is whether iron fertilization would create unintended and negative consequences to ocean ecosystems. In this talk, both the theory, practice and results of iron fertilization experiments will be presented together with a discussion of some possible negative impacts. Natural iron inputs have had a major impact on climate in the past when atmospheric carbon dioxide was much less than it is today. The role of iron fertilization as a geoengineering solution to climate change, has yet to be tested and can only be evaluated through experimental manipulations designed for this purpose.