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**Climate Change Impacts on Marine Phytoplankton Communities**

Phytoplankton play key roles as the base of the marine food web and as a crucial component in the earth's carbon cycle. Changes to sea temperatures, increased stratification, and decreasing pH are just some environmental stressors that are and will continue to impact plankton communities and productivity. However, these changes are complex, regionally variable, and signatures of the trends may take many decades to be detected. In this talk I will use a complex physical-biogeochemical-ecosystem model of the global ocean to examine the possible changes to the marine ecosystem over the course of the twenty-first century. We will examine how changes to temperatures, nutrient supplies, and ocean acidification will work separately and together to alter productivity and the phytoplankton communities. We will also explore our ability to detect these changes from in situ and remote observations. Our model results suggest that by 2100, only about 50% of the ocean will show a statistically significant trend in productivity or Chl-a concentrations; a consequence of strong natural variability. On the other hand, we find that almost 75% of the ocean has a statistically significant trend in remotely sensed reflectance by 2100. This is because reflectance integrates the changes in all the optically important constituents in the ocean including the shifts in phytoplankton community structure.