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Ocean-atmosphere fluxes of carbon dioxide and heat in response to phytoplankton light absorption

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Oceanic phytoplankton absorbing solar radiation can influence the upper ocean physics. This process is called phytoplankton light absorption. Previous studies indicate that phytoplankton light absorption significantly impacts the oceanic heat distribution and, if taken into account in an Earth System model, can lead to different climates under similar primary production. However, the dominant processes responsible for these drastic changes in atmospheric temperature have not been yet identified. Phytoplankton light absorption increases the sea surface temperature, therefore altering the exchange of heat between the ocean and the atmosphere. Additionally, phytoplankton light absorption indirectly modifies the ocean carbon cycle and thus the CO₂ flux into the atmosphere. To shed light on these aspects, we use an Earth System model of intermediate complexity coupled to an ecosystem model (EcoGENIE). By running a suite of experiments, we determine which fluxes are most important in controlling atmospheric temperature. Here, we present first results of our study.