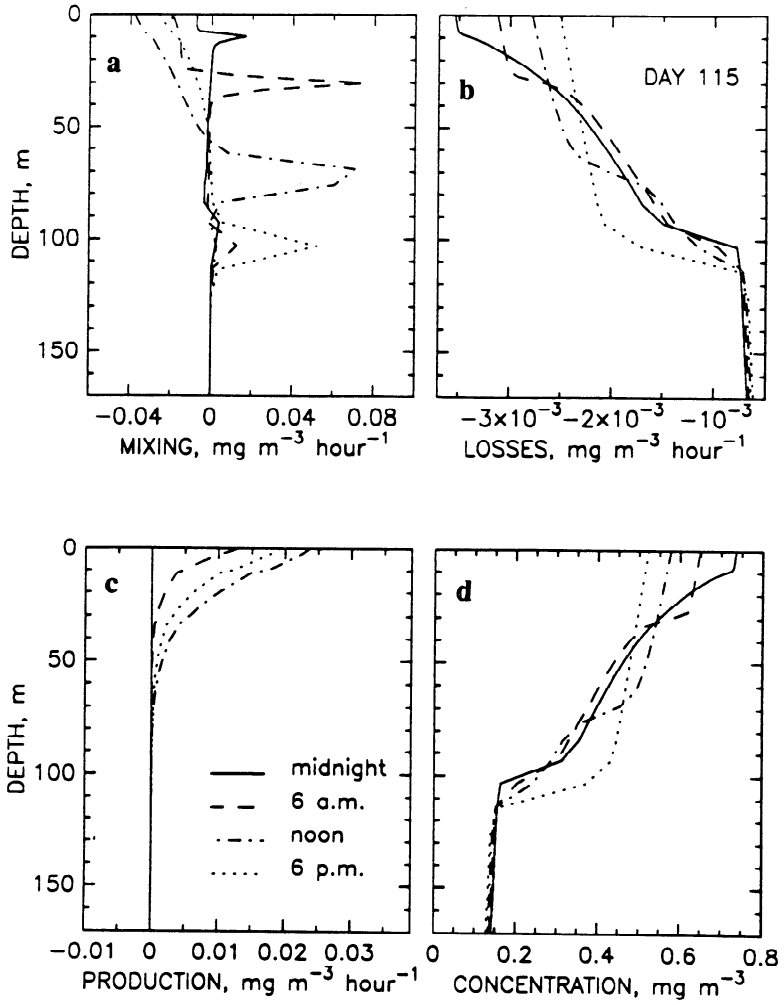

Figure 8. Same as Figure 6, but for day 115.

description of all the details of the temporal bloom evolution in its initial phase. This is because they are based on a mixed layer concept, assuming that such a layer is uniform and mixing actively at all times. Measurement techniques which could indicate modest thermal stratification in the upper layer were not available to early workers, including Sverdrup, and thus it is understandable that hypotheses and models were based on "truly uniform" mixed layers. However, that assumption is not strictly valid, and surface waters are often somewhat stratified and at times not actively mixing. Our results show that models resolving vertical stability structure of the upper ocean are more adequate for the description of biological/physical feedbacks.

Another aspect of our modeling effort is the simulation of the diel cycle of biomass concentration [e.g., *Siegel et al.*, 1989; *Cullen et al.*, 1992; *Stramska and Dickey*, 1992b]. In order to reproduce diel variations of Chl a, pCO_2, and oxygen concentration observed in the region of our experiment, *Taylor and Stephens* [1993] imposed diurnal variation of the phytoplankton mixing in a two layer model. Our approach was different, as no assumptions were made about the MLD or turbulent exchange, but rather a model was run with observed surface heat and momentum fluxes. The diel cycle of phytoplankton concentration in our model resulted from the net gain of phytoplankton biomass during a daytime and the net loss at nighttime. However, unlike the Taylor and Stephens model, in our model the loss rate of phytoplankton owing to removal from the upper part of the water column by mixing could be much larger during the daytime than during the nighttime. We conclude that rigorous interpretation of the apparent accumulation of biomass in the water layer in terms of primary production estimates should account for these losses.

Finally, our simple model should help with the interpretation of in situ productivity measurements by incubation methods. Incubation methods do not allow for the mixing of phytoplankton. Thus artificial accumulation of the biomass may occur in incubation bottles located close to the sea surface (no loss by mixing is allowed). This will lead to an overestimation of production. In contrast, the increase of the biomass in deepwater bottles may be smaller than in the surrounding water at that depth (no gain by mixing is allowed), which will lead to underestimation of primary production. Such errors do not occur in the bio-optical models, which are based on the actual concentration of Chl a in the water. Thus such model calculations cannot generally be expected to show very good agreement with in situ productivity measurements.