

- b. When the data permit, compare diffuse attenuation coefficients calculated by the different methods outlined above to determine internal offsets and uncertainties in the data set. These comparisons can also be used, in time series mode, to detect the onset and extent of biofouling in different radiometers. Fig. 3.15, shows time series of  $K_d(\bar{z}_{0i}, 490, t)$  for a 5 month MOOS buoy deployment in Monterey Bay. The three time series were computed using equation (3.3) with surface values determined from  $E_s(\lambda, t)$  in (3.1) and  $E_d(z_i, \lambda, t)$  for  $z_1 = 10$  m (top curve),  $z_2 = 20$  m (bottom curve), and  $z_3 = 30$  m (middle curve). After approximately 2 months, the 3 curves diverge in a manner that cannot be explained by optical stratification of the water column, offering strong evidence of progressive biofouling of the radiometers at 10 m and 30 m.
- c. When  $K_d(\bar{z}_j, \lambda, t)$  is determined from in-water measurements alone, *i.e.* independently from  $E_s(\lambda)$ , measures of internal consistency between in-water and the above-water radiometer may be calculated as the unbiased percent differences

$$\Delta_{0k}(\lambda, t) = 100 \left| \frac{E_d(z_k, \lambda, t) e^{-K_d(\bar{z}_{0k}, \lambda, t) z_k} - E_d(0^-, \lambda, t)}{E_d(0^-, \lambda, t)} \right| \%, \quad (3.10)$$

where  $k = i$  or  $j$ , and  $E_d(0^-, \lambda, t)$  is calculated using  $E_s(\lambda, t)$  in equation (3.1). If running means and standard deviations of  $\Delta_{0i}(\lambda, t)$  and  $\Delta_{0j}(\lambda, t)$  are calculated over a suitable averaging period - perhaps 2 weeks - the comparative time series may be used to provide additional diagnostic indications of instrument degradation and biofouling.

5. *Chl* and *K490* derived from ratios of water-leaving radiance should agree with the parameters determined from satellite ocean color data within approximately 35 % and 20 %, respectively. Fig. 3.16 illustrates an example time series of *Chl* derived from the MBARI radiometers on the EP1 TAO mooring compared with *Chl* derived from SeaWiFS data and with chlorophyll a concentration from shipboard samples.

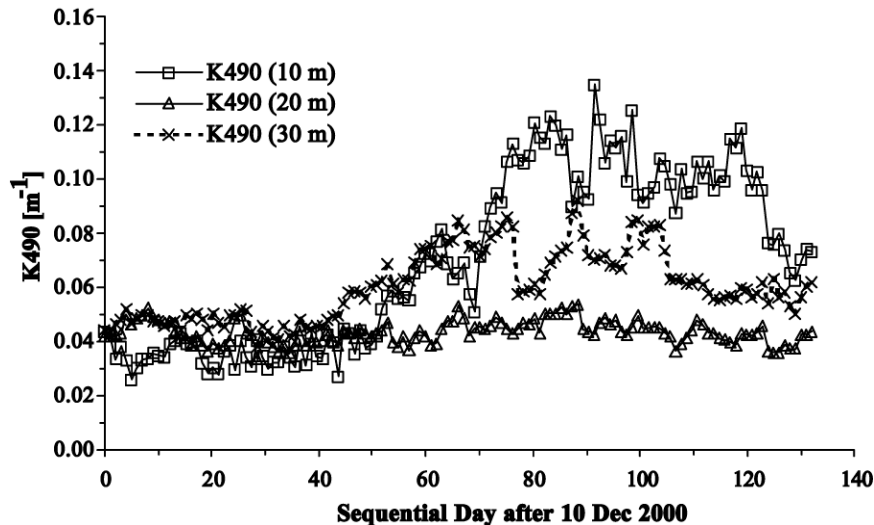


Fig. 3.15: An example of biofouling symptoms, as evidenced by the divergences in *K490* over different depth intervals, beginning midway through a 135 day time series of radiometric measurements on a mooring in Monterey Bay, CA.