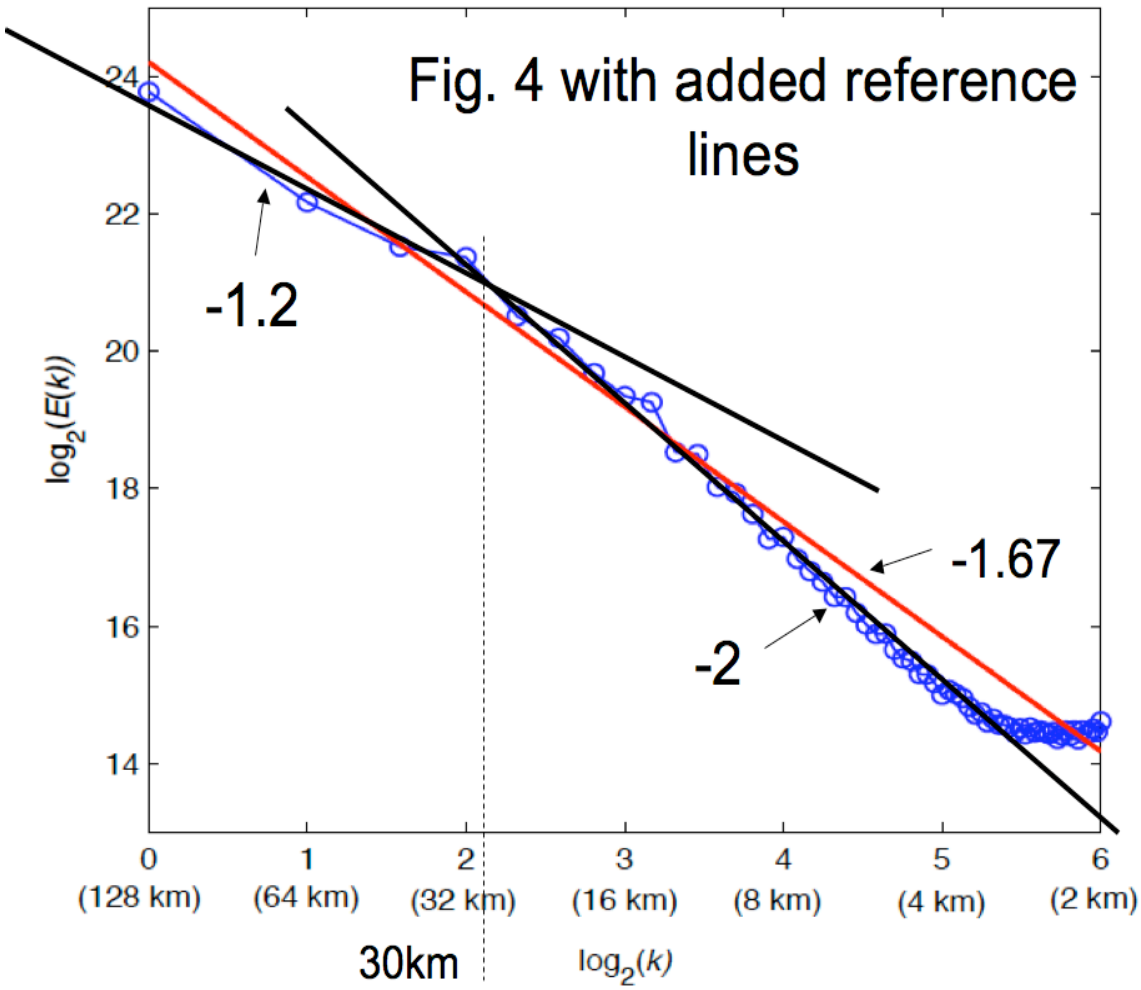
I think we agree that it is not possible that phytoplankton patches are always, everywhere, the result of passive scalar dynamics, that growth is never important. You simply claim that there is no evidence of anything else except passive scalar statistics in your data. However, I think the issue needs a little more care. I took another look at your ensemble spectrum (figure 4) and plotted references lines with absolute slopes $\beta = 1.2, 2$. The line $\beta = 1.2$ is the prediction of the combined growth-dynamics mechanism (Lovejoy et al., 2000), whereas $\beta = 2$ is roughly the exponent of Sea Surface Temperatures as well as cloud radiances. The two lines fit quite well and cross at wavenumbers of about $(30\ km)^{-1}$. It would seem that this interpretation of the spectrum is at least as plausible as yours ($\beta = 5/3$ up to about $(4\ km)^{-1}$ although it isn't clear why the high wavenumbers have a such a large β.

The main difficulty with this new interpretation is that it doesn't explain the structure function at the larger scales (your fig. 3). Up to about 10 *km* the latter has $H \approx 0.5$ which (ignoring intermittency corrections), implies $\beta = 1+2x0.5=2$ as for the spectrum. However, over the range 10 *km* to about 100 *km* it does have the $H \approx 0.4$ rather than the value ≈ 0.1 as expected from the $\beta = 1.2$ range (the prediction of the combined growth-dynamics mechanism). The problem is that the real space-fourier space relation $\beta = 1+2H$ only holds for scaling ranges which are very large, not only an order of magnitude or so (also, it ignores intermittency corrections, here presumably around 0.1). Therefore, we have to choose which we prefer to trust, a short range of apparent scaling in fourier space or a short range of apparent scaling in real space.

I guess the bottom line is that your data does not support the passive scalar hypothesis as strongly as you argue, I think you should at least leave the door open for other possibilities, and there may be opportunities to delve into this further by looking more carefully at the spectra on an image by image basis (although ultimately, wider ranges of scaling will be necessary).



Your fig. 4 with added reference lines, slopes -1.2, -2 (solid black). The dashed line indicates the cross-over point at about 30 *km*.

References:

S. Lovejoy *et al.*, Universal Multfractals and Ocean patchiness Phytoplankton, physical fields and coastal heterogeneity, *J. Plankton Res.* **23**(2000), pp. 117-141.