

Figure S1: PE curves of productivity (mg C (mg Chl a)⁻¹ h⁻¹) with (Fe, red dots) and without (Control, blue dots) the addition of iron for experiments (a) 1, (b) 2, (c) 3, (d) 4, (e) 5 and (f) 6; lines represent a non-linear least squares fit to the equation of Platt et al. (1980).

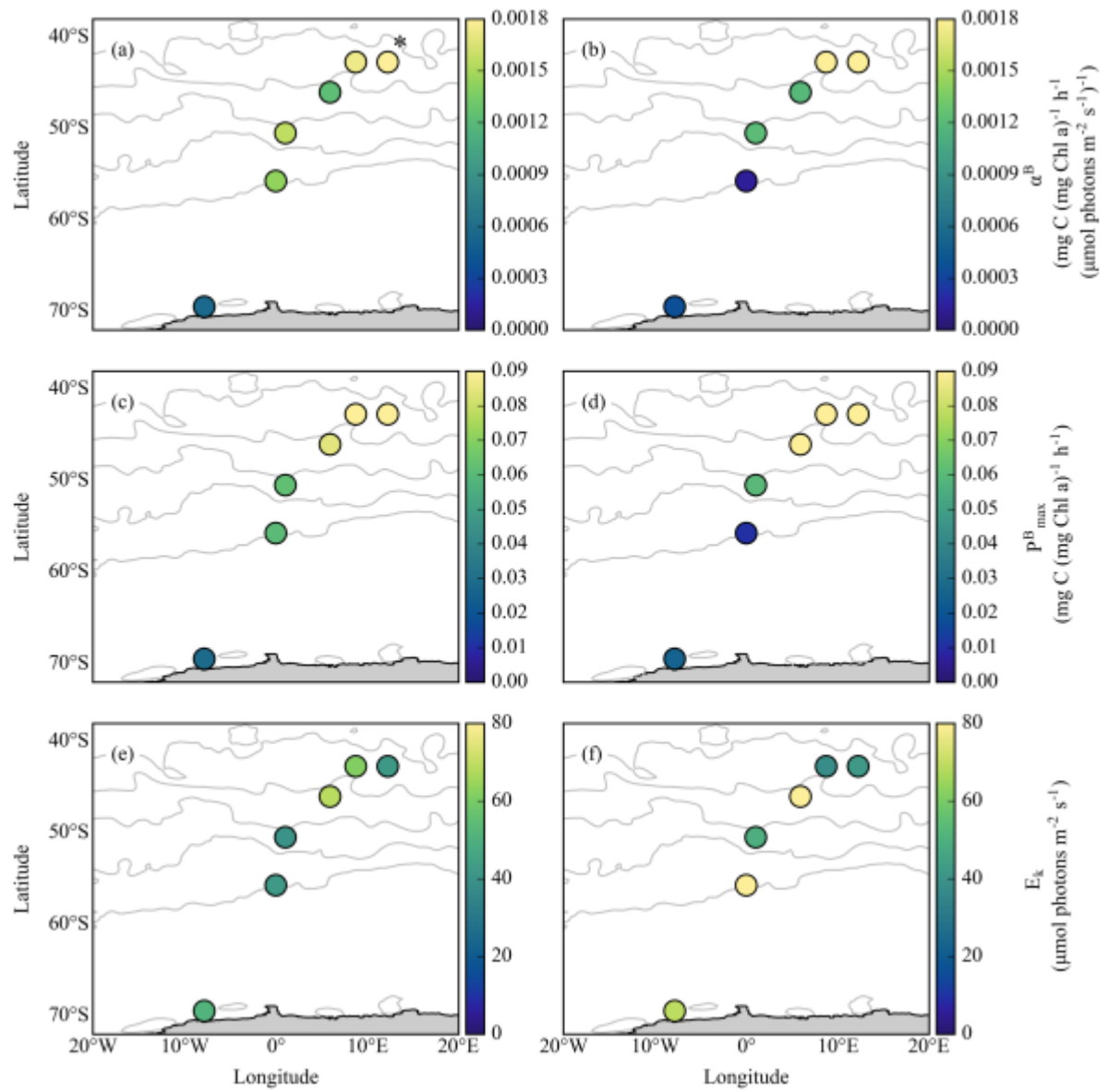


Figure S2: PE parameters (a) α^B (mg C (mg Chl a)⁻¹ h⁻¹ (μmol photons m⁻² s⁻¹)⁻¹), (b) P^B_{\max} (mg C (mg Chl a)⁻¹ h⁻¹) and (c) E_k (μmol photons m⁻² s⁻¹) for the iron addition and control treatments of experiments set up in the Atlantic sector of the Southern Ocean.

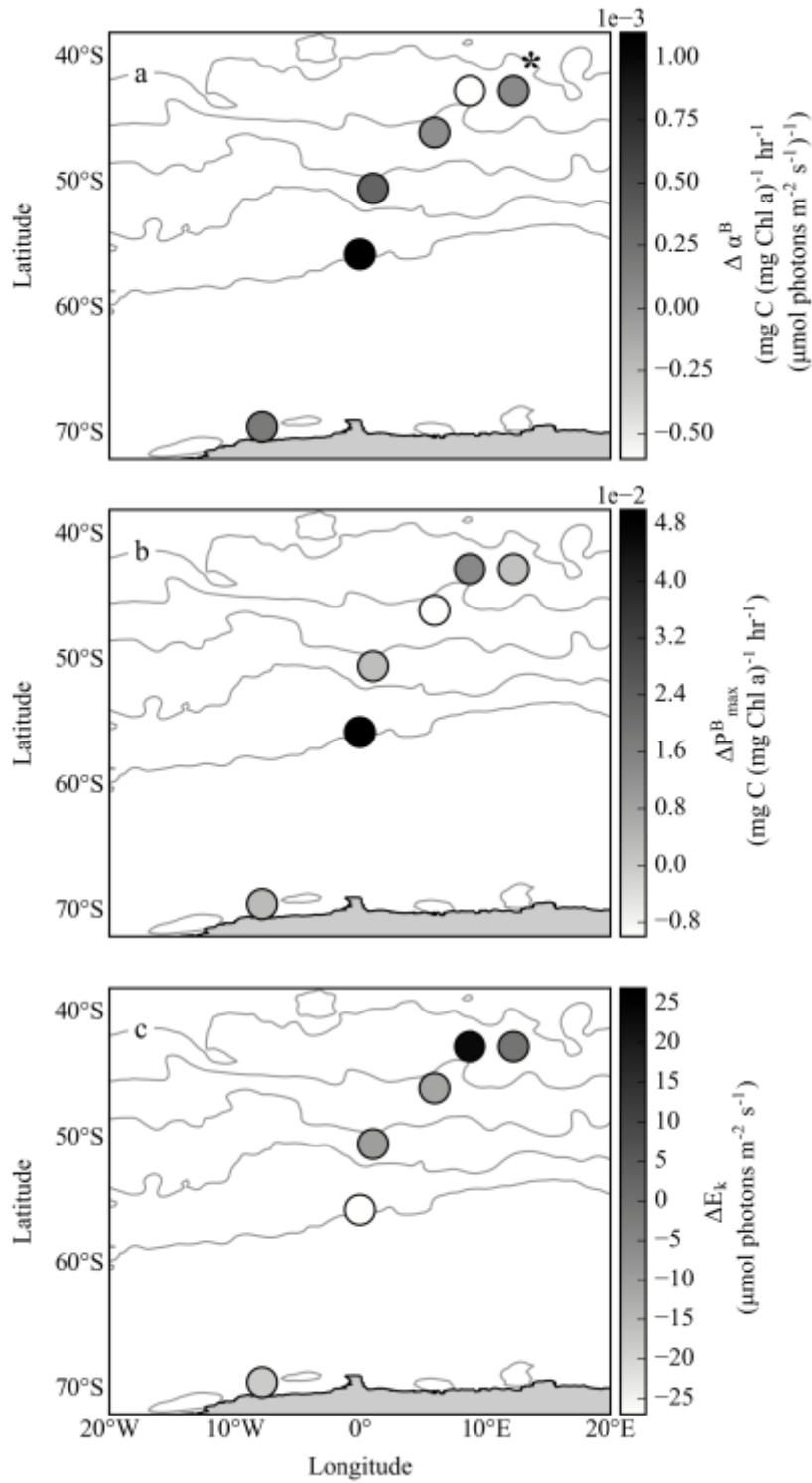


Figure S3: Absolute differences in the PE parameters between the iron treatment and the control treatment (a) α^B ($\text{mg C (mg Chl a)}^{-1} \text{ h}^{-1} (\mu\text{mol photons m}^{-2} \text{ s}^{-1})^{-1}$), (b) P^B_{max} ($\text{mg C (mg Chl a)}^{-1} \text{ h}^{-1}$) and (c) E_k ($\mu\text{mol photons m}^{-2} \text{ s}^{-1}$) for experiments set up in the Atlantic sector of the Southern Ocean.

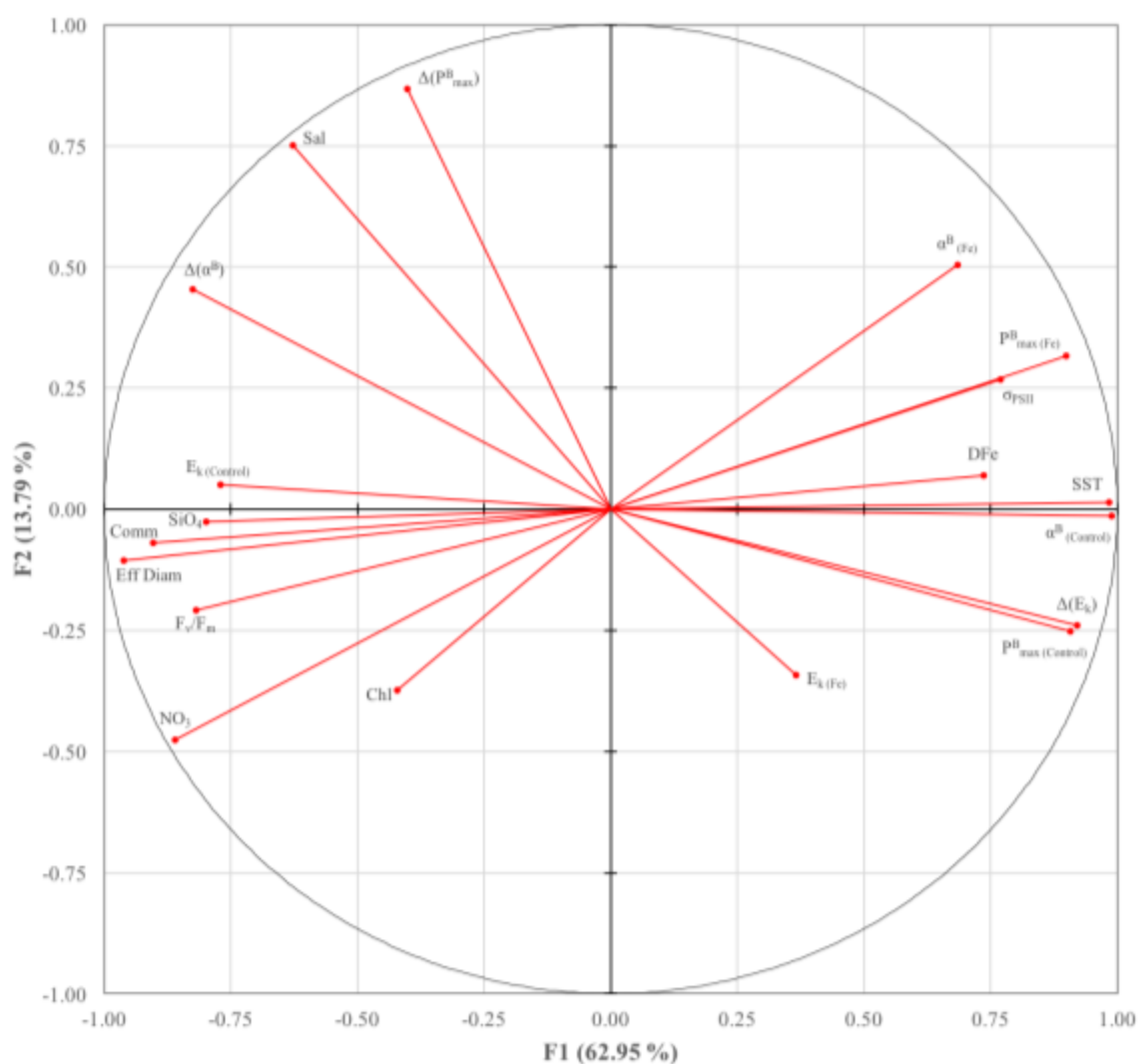


Figure S4: PCA: projection of the photosynthetic parameters determined experimentally and *in situ* variables measured, including: α^B , P^B_{max} and E_k from the both Fe and control treatments, the relative differences, sea surface temperature (SST), Salinity, Nitrate, Silicate and dissolved Iron concentration, Chl concentration, Effective Diameter, F_v/F_m , σ_{PSII} and Community composition (ratio of Diatoms to Haptophytes).

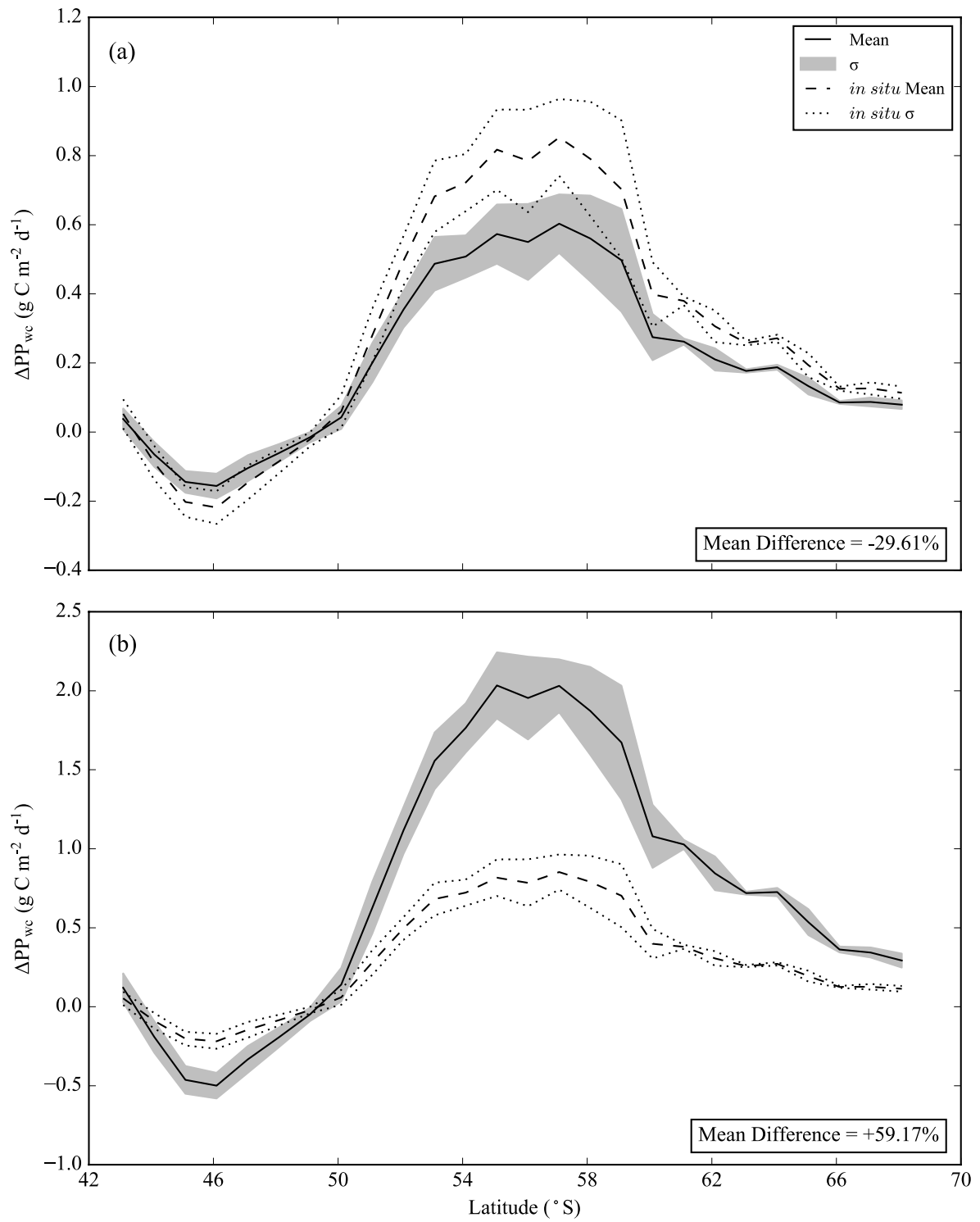


Figure S5: The absolute mean differences in depth integrated primary production (ΔPP_{we}) with \pm standard deviation (σ) interpolated along the transect line utilizing the (a) increased K_d values and (b) decreased K_d values; also displayed is PP_{we} derived utilizing *in situ* K_d .

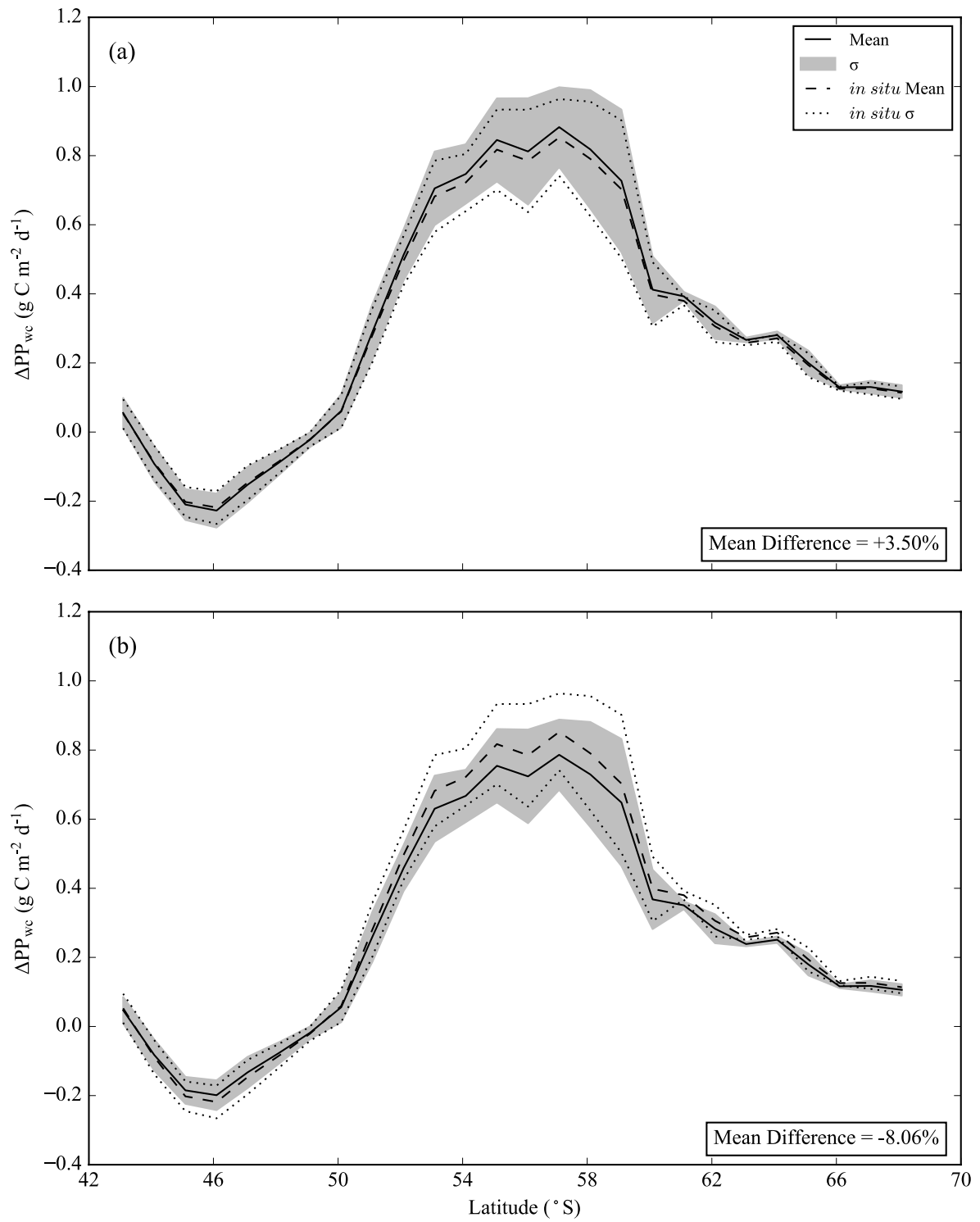


Figure S6: The absolute mean differences in depth integrated primary production (ΔPP_{we}) with \pm standard deviation (σ) interpolated along the transect line utilizing the (a) increased PAR values and (b) decreased PAR values; also displayed is PP_{we} derived utilizing *in situ* PAR.

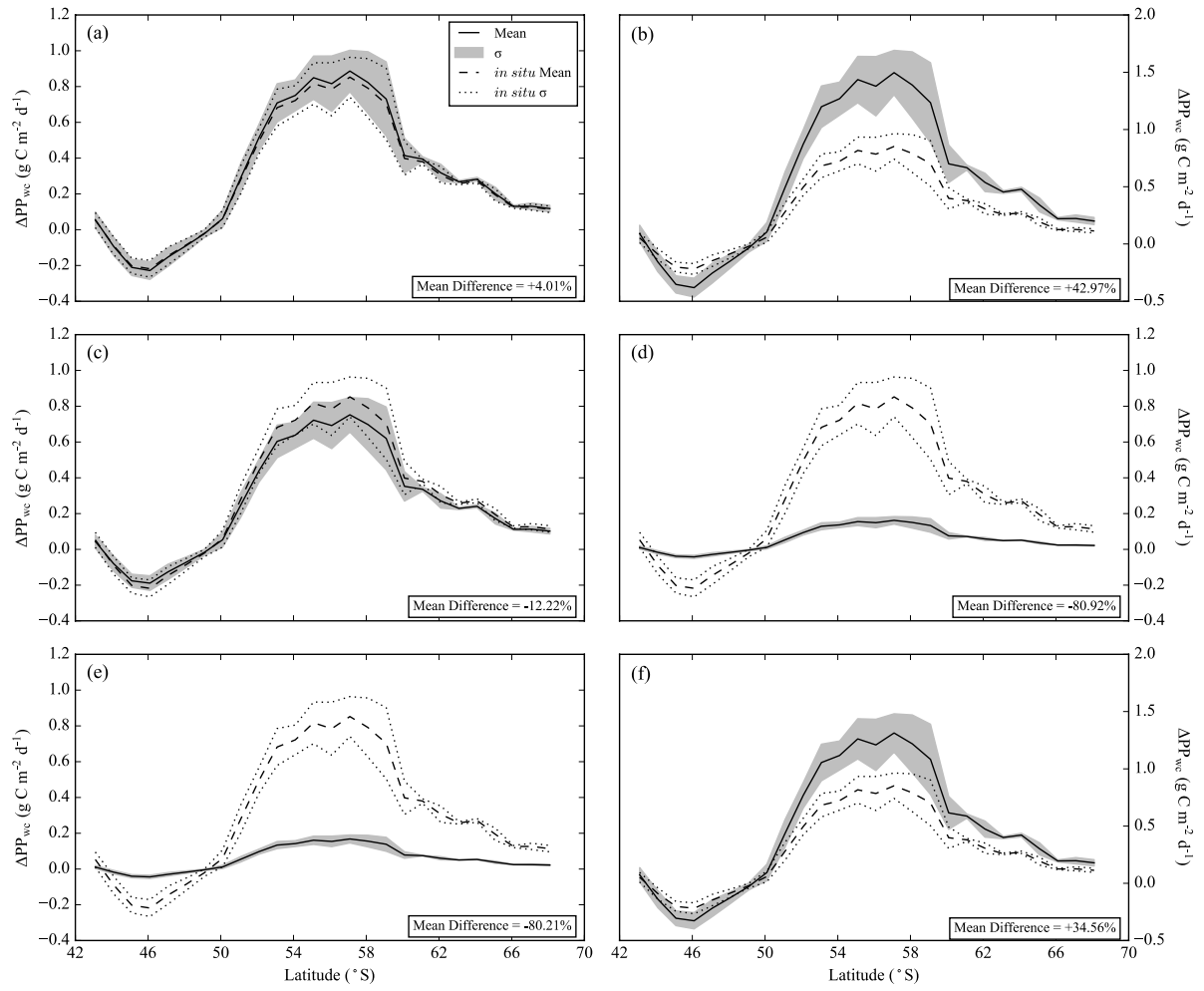


Figure S7: The absolute mean differences in depth integrated primary production (ΔPP_{wc}) with \pm standard deviation (σ) interpolated along the transect line utilizing increased (a) α values and (b) P_{max} values, decreased (c) α values and (d) P_{max} values, (e) increase α and decreased P_{max} values and (f) decreased α and increased P_{max} values. Displayed on all plots is the PP_{wc} derived utilizing the *in situ* α and P_{max} values. (Please note the different scales in subplots b & f).