Supplementary Material

Inhibition of non-photochemical quenching increases functional absorption cross-section of photosystem II as excitation from closed reaction centres is transferred to open centres, facilitating earlier light saturation of photosynthetic electron transport

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**Supplementary data I:** Induction of NPQ in dark adapted *Arabidopsis* genotypes transferred to 1000 μmol photons m⁻² s⁻¹ WL as monitored by saturating pulse of MINI-PAM at intervals of 30 s (means ± s.e; n = 3; error bars appear when they exceed symbol size).
Supplementary data II: To a first approximation, increase of functional absorption cross-section of PSII ($\sigma_{PSII}'$) is evident as an increase in the initial slope (drawn by eye) of the SQA phase of the transient chlorophyll fluorescence from individual QA flashes of LIFT/FRR. Treatment with DTT inhibits steady state NPQ and increases $\sigma_{PSII}'$ in detached leaves of (a) shade- and (b) sun-grown spinach (SH and SU respectively) shown in representative QA flash transients 7.5 min. after transfer from dark to 530 $\mu$mol m$^{-2}$ s$^{-1}$ WL. Values of NPQ and $\sigma_{PSII}'$ (units of Å$^2$/RCII) from FRR model fit to the transients are shown in each case.
Supplementary data III: Correlations between ETR and NPQ measured in rosettes of Arabidopsis using LIFT with those measured by MINI-PAM in leaves of Arabidopsis genotypes during steady state after 5 to 6 min. induction in 1050 μmol photons m\(^{-2}\) s\(^{-1}\) WL (broken line = ratio 1:1). The LIFT assays (n = 2–4 plants) were done on different individuals from the same populations of genotypes three and four days after the MINI-PAM assays (n = 3 plants; mean ± s.e.).
Supplementary data IV: The greater initial slope of the QA flash in Arabidopsis NPQ mutants, compared to their corresponding NPQ replete genotypes, after 9 min in 1000 μmol m⁻² s⁻¹ WL confirmed that $\sigma'_{PSII}$ increases when NPQ is impaired. Values of NPQ and $\sigma'_{PSII}$ (units of Å²/RCII) from FRR model fit to the individual transients are shown in each case.