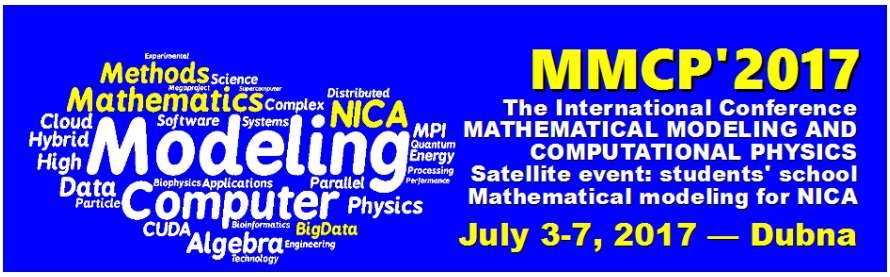

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Reduced model of electron transfer in photosystem II inhibited by DCMU

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Photosystem II (PSII) is one of the cue protein complexes involved in photosynthesis. It carries out the transfer of electrons from oxygen evolving complex (OEC) to the plastoquinone in the time range from picoseconds to hundreds of milliseconds. The fluorescence emitted by the antenna pigments of PSII is an important marker of the photosynthesis activity. Different phases of fluorescence transient reflect definite stages of electron transfer in PSII, but the interpretation of fluorescence transient is not fully clear because of the complexity of PSII. To get more simple system for studying the inhibitor DCMU, which blocks transfer of electron to plastoquione, is used.

In this work we developed the detailed model of electron transfers in PSII treated with DCMU. The model describe transitions of different states of PSII, which mediate electron transfer from OEC to primary quinone. The model possesses 24 ordinary differential linear equations. Time hierarchy of processes allowed us to apply Tikhonov's theorem and reduce this system to three ordinary differential linear equations. The parameters of novel reduced model are the expressions that consists of original parameters of the fully model. We derived the analytical solution of the reduced model as the sum of three exponential functions. The final three-exponential expression describes three slow stages of electron transfer: light-dependent stage and two stages of electron transfer by OEC. This analytical solution allowed us to get single-valued fitting of experimental curves and analyze some changes in PSII of algae growth under different light conditions.

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