**E-photosynthesis model users guide**

This file contains the basic information about how to use the program:

1. e-Photosynthesis was developed by Dr. Xin-Guang Zhu. To see the details of the model, please check publications for this model ([Zhu *et al.* 2012](#_ENREF_3), [Zhu *et al.* 2007](#_ENREF_1) and [Zhu *et al.* 2005](#_ENREF_2)).
2. To use this model, first copy all the files to a directory, then run MATLAB and set the working directory to the directory where the codes are saved.
3. **Condition** defines the environmental conditions. Such as intercellular CO2 concentration and photon flux density.

**SYSInitial** defines the simulation time.

1. **PS\_Drive** describes the Calvin cycle in addition to the starch synthesis, triose phosphate export.

**PR\_Drive** describes the photorespiration model.

**PS\_PRDrive** includes the Calvin cycle, starch synthesis, triose phosphate export, and photorespiration process.

**FI\_Drive** includes the light energy absorption, transfer, primary charge separation, and electron transfer around PSII.

**BF\_Drive** includes the electron transfer from reduced platquinone until the generation of ATP and NADPH, including the ion transfer through thylakoid membrane and ATP synthesis process.

**FIBF\_Drive** includes all the reactions covered by FI\_Drive, and BF\_Drive. **RuACT\_Drive** includes reactions of Rubisco activation process. **XanCycle\_Drive** includes reaction of the xanthophylls cycle.

**EPS\_Drive** includes all the reactions covered by PS\_PRDrive and FIBF\_Drive.

**RA\_Drive** includes reactions covered by EPS\_Drive and RA\_Drive. **RedoxReg\_Drive** includes reactions covered by EPS\_Drive and the redox regulation of enzyme activities.

**DynaPS\_Drive** includes reactions covered by EPS\_Drive and RuACT\_Drive and XanCycle\_Drive

tr **DynaPS\_Drive** ncludes reactions covered by EPS\_Drive, RuACT\_Drive, XanCycle\_Drive and RROEA\_Drive.

1. **XIni** defines initial values and parameters.

**XRate** defines rate equations.

**Xmb** defines differential equations

**X** represents PS, PR, FI, BF, RuACT, RA, RedoxReg and XanCycle.

**Reference**

Zhu XG, de Sturler E, Long SP (2007) Optimizing the distribution of resources between enzymes of carbon metabolism can dramatically increase photosynthetic rate: A numerical simulation using an evolutionary algorithm. Plant Physiol 145: 513-526

Zhu XG, Govindjee, Baker NR, deSturler E, Ort DO, Long SP (2005) Chlorophyll a fluorescence induction kinetics in leaves predicted from a model describing each discrete step of excitation energy and electron transfer associated with Photosystem II. Planta 223: 114-133

Zhu XG, Wang Y, Ort DR, Long SP (2012) e-Photosynthesis: A Comprehensive Dynamic Mechanistic Model of C3 Photosynthesis: From Light Capture to Sucrose Synthesis. Plant Cell Environ