

## **Proposal for KoFlux-NCAM Data Use**

### **Title: Geographical Variations in Gross Primary Production and Evapotranspiration of Paddy Rice in the Korean Peninsula**

**Tentative Author list & authors' roles:** Jonghan Ko (correspondent, model design & development, and manuscript organization & preparation), Chi Tim Ng (coauthor, design and initial programming of the crop model algorithms), Jongmin Yeom (coauthor, satellite data process), Seungtaek Jeong (leading author, post process of satellite data and classification of crop lands), and Data Provider(s); \* Author list and order will be updated and confirmed later considering the data providers' proposal.

### **Objectives:**

1. To develop both a canopy photosynthesis model and an evapotranspiration (ET) model, applicable with remote sensing information
2. To evaluate the models' simulated results (GPP, ET, dry mass, and yield) using in-situ measurement and regional survey data

### **Significance:**

1. Quantification of the canopy photosynthesis and ET of crops is essential to determine the effects of environmental changes on CO<sub>2</sub> fluxes and ET in agricultural ecosystems and crop productivity.
2. The investigation of CO<sub>2</sub> and water fluxes in an agricultural system is critically important for elucidating the physiological responses of crops to environmental conditions. Also, understanding of these processes will be beneficial for projection of food production in climate change models.
3. Our study results would highlight the need to partition water and carbon fluxes to improve our mechanistic understanding of primary productivity and water use efficiency of rice and environmental impact of agricultural practices.

**Outline:**

1. Abstract
2. Significance
3. Introduction
4. Results
  - a. Simulation of carbon assimilation and ET
  - b. Geographical Projection of Carbon Assimilation and ET
5. Discussion
6. Conclusions
7. Study Area and Data
  - a. Flux and Lysimeter Data
  - b. Study Region for Spatiotemporal Simulation
  - c. Satellite Data
8. Methods
  - a. Cumulative Crop VIs based on the Semi-empirical BRDF Model
  - b. Insolation from COMS MI based on the Physical Model
  - c. Air Temperature from LAPS based on the Numerical Model
  - d. Crop Classification and Acreage Map of Korea
  - e. Simulation of GPP and ET using the GRAMI-rice Crop Model
  - f. Statistical Examination
9. Acknowledgements
10. References

**Proposed sites to be involved:** CRK (Cheorwon), HFK (Haenam), and CFK (Cheongmincheon)

**Proposed rules for co-authorship:** Participate in drafting, reviewing or revising the manuscript; make substantial intellectual contributions for the three biophysical models; main evaluation data (Flux tower GPP, etc.) provider, etc.

**Project Funds to be used:** NRF-supported Basic Science Research, entitled “Development and construction of a staple crop production monitoring system for the Northeastern Asia using Satellite Images” (Project ID #: NRF-2018R1D1A1B07042925)

**Research Schedule:**

1. Flux data analyses: Mid May to Early July, 2018
2. Model formulation and simulation: Early June to Early August, 2018
3. Analysis of study outcomes: Early August to End of Feb., 2019
4. Manuscript preparation: Mid-March to Early April, 2019

**The Importance of the Requested Data in this proposal:**

☒ Essential      ☐ Moderate      ☐ Minor

**Target Journal & Justification of the journal selection:** PNAS; the overall organization and research outcomes may be fit well to a popular journal like the one chosen.