Factors affecting on the level of ground surface in tropical peatland

(1) Bulk Density?

Woody matrix and water/air gaps

(Yonebayashi et al, 1995)

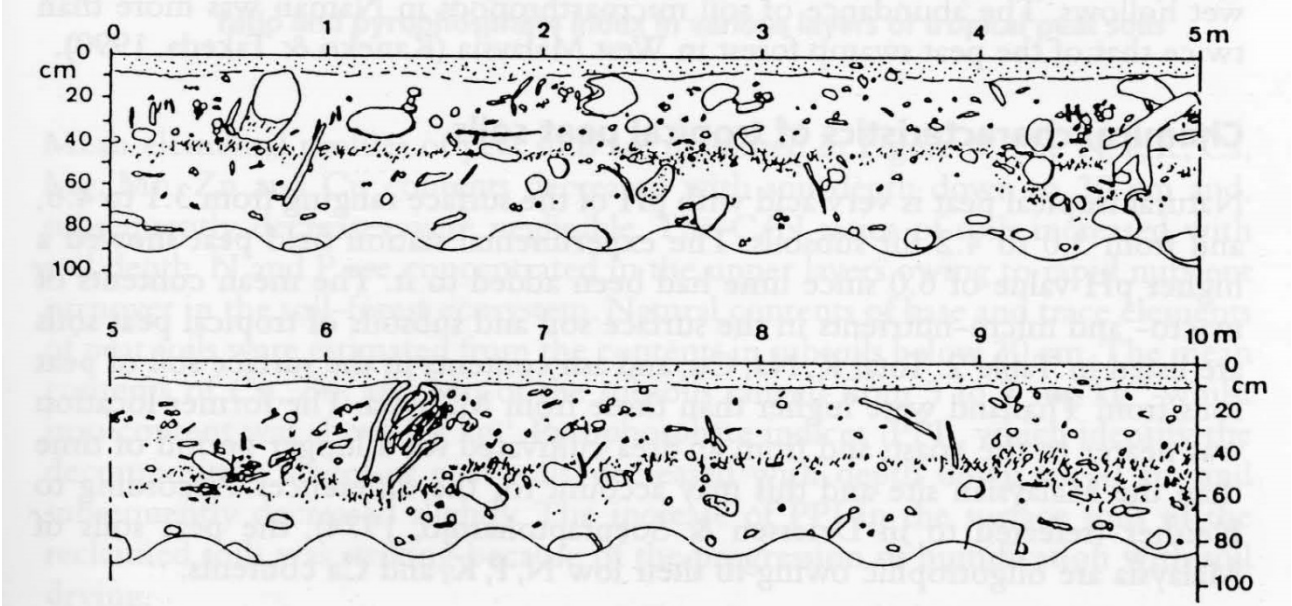
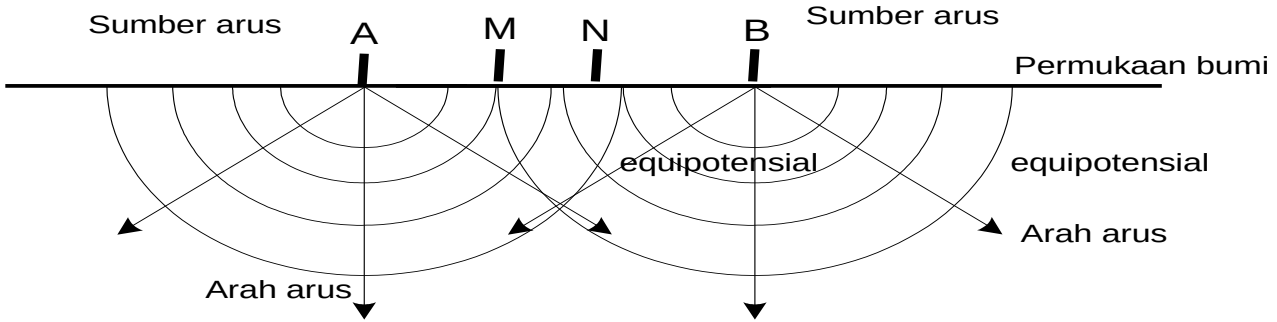
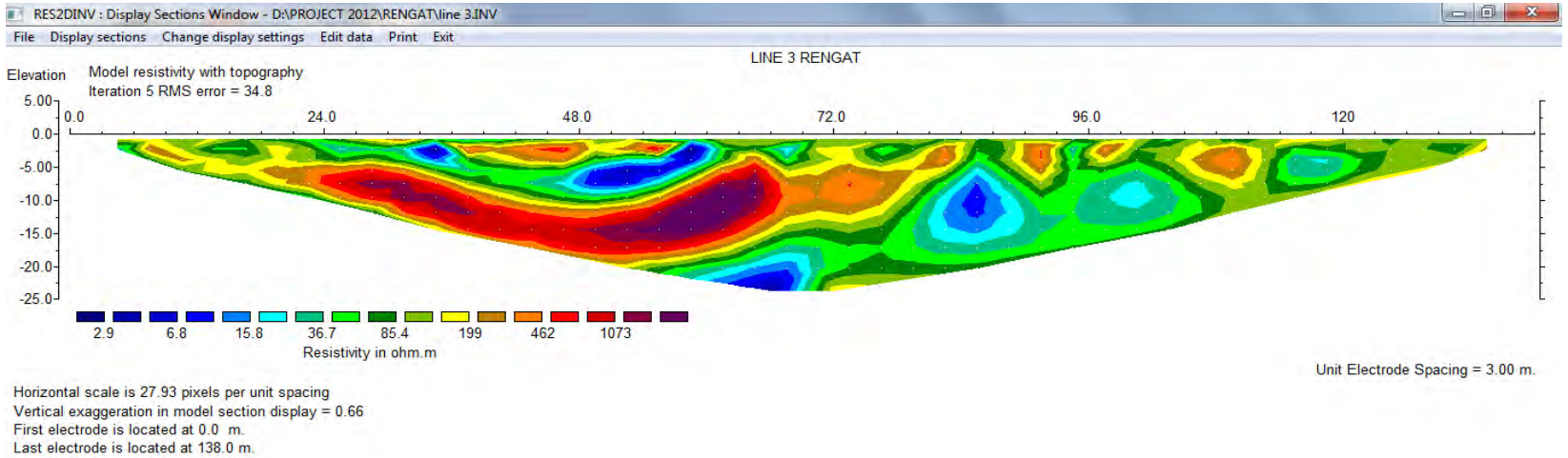


Figure 3 Woody peat profile in Pontian MARDI experimental station, Johor, Malaysia

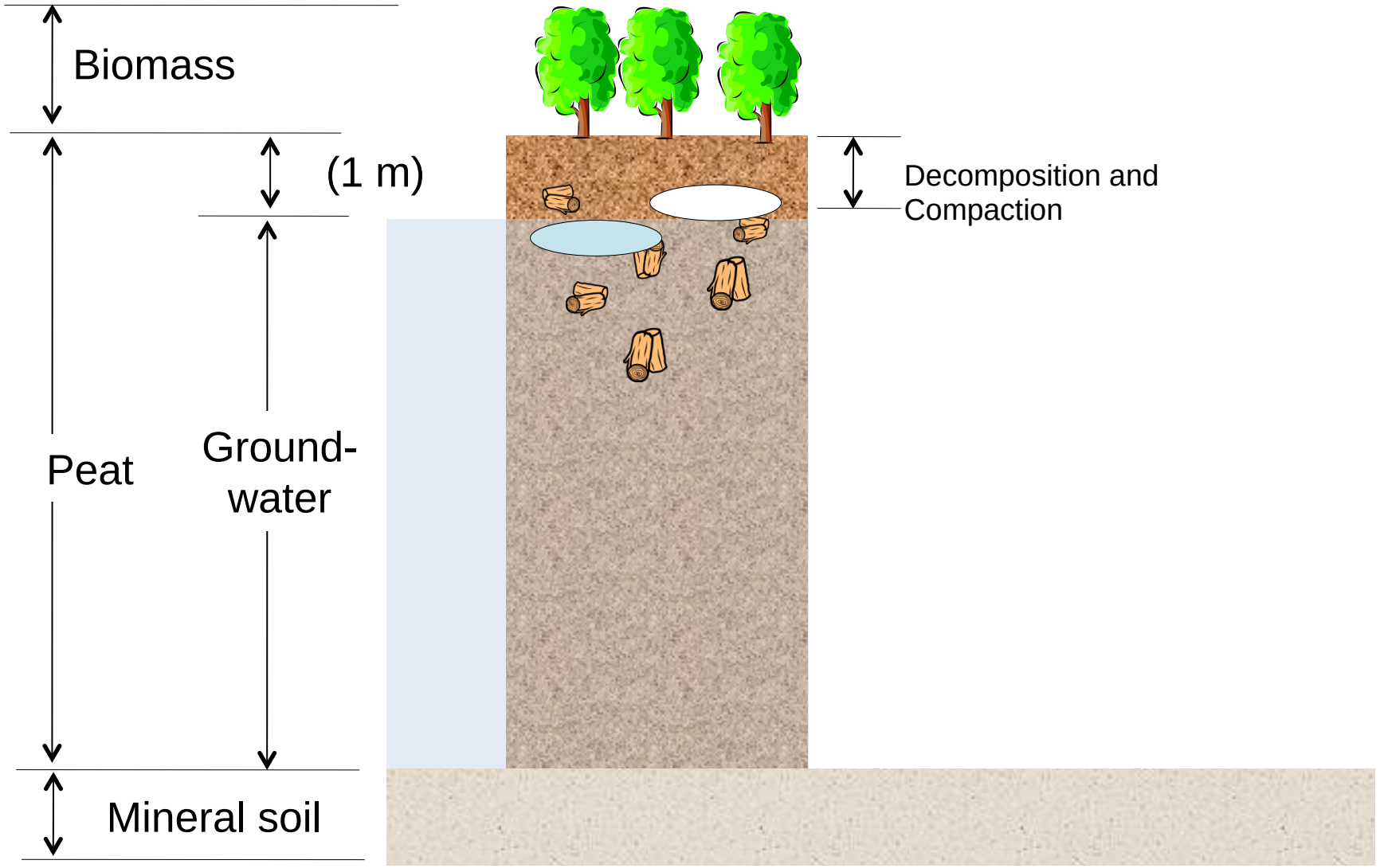
GEOSCANNER ASSESSMENT





Factors affecting on the level of ground surface in tropical peatland

(2) How separate Decomposition and Compaction?



Subsidence measurement by use of a laser distance meter

SESAME system at Taruna-Camp

2013.10.23 -

Coordinate:	-2.317350° 114.059560°
Altitude:	
Responsible person:	H. Takahashi/ Y. Shigenaga/ Wisnu K.
	Instruments
Telemetric data logger	SESAME-2/ Taka1
Groundwater level	Pressure sendor
Ground surface level	LLS-3 20130901-002
Air temperature	Thermister air, 140 cm above ground surface
Rainfall:	Tipping bucket type and recorder

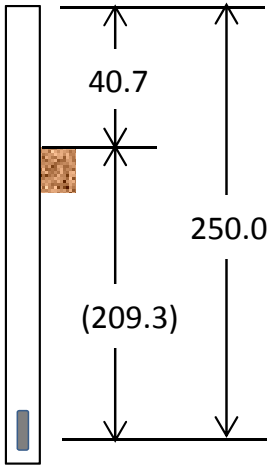
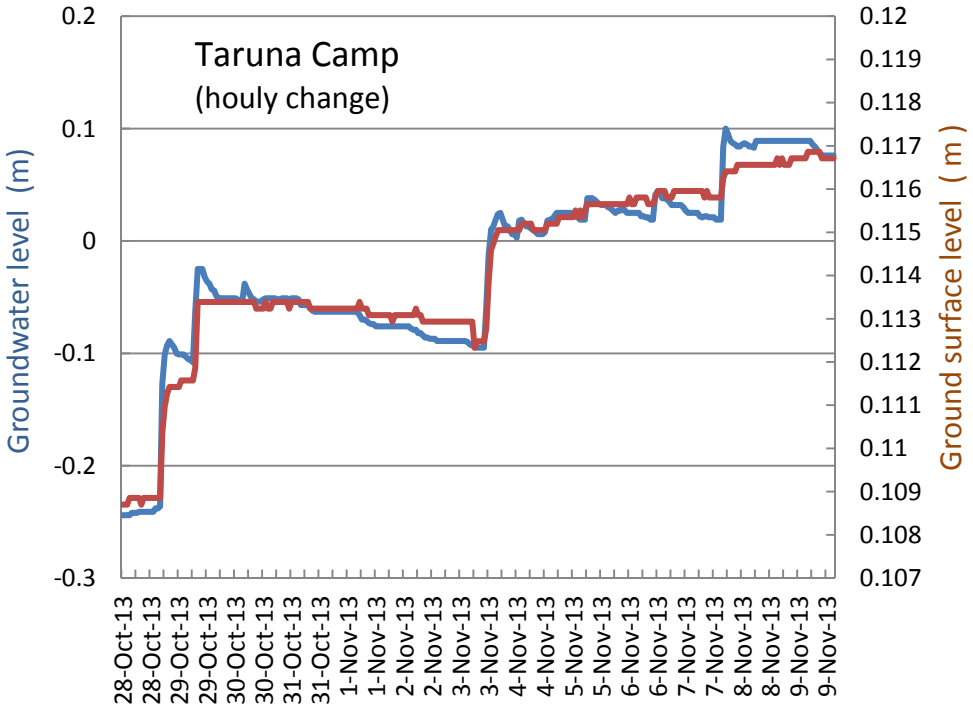
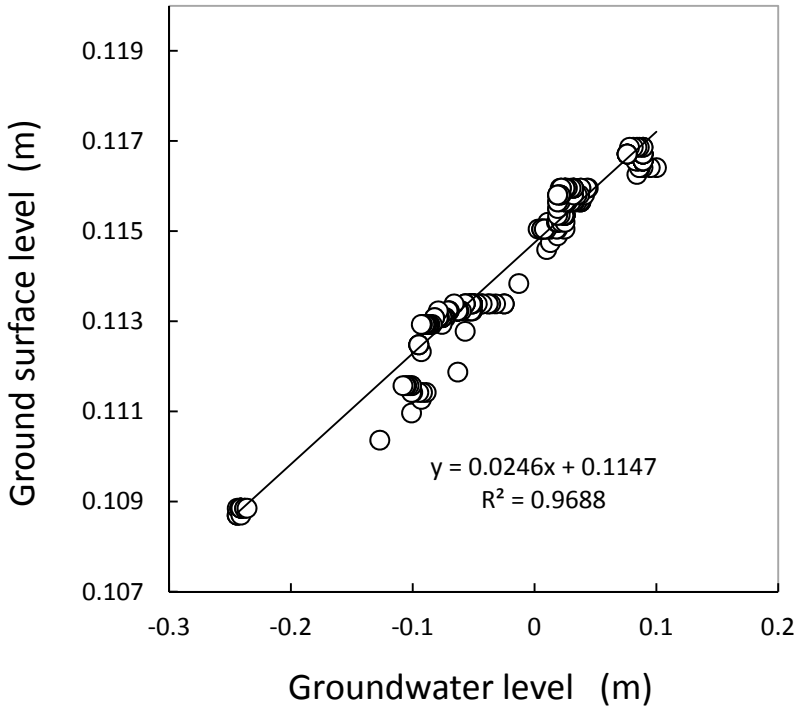


Photo.
2013.10.23
by H. Takahashi

PS 120624 Temperatures are abilable to use from 24 June, 2012
PS 141024 Ground surface recorder started on 23 Oct. 2013

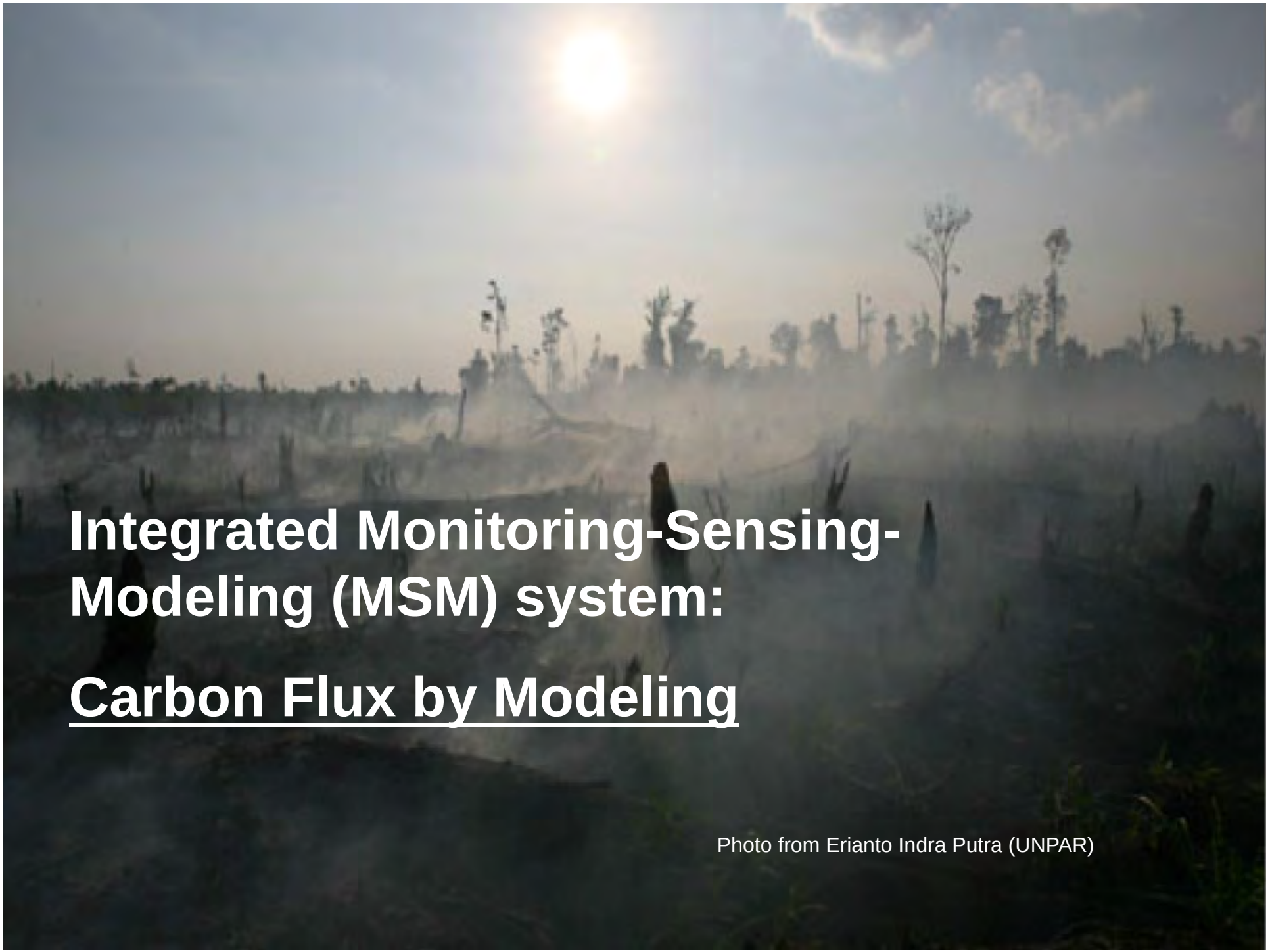
Peatland Subsidence and Water Table Monitoring





Three Elements for Peatland Subsidence

1) **Decomposition by Oxidation**
2) **Compaction**
3) **Swelling /shrinking following water table**



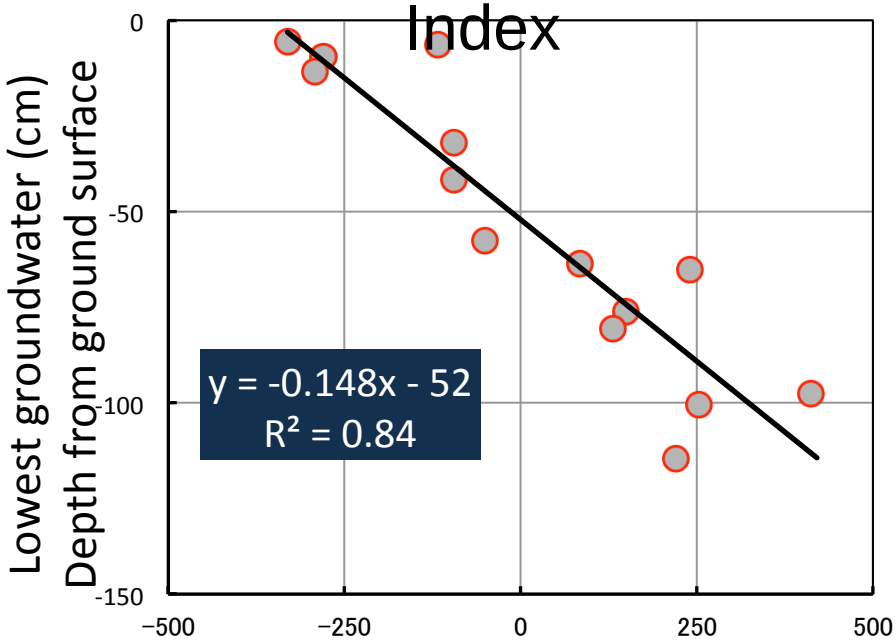
Integrated Monitoring-Sensing-Modeling (MSM) system:

Carbon Flux by Modeling

Photo from Erianto Indra Putra (UNPAR)

Takahashi Model

The lowest GWL in dray season and Peat Fire Index



correlation

Fire occurrence

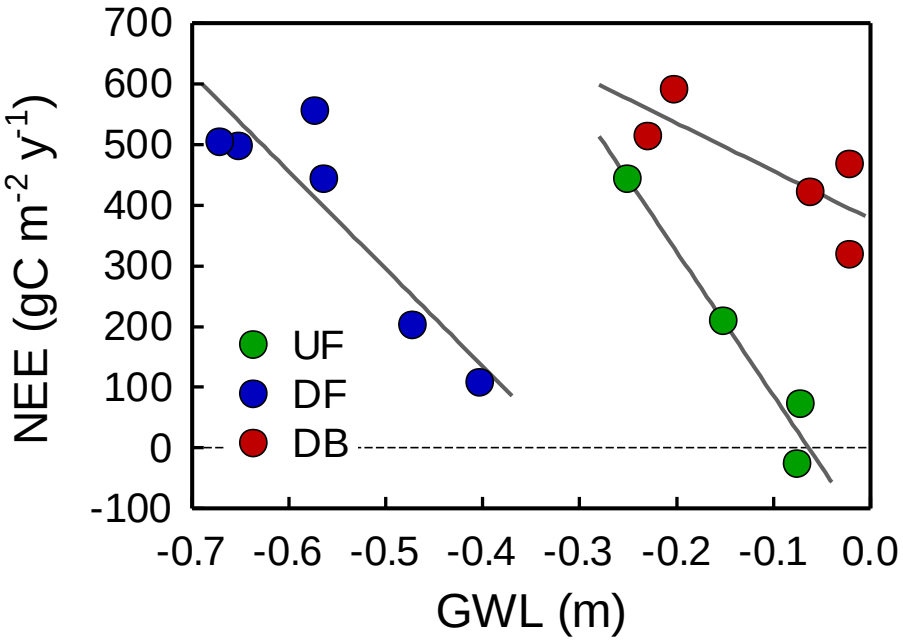
(Takahashi)

Summary

1. Peat boundary selection
2. GWT by Takeuchi model
3. CO2 emission by Hirano model
4. Fire occurrence by Takahashi model

Hirano Model

Annual NEE vs. Annually Mean GWL



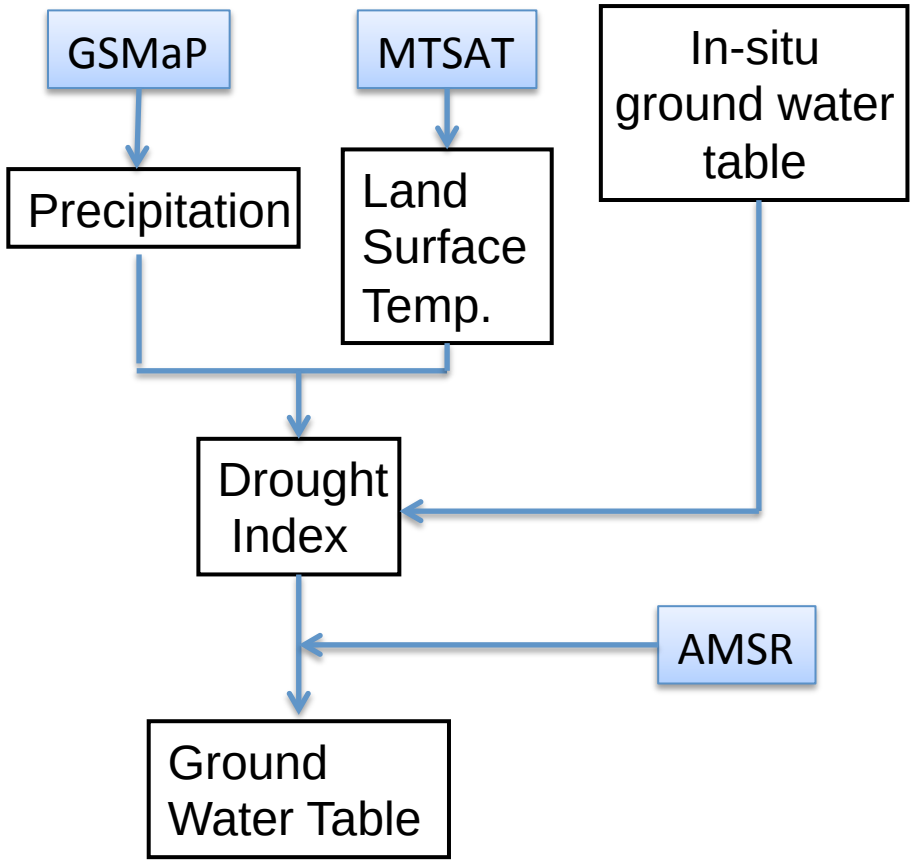
- UF *NEE*=-2376*GWL*-151
- DF *NEE*=-1609*GWL*-510
- DB *NEE*=-789*GWL*-378

NEE: Net Ecosystem CO2 Exchange

Hirano et al.(2012), GCB

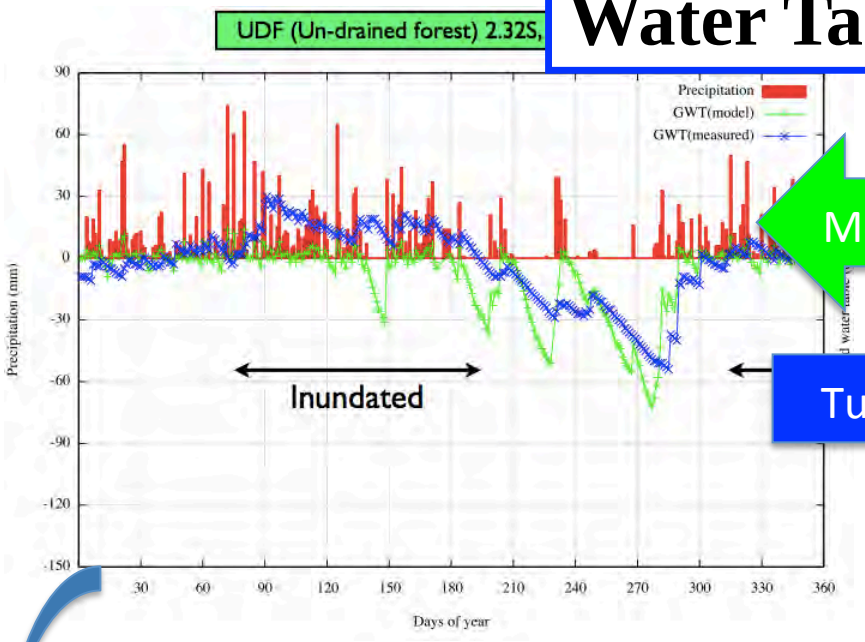
Takeuchi Model

GWT estimation by Remote Sensing Data



Takeuchi, Hirano, Anggraini and Roswintiarti (2010)

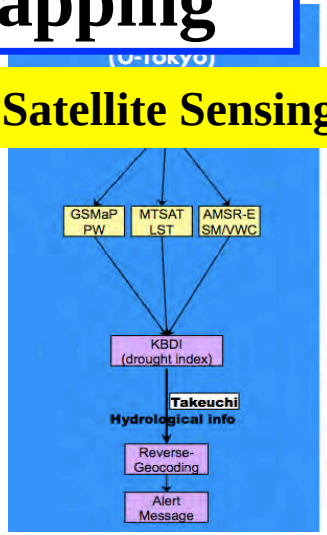
Water Table Mapping



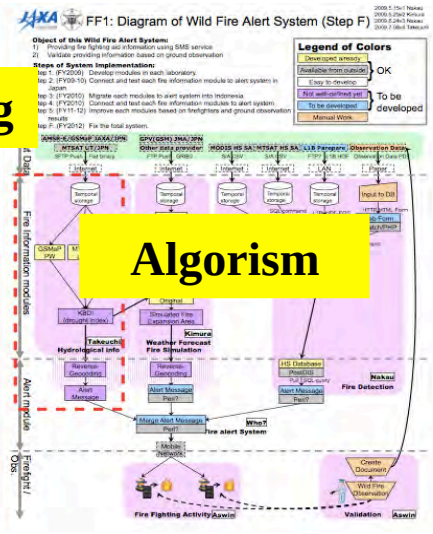
Modeling

Tuning

Satellite Sensing

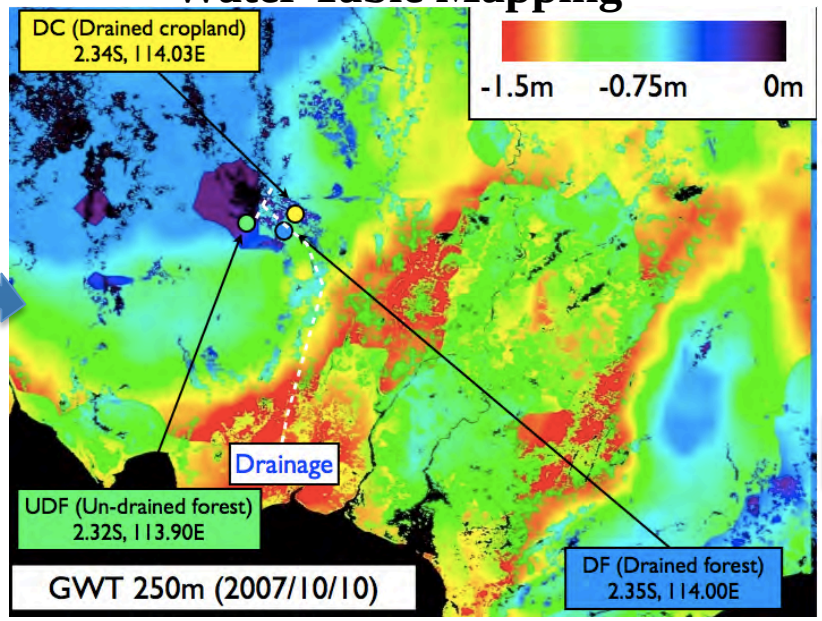


Algorism



By Wataru Takeuchi, University of Tokyo, Japan

Water Table Mapping



Input

Coefficiency between Water Table Level and

1) CO2 emission by Oxidation

2) CO2 emission by Fire Factors

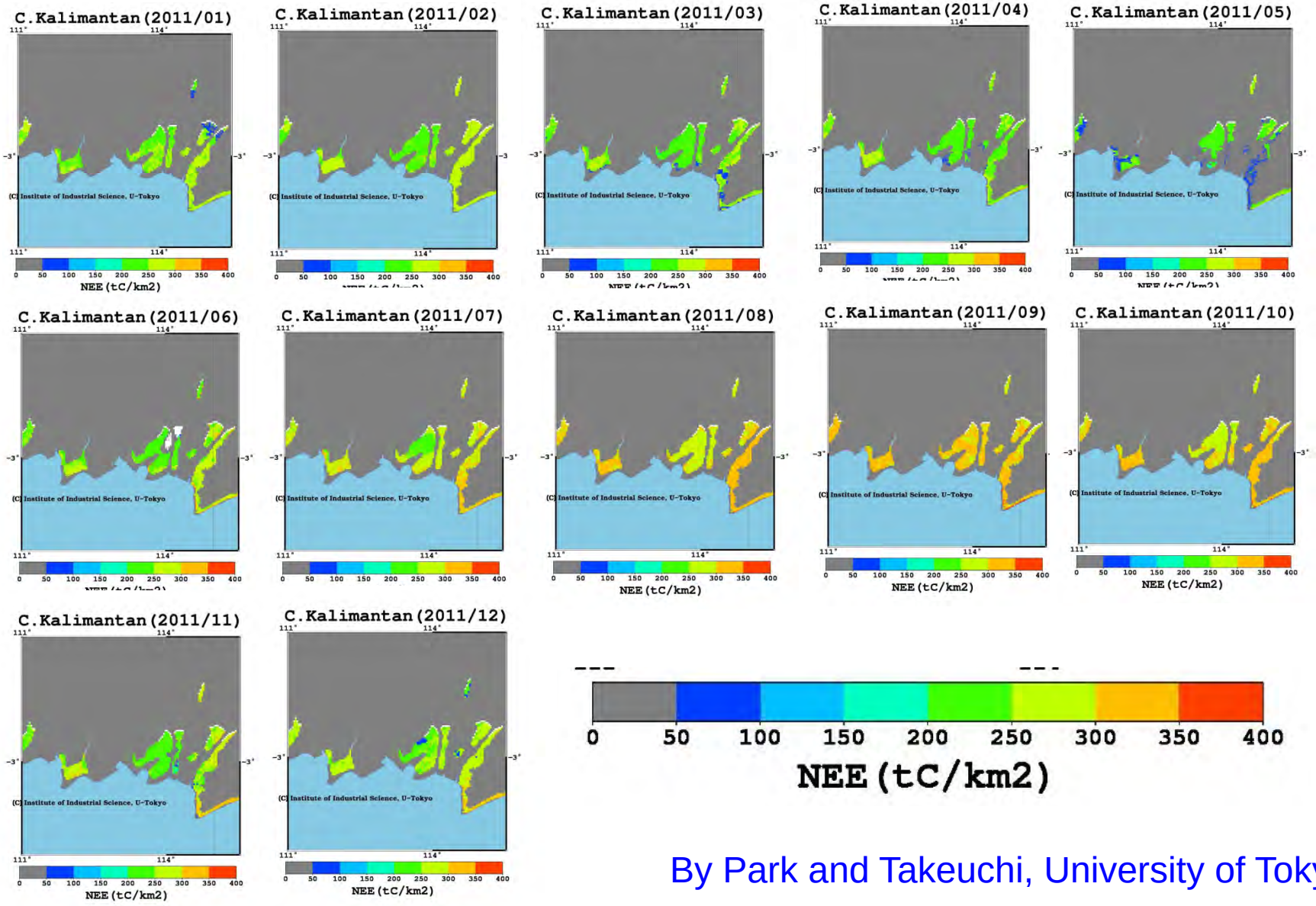
Output

Mapping of

1) CO2 emission by Oxidation

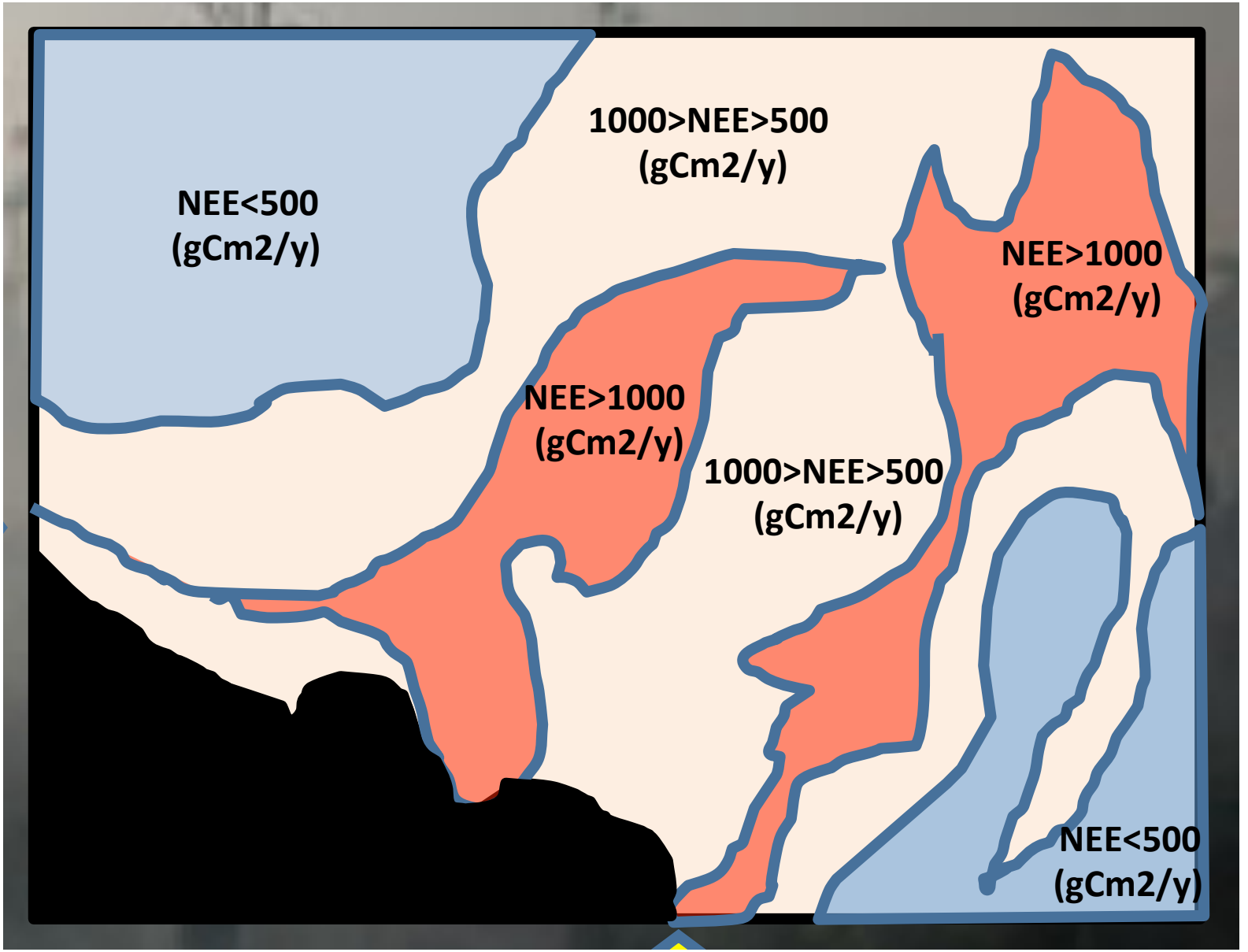
2) CO2 emission by Fire Factors

CO_2 balance (NEE, tC m^{-2} $month^{-1}$) of peatland in Central Kalimantan in 2011



By Park and Takeuchi, University of Tokyo

NEE mapping in peatland during one year



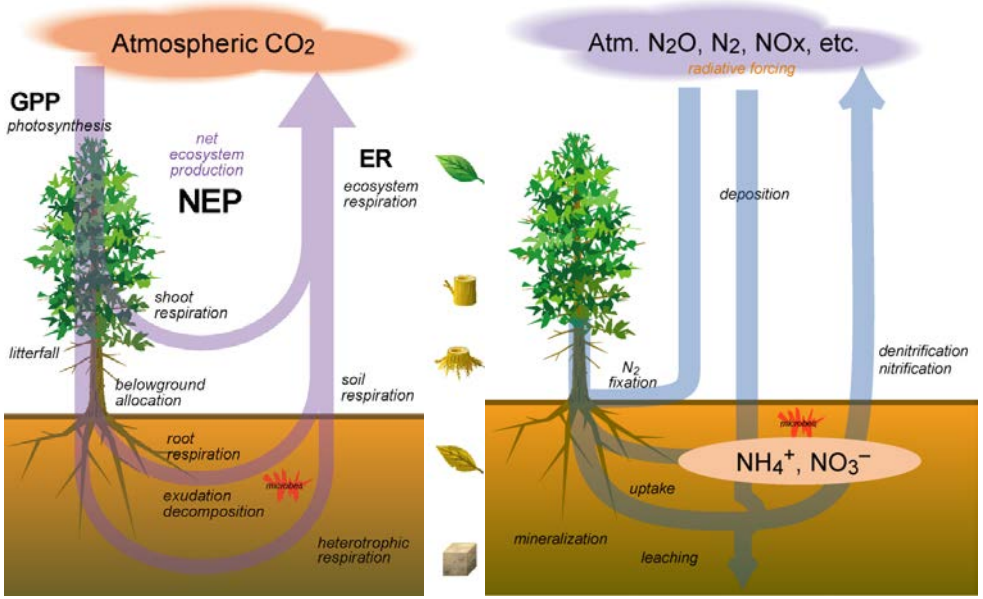
The Ecosystem model developed by NIES(Dr. Ito)

VISIT **Vegetation Integrated SImulator for Trace gases**

(Developed in NIES & FRCGC-JAMSTEC)

Objectives

- Atmosphere-ecosystem biogeochemical interactions
- Especially, major greenhouse gases (CO_2, CH_4, and N_2O) budget
- Assessment of climatic impacts and biotic feedbacks



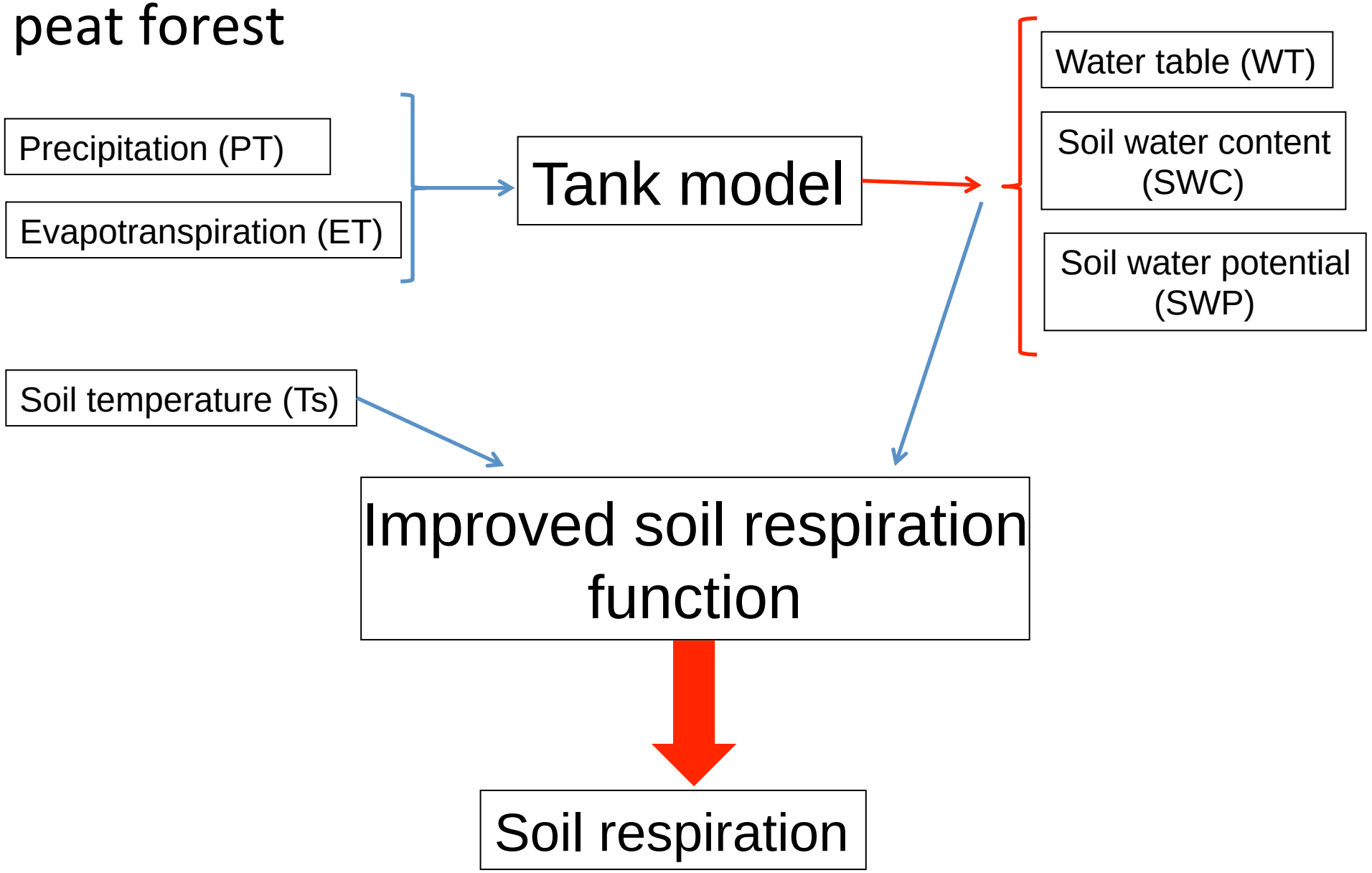
Carbon-cycle
(Sim-CYCLE-based)

Nitrogen-cycle

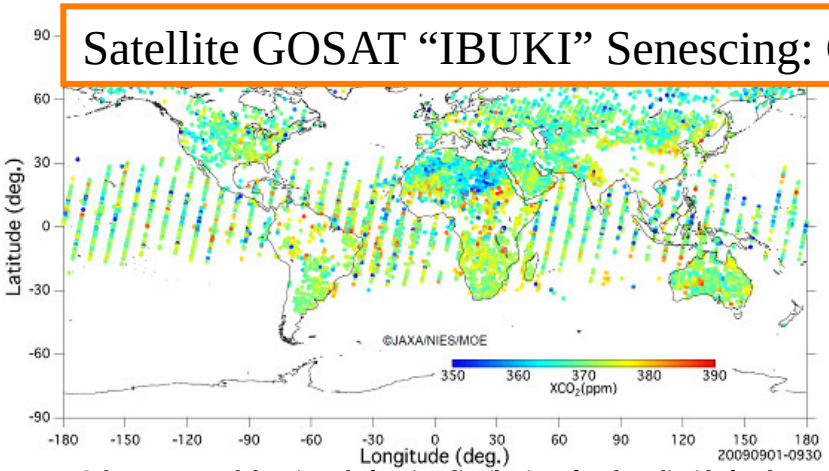
Point-global, daily-monthly

- CO_2: photosynthesis & respiration
- CH_4: production & oxidation
- N_2O: nitrification & denitrification
- LUC emission: cropland conversion
- Fire emission: CO_2, CO, BC, etc.
- BVOC emission: isoprene etc.
- Others: N_2, NO, NH_3, erosion

Improved scheme for soil respiration of tropical peat forest

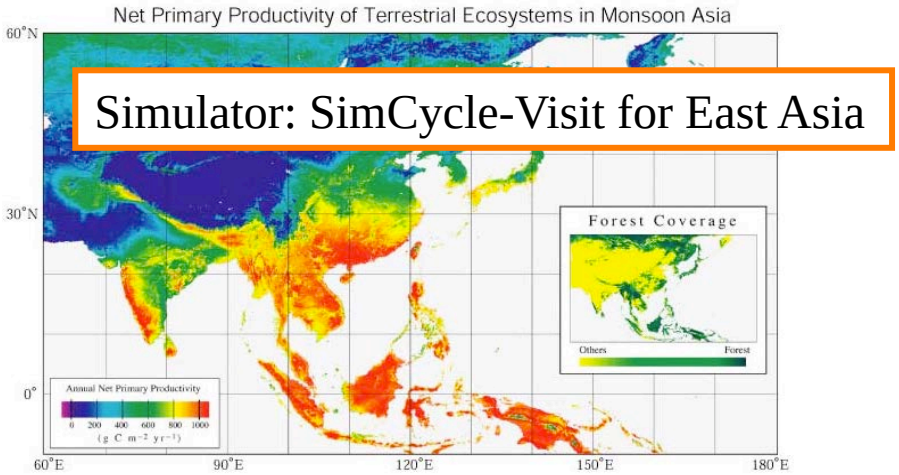


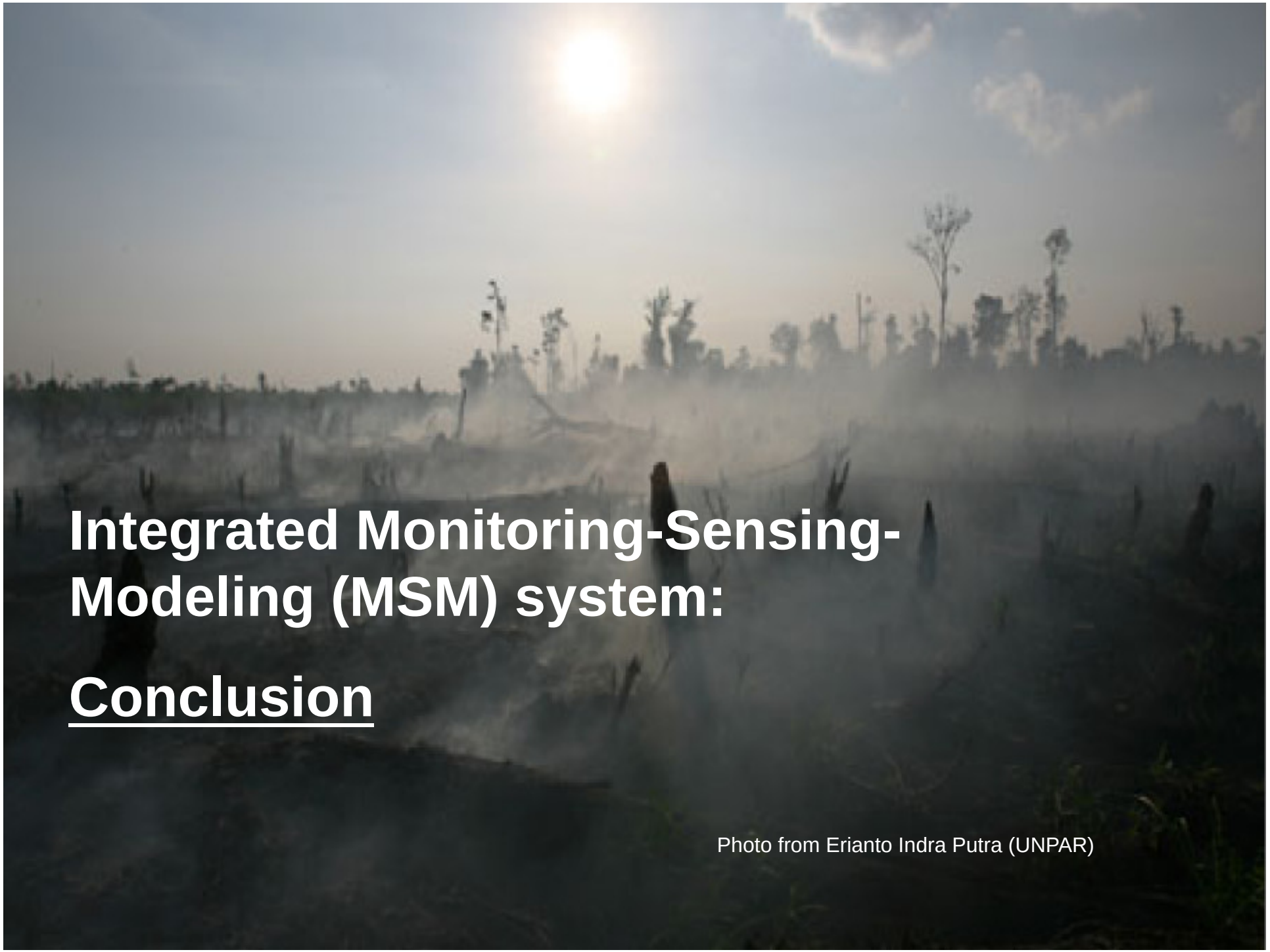
Satellite GOSAT “IBUKI” Senescing: CO2



Column averaged dry air mole fraction distribution of carbon dioxide for the month of September, 2009, obtained from IBUKI observation data (unvalidated) By JAXA

Simulator: SimCycle-Visit for East Asia





Integrated Monitoring-Sensing-Modeling (MSM) system:

Conclusion

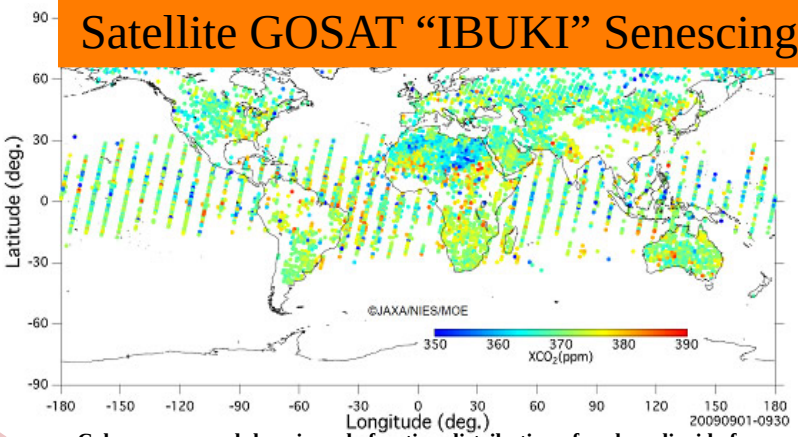
Photo from Erianto Indra Putra (UNPAR)

Top-down
- satellite
- airplane
- inverse model

Integrated, practical carbon budget map

Bottom-up
- field survey
- flux obs.
- process model

Satellite GOSAT "IBUKI" Senescing: CO2



Column averaged dry air mole fraction distribution of carbon dioxide for the month of September, 2009, obtained from IBUKI observation data (unvalidated) By JAXA

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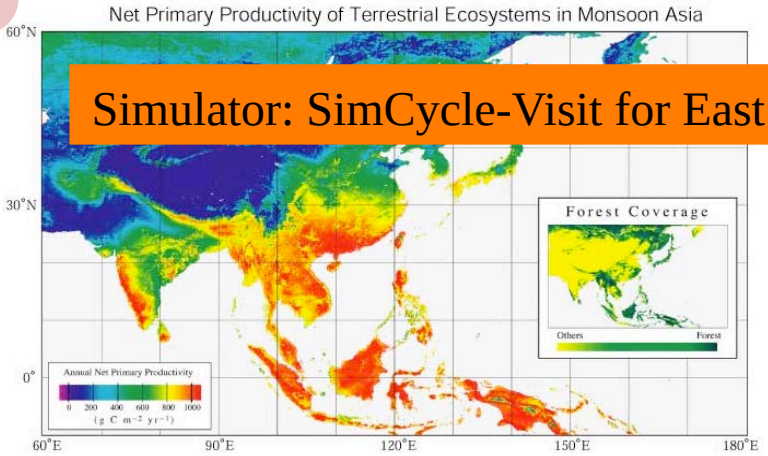


Subsidence Model

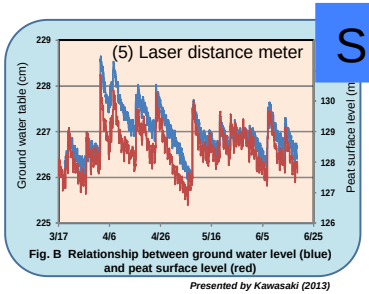
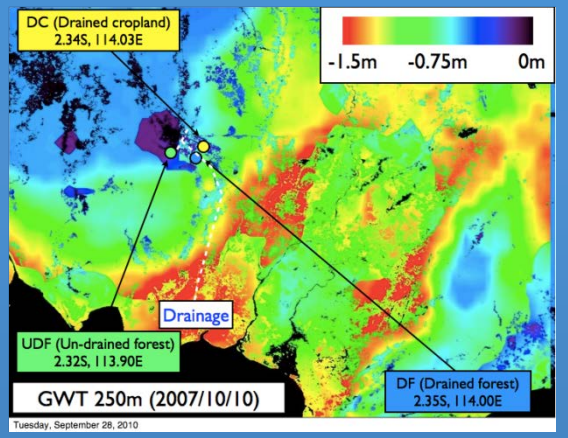


Fig. B Relationship between ground water level (blue) and peat surface level (red)

Presented by Kawasaki (2013)

Carbon-Water Simulation



- **Carbon Emission by Fire**
- **Carbon Loss through Water**
- **Carbon Emission by Microorganisms Degradation**
- **Tree Growth/Mortality**
- **Pest subsidence**


Thanks for your attention!

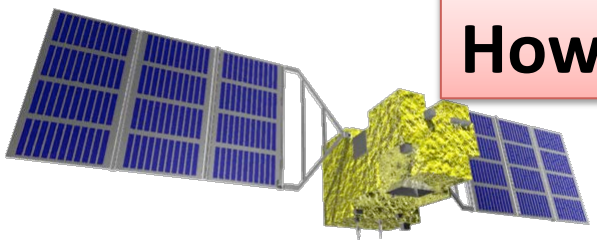
Integrated Monitoring-Sensing-Modeling (MSM) system:

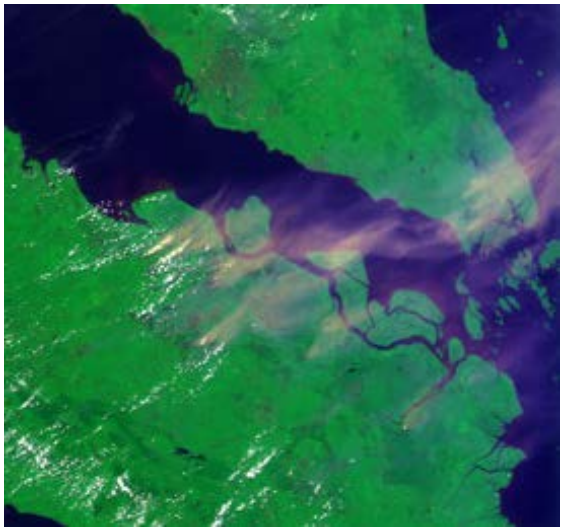
Carbon Flux by Fire

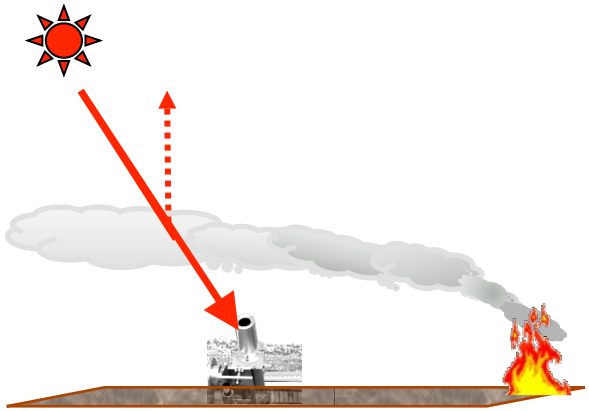
(directly)

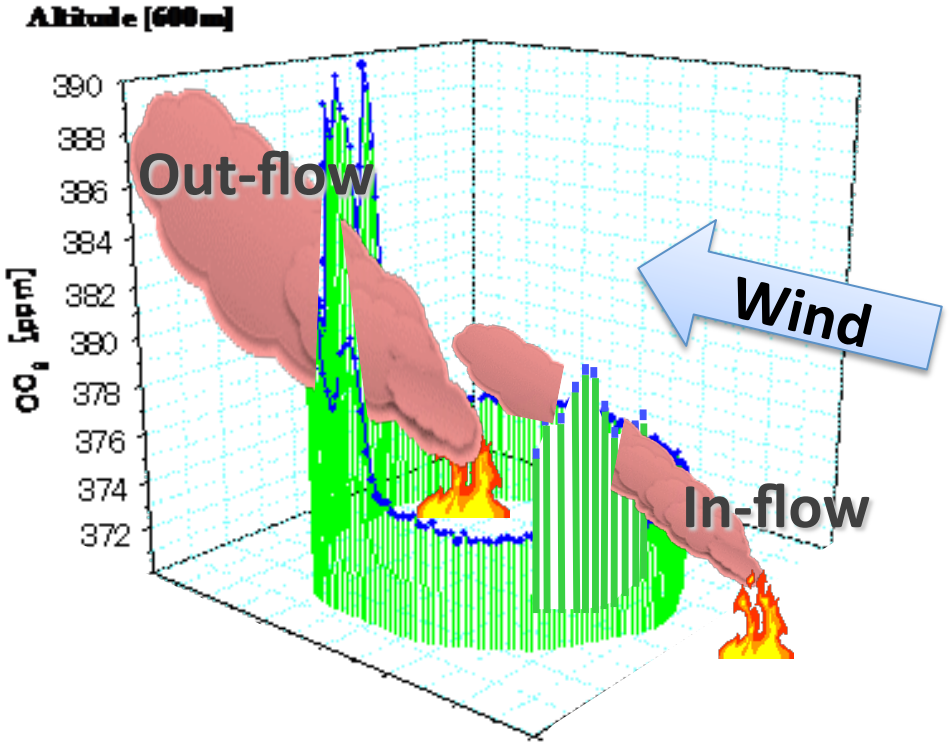
Photo from Erianto Indra Putra (UNPAR)

How to evaluate the CO_2 flux from wild fire?





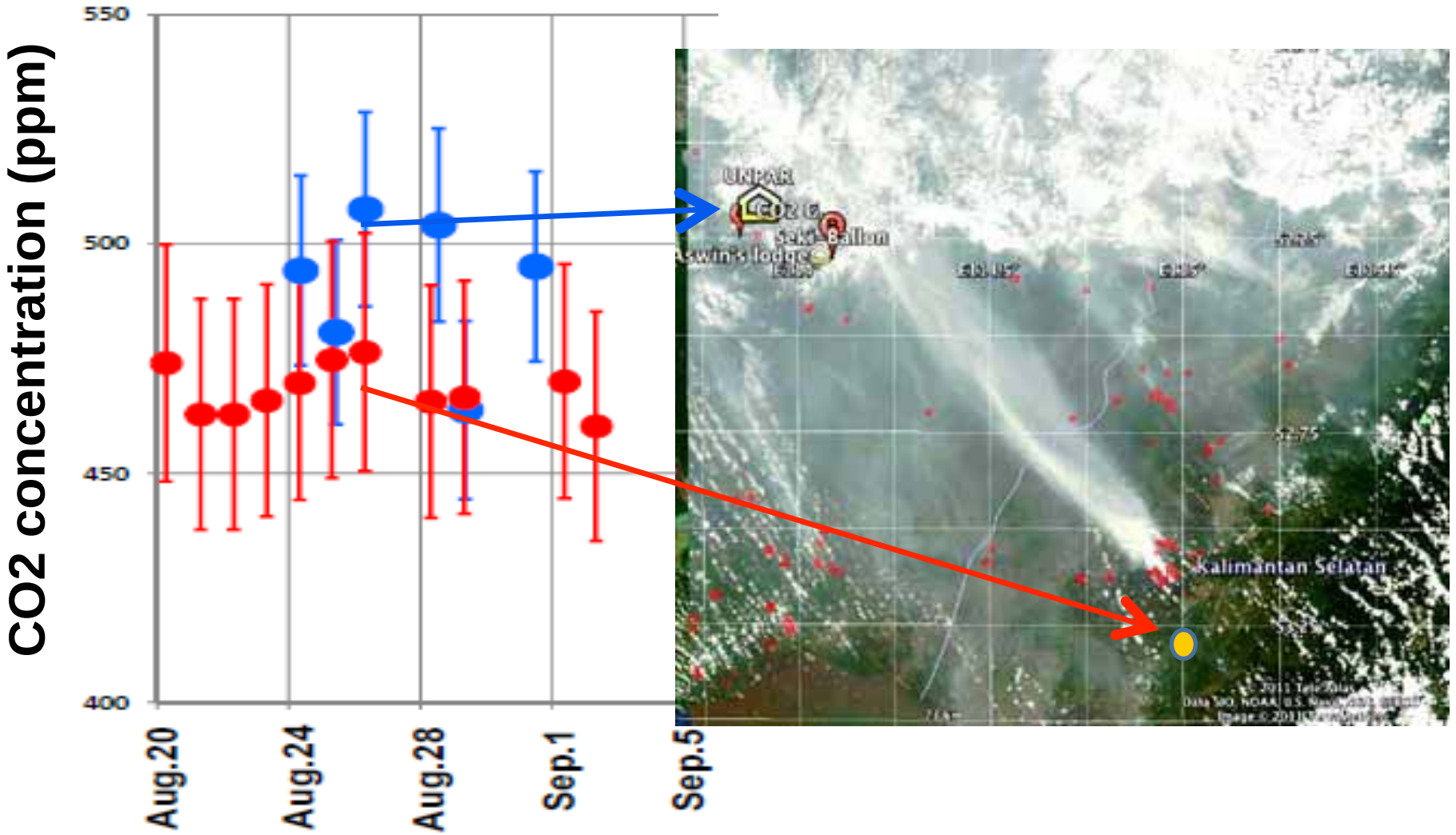




$$\text{Flux} = \int C(h,x)\, v(h,x)\, dx\, dh$$

v: Wind velocity at (h,x)
C: Concentration at (h,x)

Flux is evaluated from concentration of CO_2, wind speed and the plume distribution



	FRP	NDVI	GFED	This work
CO2 emission (Mt in 2002-10)	42±33	1.83±1.47	280±350	2870 (in 2011)