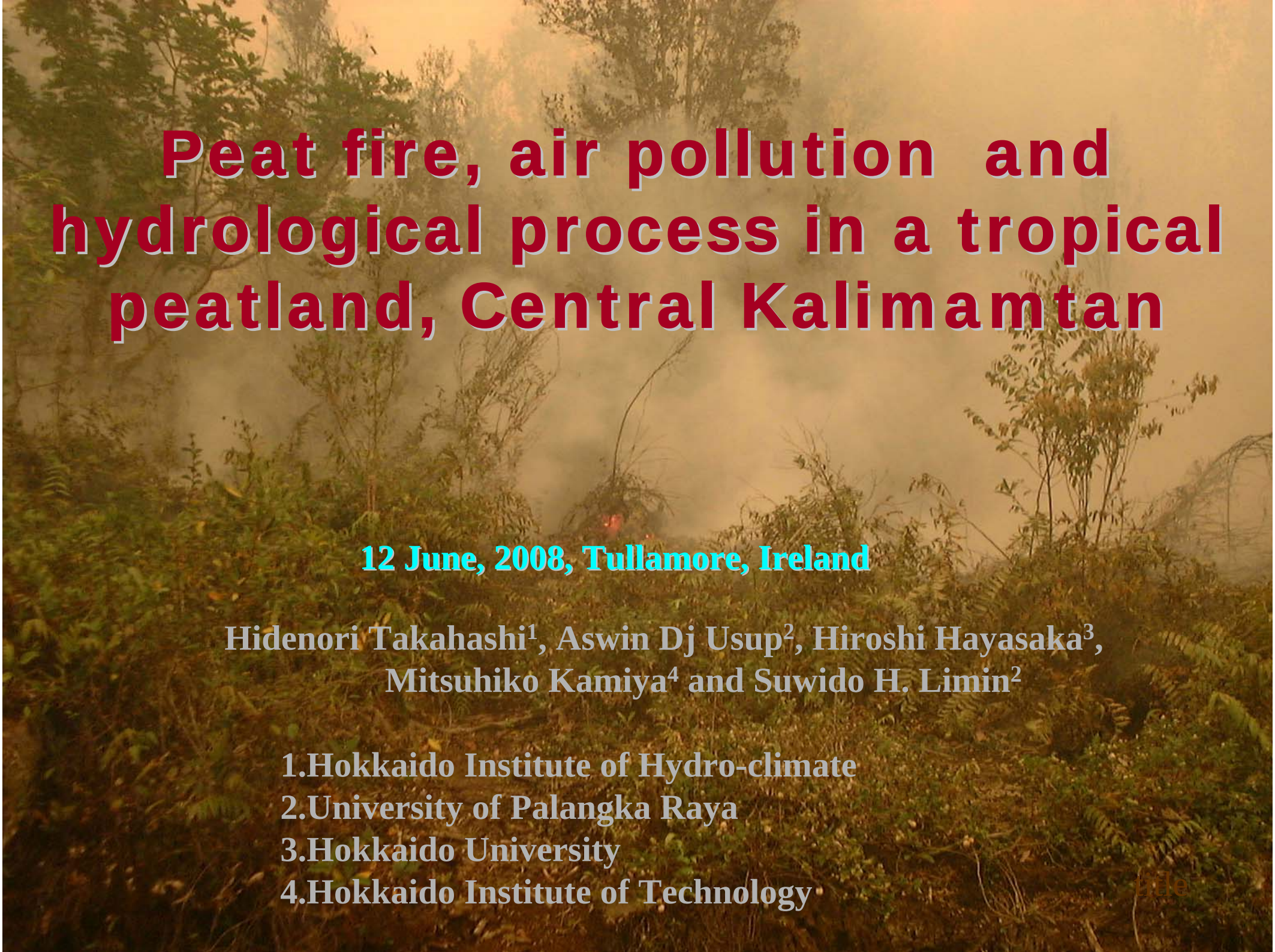
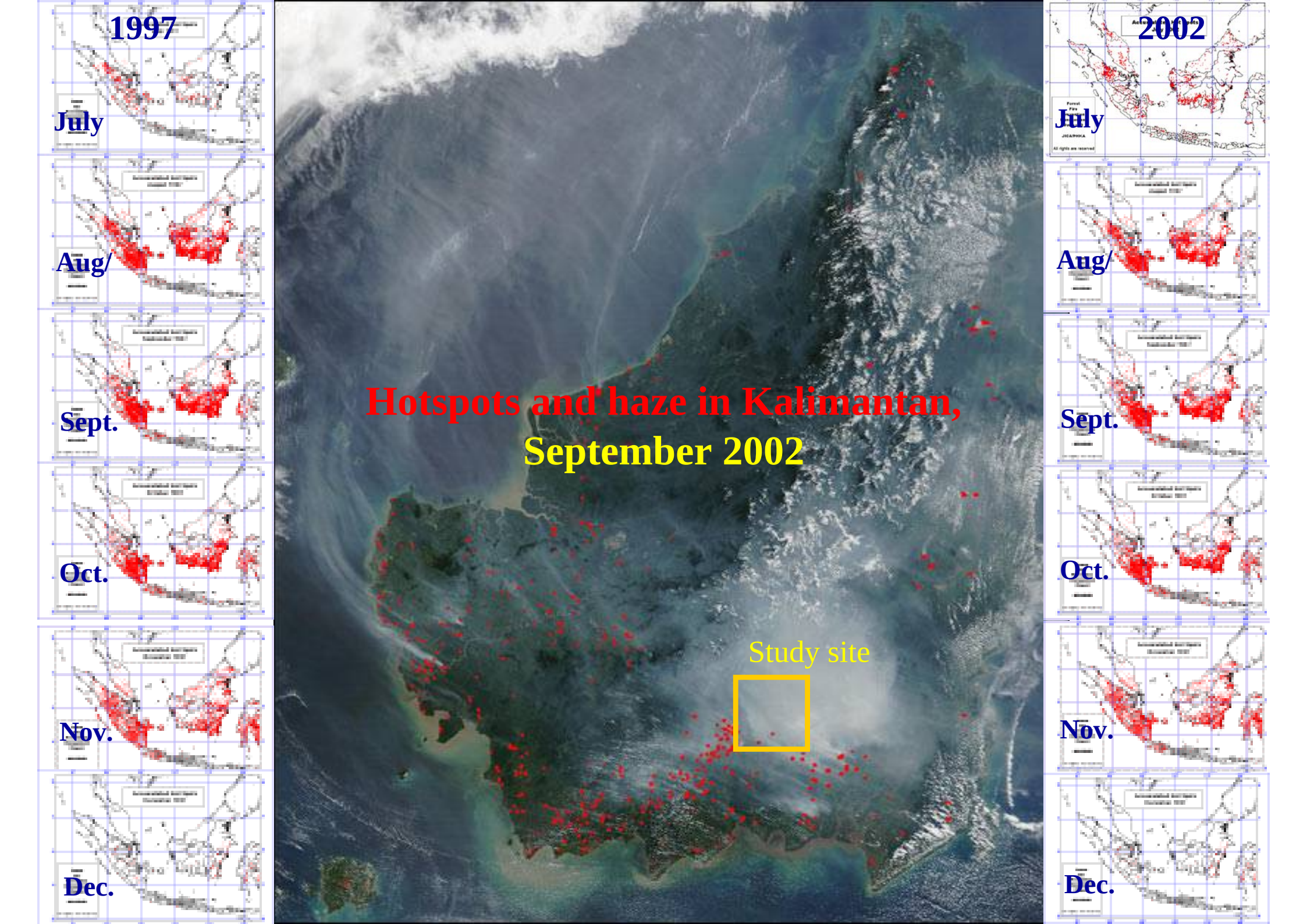


Peat fire, air pollution and hydrological process in a tropical peatland, Central Kalimamtan

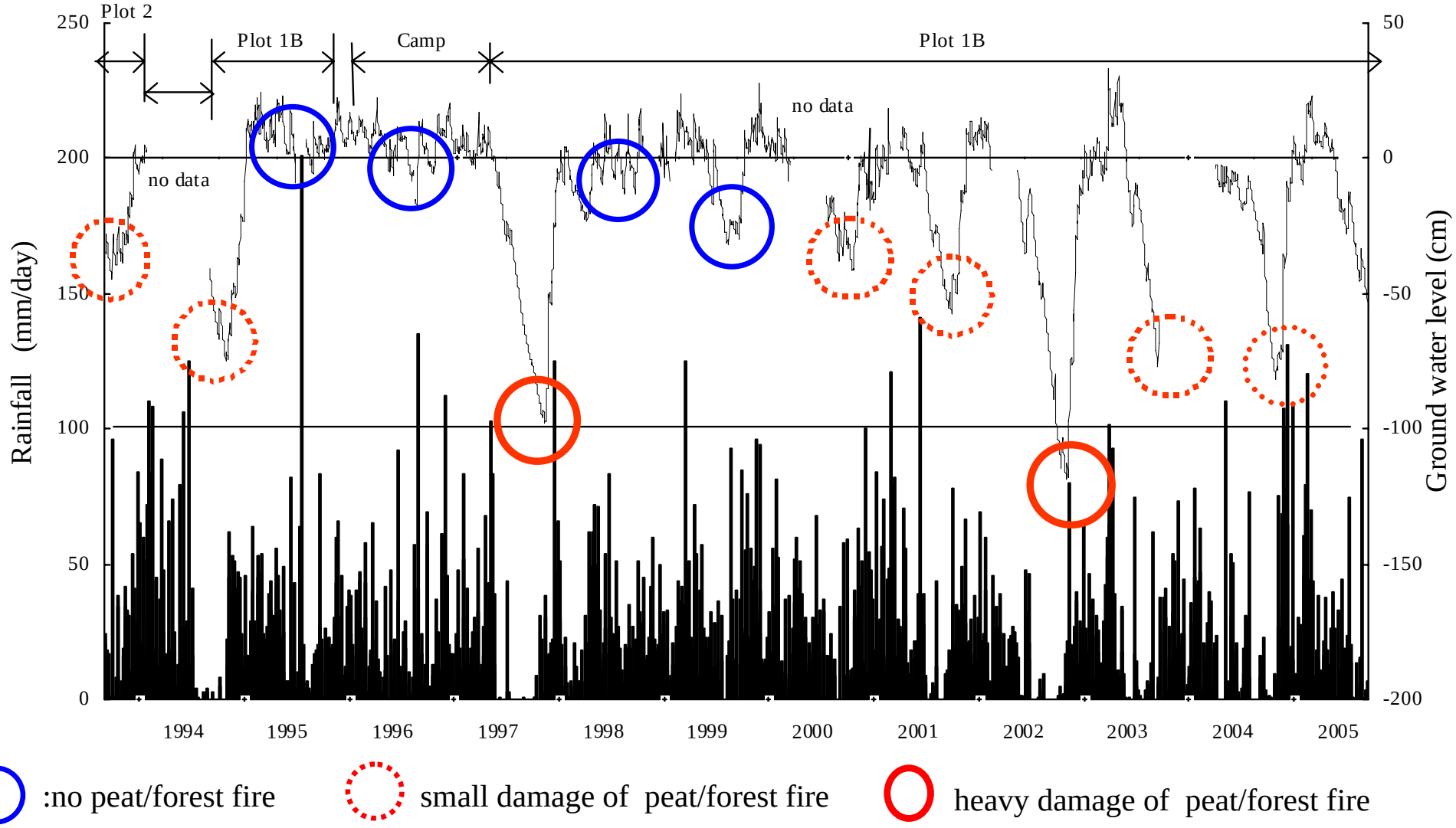
12 June, 2008, Tullamore, Ireland

Hidenori Takahashi[1], Aswin Dj Usup[2], Hiroshi Hayasaka[3], Mitsuhiko Kamiya[4] and Suwido H. Limin[2]

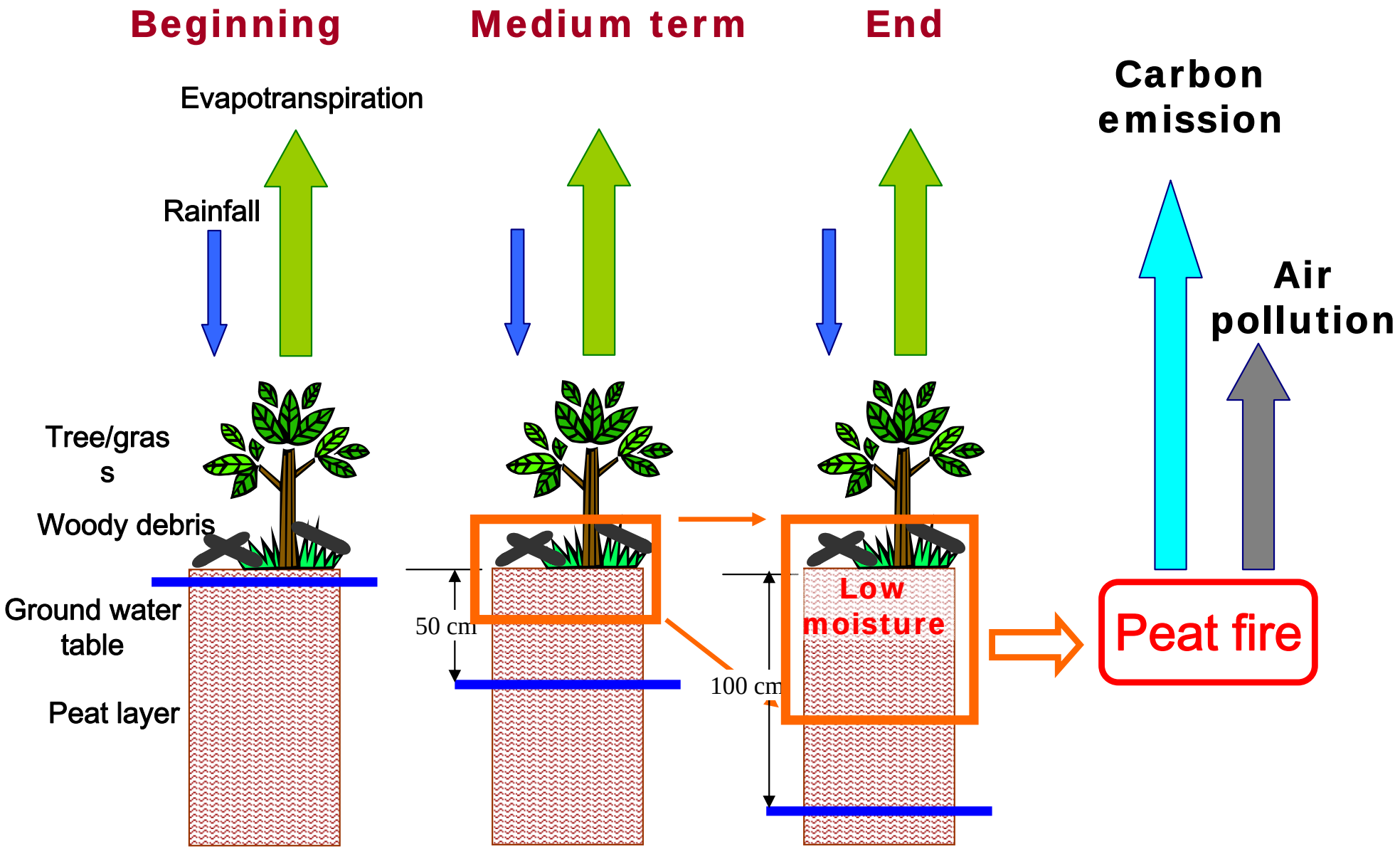
1.Hokkaido Institute of Hydro-climate
2.University of Palangka Raya
3.Hokkaido University
4.Hokkaido Institute of Technology


1997
July
Aug/
Sept.
Oct.
Nov.
Dec.
Hotspots and haze in Kalimantan,
September 2002
Study site
2002
July
Aug/
Sept.
Oct.
Nov.
Dec.

Hydrological system such as *the ground water level* and *the moisture of surface peat* is the important keys for peat fire control in a tropical peat land



Hydrological conditions of a tropical peatland during dry season and global and regional problems



Impact on global environment

The total released C from Indonesia through the peat/forest fires in 1997 : 13-40% of C emission from the fossil fuels in the world (S. E. Page, et al.,2002)

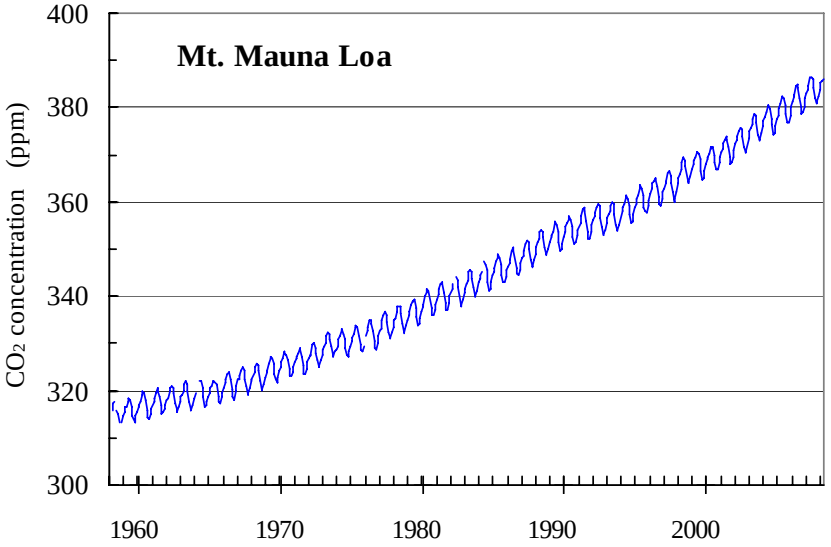
letters to nature

The amount of carbon released from peat and forest fires in Indonesia during 1997

Susan E. Page*, Florian Siegert†‡, John O. Rieley§, Hans-Dieter V. Boehm‡, Adi Jaya‖ & Suwido Limin‖

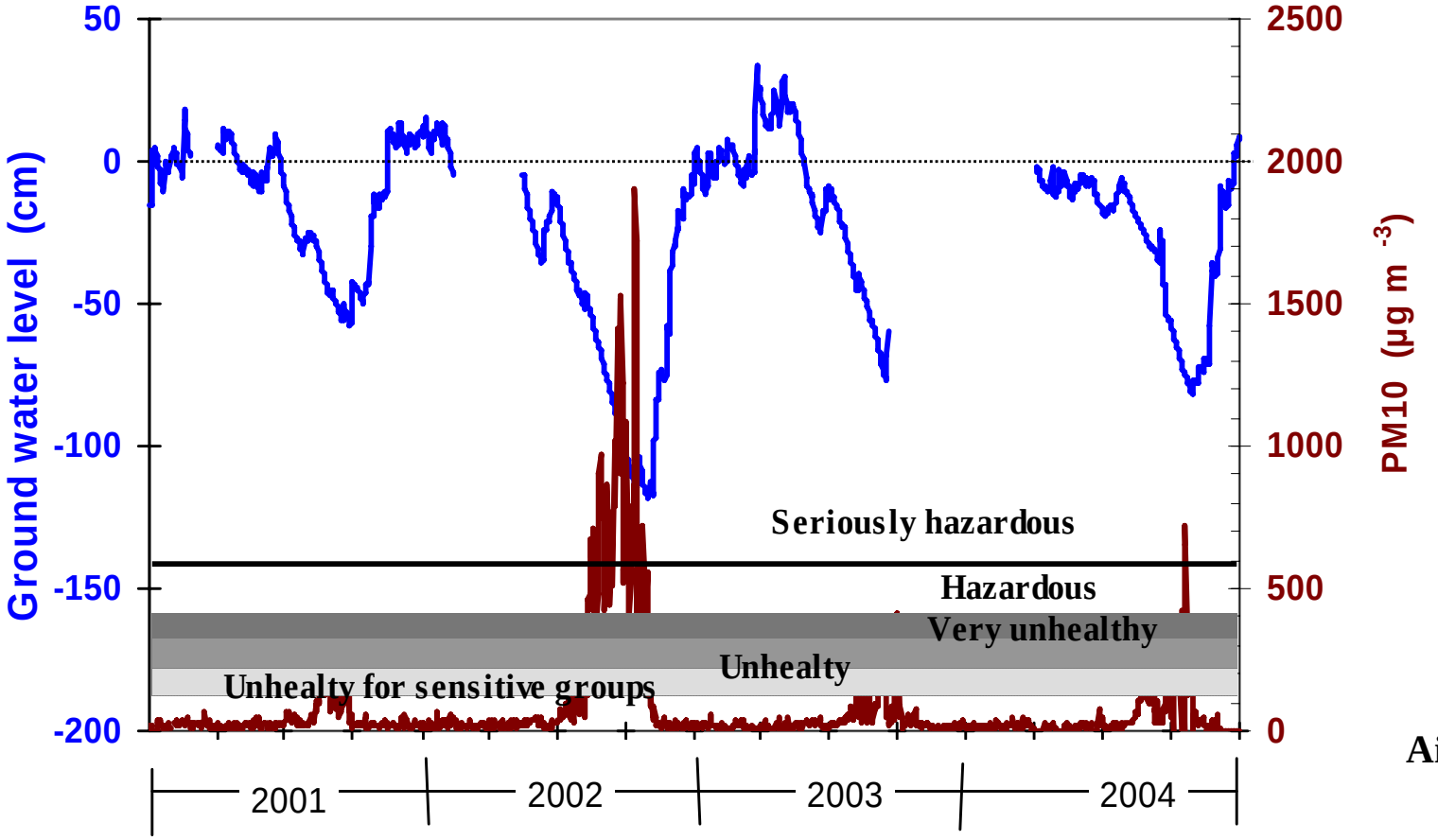
** Department of Geography, University of Leicester, Leicester LE1 7RH, UK*
† Ludwigs-Maximilians-Universität München, Biology Department II, Luisenstrasse 14, D-80333 München, Germany, and Remote Sensing Solutions GmbH, Woerthstrasse 49, D-81667 München, Germany
‡ Kalteng Consultants, Kirchstockacher Weg, 81663 München, Germany
§ School of Geography, University of Nottingham, Nottingham NG7 2RD, UK
‖ Centre for International Co-operation in Management of Tropical Peatland, Faculty of Agriculture, University of Palangka Raya, Palangka Raya 73112, Indonesia

Tropical peatlands are one of the largest near-surface reserves of



Impact on local environment

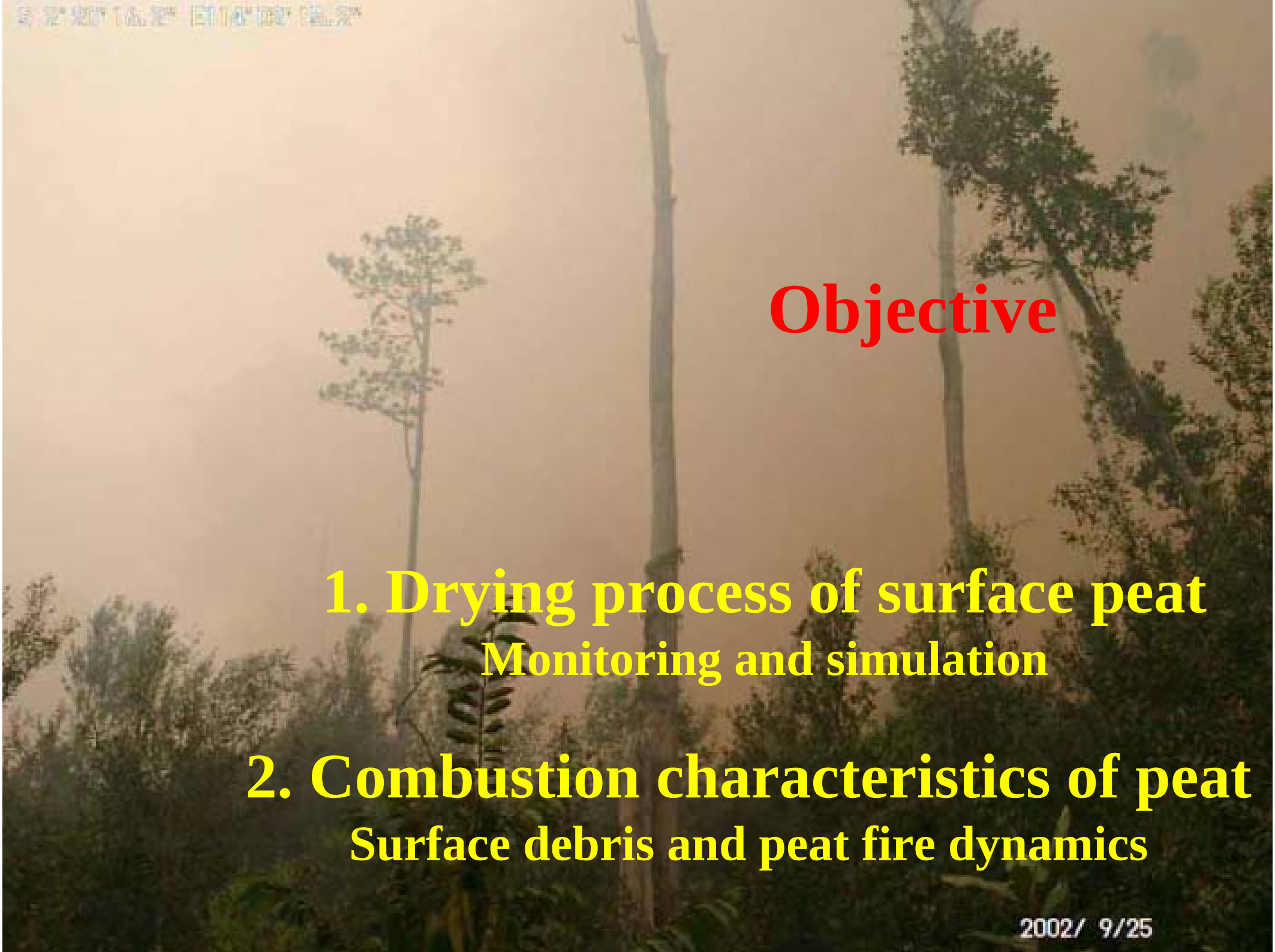
The amount of suspended particulate matter PM_{10} concentration in Palangka Raya exceeded the hazardous level for more than 2 months in 2002 (S.H. Limin et al., 2006)



Drainage channel make the ground water level lower.

Dry surface debris and surface peat were burning.

Air pollution was very serious in Central Kalimantan



Objective

1. Drying process of surface peat
Monitoring and simulation

2. Combustion characteristics of peat
Surface debris and peat fire dynamics

Location of study sites

- Drying of peat surface
- Lowering of ground water l in 2002

Farmland

P1b

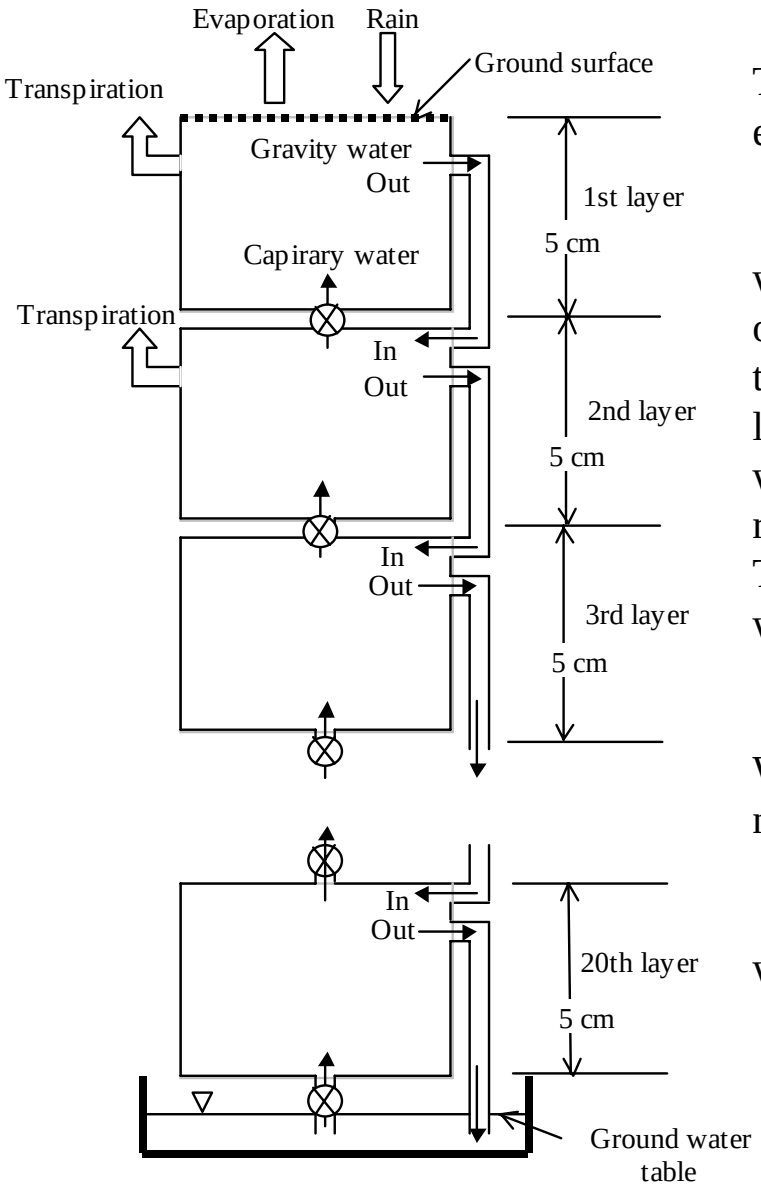
- Peat moisture profile close to peat fire
- Combustion characteristics of surface peat materials in 2002

Long term monitoring of ground water level

Peat fire

4 km

One dimensional bucket model in a peat layer



The water budget in the first layer in the unit time is shown in next equation.

$$\Delta W_1 = P + E + T_1 + F_{o1} + C_{i1} \qquad \text{Eq-1}$$

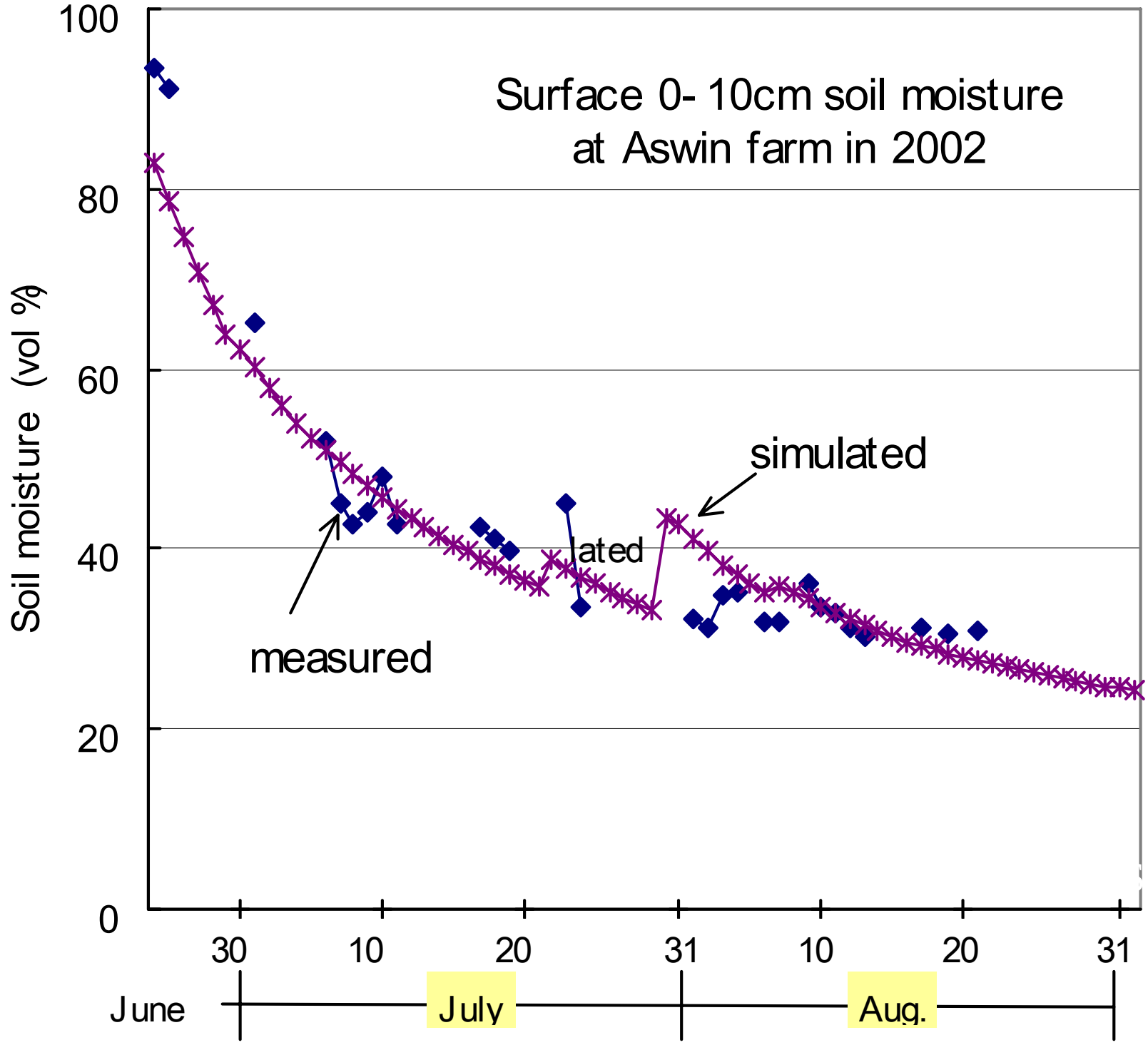
where, ΔW_1: the change of water in the layer and subscript means number of layer, P: Rain, E: evaporation from the ground surface, T_1: transpiration through plant, F_{o1}: flow out to lower layer by infiltration, C_{i1}: flow in from lower layer by capillary.The evaporation E in Eq-1 is replaced with the water flew into the first layer by capillary C_{i1} from the second layer. The rain P is replaced with the water F_{o1} flew out from the first layer. Transpiration T_2 becomes active when the second layer is unsaturated by water.

$$\Delta W_2 = F_{o1} + F_{o2} + C_{i1} + C_{i2} + T_2 \qquad \text{Eq-2}$$

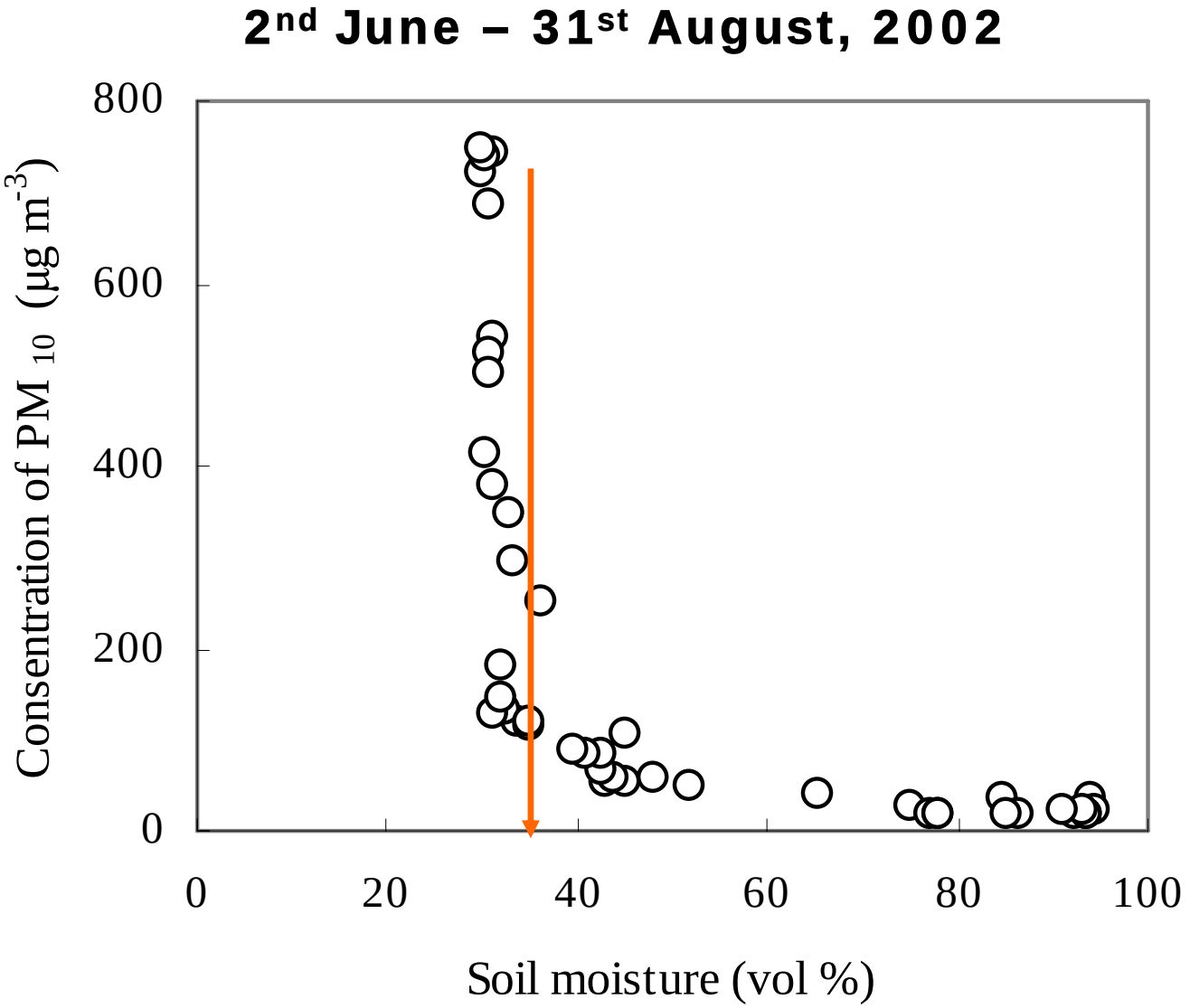
Water budgets in the layers deeper than the second layer are follows to next equation.

$$\Delta W_n = F_{on-1} + F_{on} + C_{in-1} + C_{in} \qquad \text{Eq-3}$$

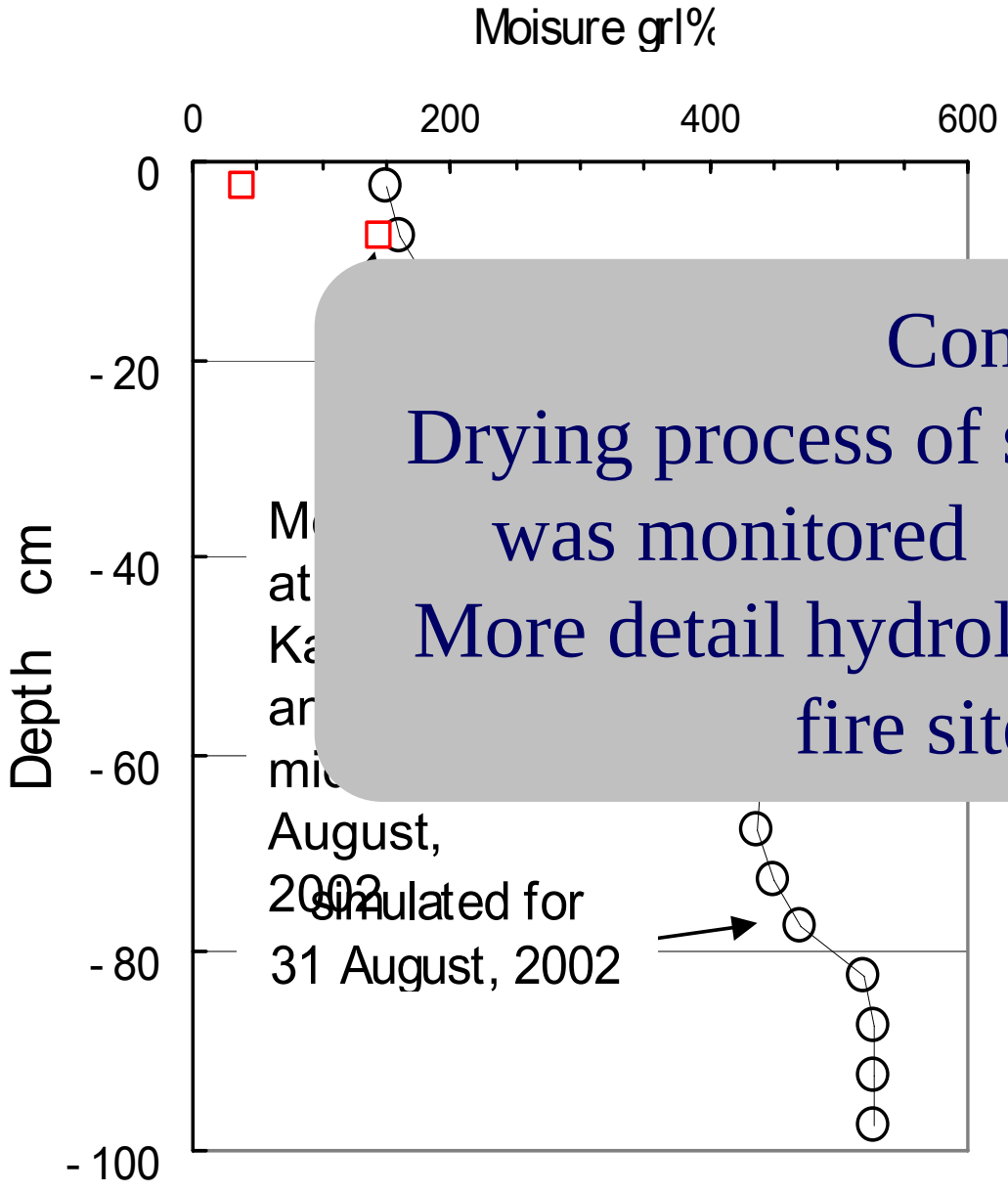
where the subscript n: number of layers changed from 3 to 20.


Surface 0- 10cm soil moisture
at Aswin farm in 2002
Soil moisture (vol %)
100
80
60
40
20
0
simulated
lated
measured
30
10
20
31
10
20
31
June
July
Aug.

Moisture of surface peat layer affects on peat fire



Profiles of soil moisture in model and field



Conclusion #1

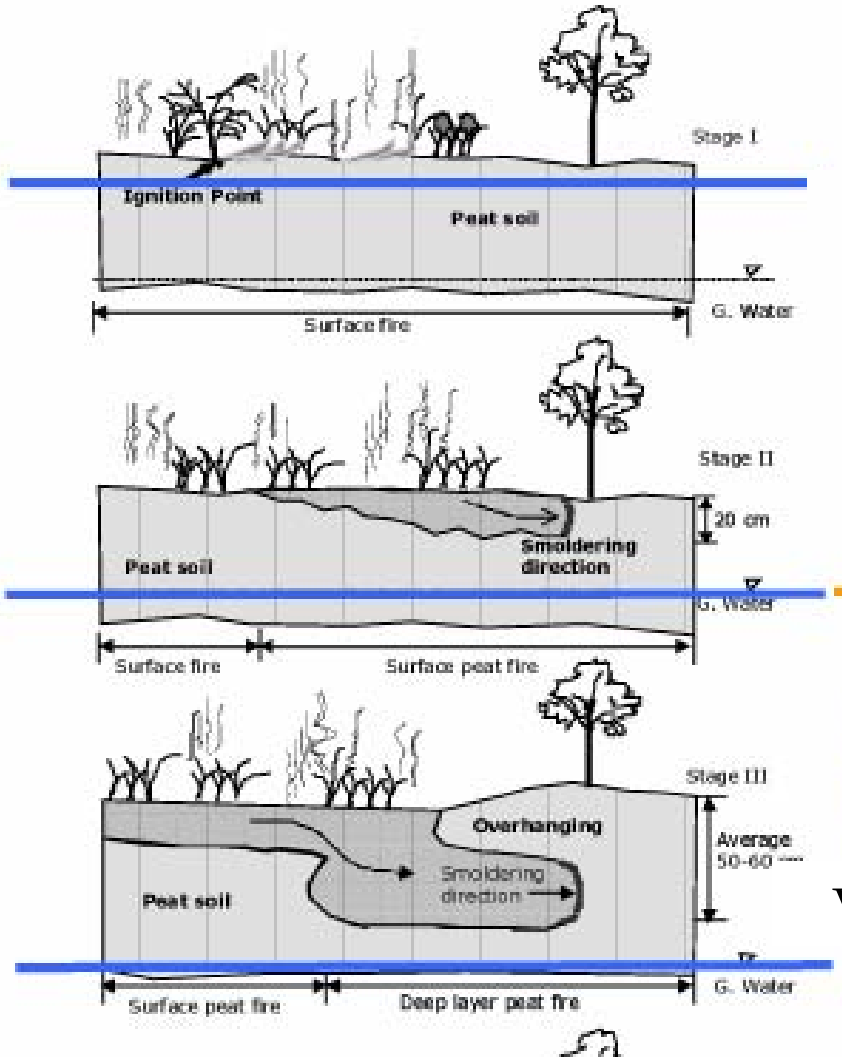
Drying process of surface peat in dry season was monitored and simulated roughly.

More detail hydrological monitoring at pear fire site is necessary

Combustion process of peat fire

The most of peat fires are caused by such human activities as cigarette disposal, fire use for weed control and agricultural development.

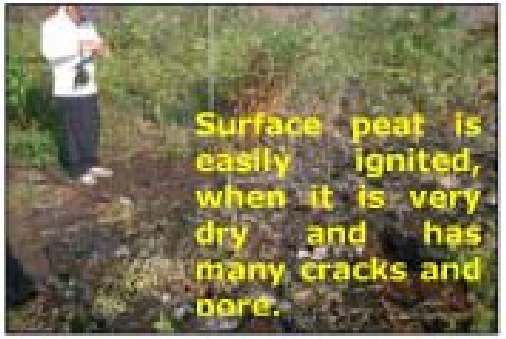
Falling of ground water level by channel construction increases the possibility of peat fire and



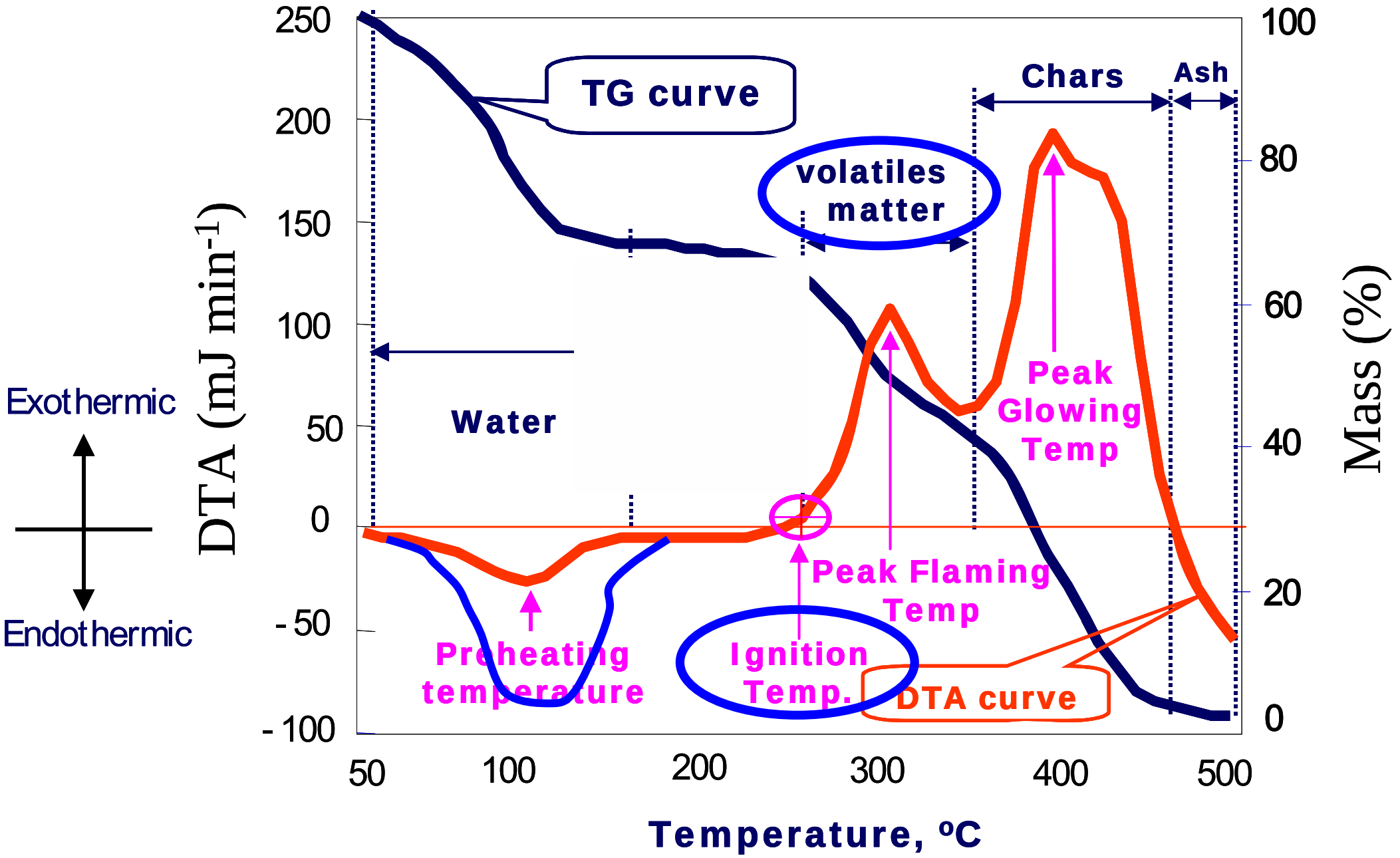
High water level → Surface fire

Low water level → Surface peat fire

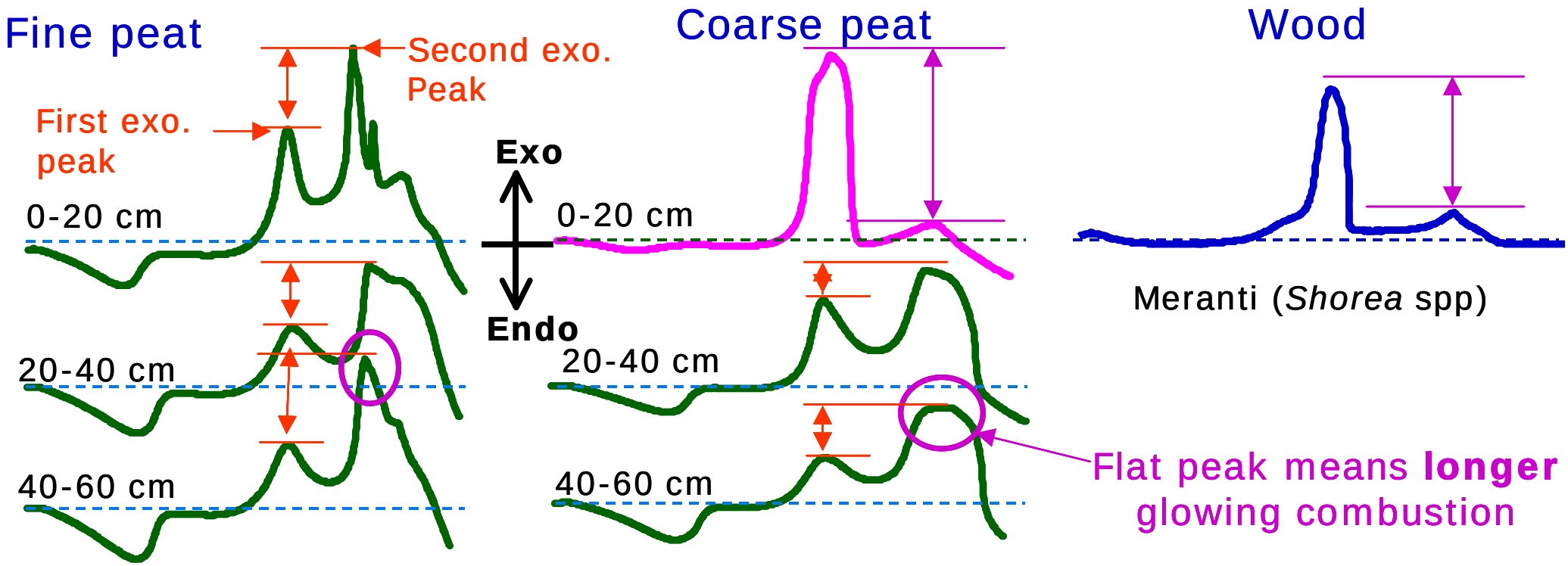
Very low water level → Deep peat fire



TG-DTA curve analysis

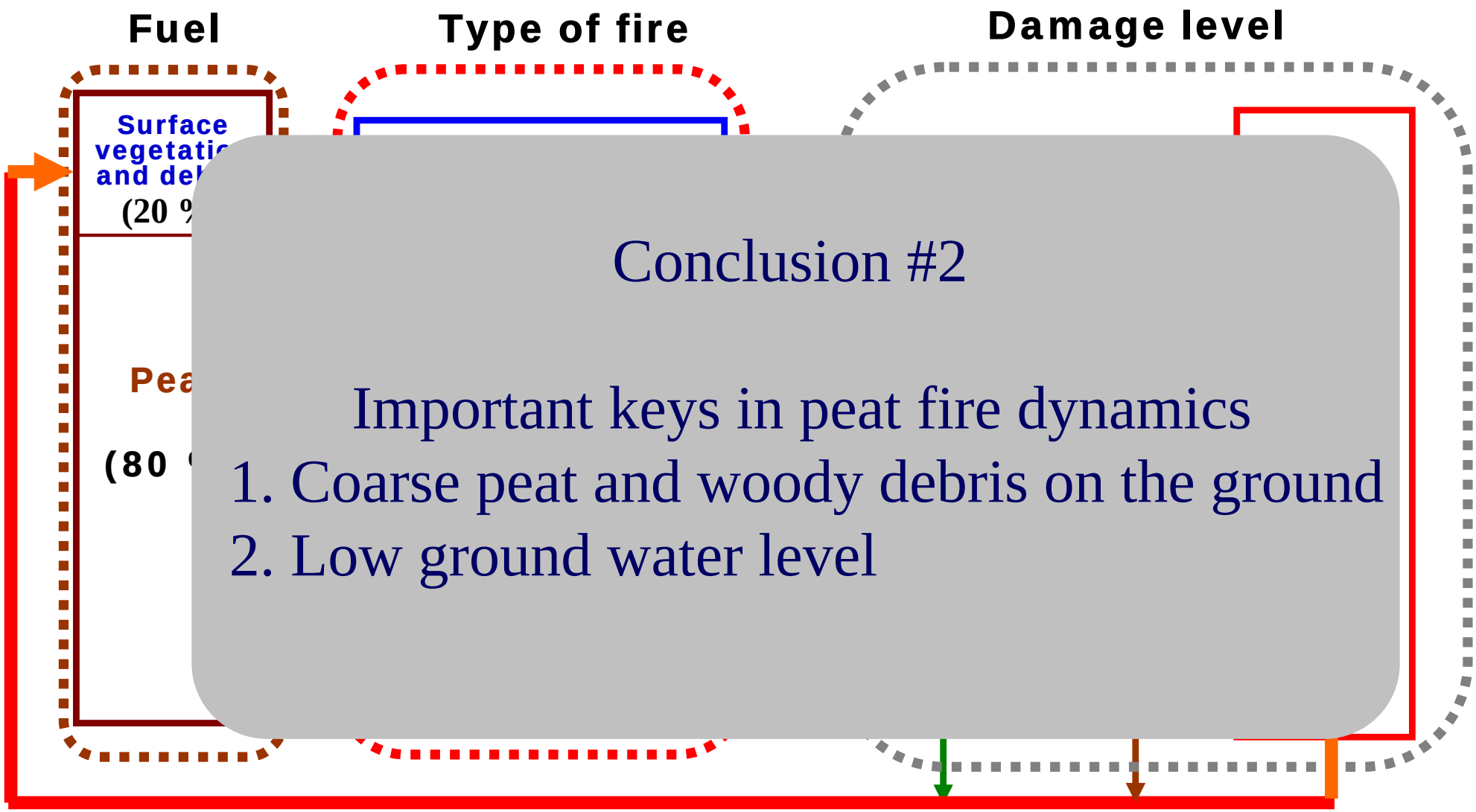


Pattern of DTA curves on peat combustion



Size of matrix and depth of sampling	Ignition temp.	Main combustion	
Coarse peat (>2mm) in the surface layer	**≈256 °C**	**Flaming**	Volatile matters
Others	263~277 °C	Growing	Chars

Dynamics of peat fire and degradation process of tropical peatlands



Damaged trees without burning become surface debris and fuels 2-3 years after

Woody debris on the ground two years after the deep peat fire in 2002