GeoBio-Center[LMU]-News Flash, December 2002

we greatly acknowledge the kind offer to use the VdBiol-„Wissenschaftstage“-Logo for **GeoBio-Center[LMU]** purposes (see entrance page in www.geobio-center.de).

Important Dates / Activities

November: **GeoBio-Center[LMU]**-web page extended by several new subjects, including: detailed „Member Sheets“, „Laboratory/Equipment Informations“, etc.

Examples:
Ion Chromatography Laboratory for analyzing nutrients (anions) from all aquatic ecosystems (both marine and fresh water). Ion chromatography allows to tie and correlate ecosystem variables such as nitrates and phosphates with other biological, ecological and geological analyses of ecosystems, such as coral reefs, marine upwelling areas, lakes, rivers, and more. (positioned at Palaeontology Munich, Fig.)

Fig.: the Ion Chromatography System (Dionex ICS90) at the **GeoBio-Center[LMU]** (for details see: www.geobio-center.de)

Remotely operating vehicle (R.O.V. Maricope)
We are proud of our newly purchased, remotely controlled underwater robot which includes a sampling device and a digital camera which transmits recordable, real time movies on a monitor positioned in a boat. The R.O.V. (Figs.) can dive down to 300 meters of water depth.



Figs.: R.O.V. Mariscope.(positioned at Palaeontology Munich)

December 12th: Invited lecture in Geo-Kolloquium, Dr. Ulrich Struck, **GeoBio-Center**[LMU]: „Decadal variability in the Benguela Current“

December: „Haushaltssperre“ for all **GeoBio-Center**[LMU] accounts.

Projects in preparation:

Call for letters of intent:

Diversity and geobiological interactions of benthic freshwater communities in Bavarian Lakes (Leinfelder, Struck, Grau, Haszprunar, Tollrian et al.)

The **GeoBio-Center**[LMU] is interested to start a initiative for a joint project of members of the **GeoBio-Center**[LMU]. The subject of proposed research should be related to biodiversity, specific habitats, physical environment and holocene evolution related to climate and anthropogenic impact in Bavarian Lakes.

We expect a short (one page) letter of intent describing proposed research, methods and possible links to other research groups by the end of january. We want to discuss the joint project during the upcoming (early february) members meeting of the **GeoBio-Center**[LMU].

Send all letters to u.struck@lrz.uni-muenchen.de.

Research of GeoBio-Center[LMU] members highlighted

Florian Siegert, Biology Department II, LMU (for details see memberslist on „GeoBio-Center.de) & Remote Sensing Solutions GmbH, Munich Germany (www.rssgmbh.de)

Remote sensing and GIS for applications in ecology and environmental monitoring.

El Niño: The burning issue

Nature cover 22 November 2001

Fires associated with the El Niño/Southern Oscillation climate event devastated huge areas of tropical rainforest in 1997–98. A detailed satellite-based survey of Indonesia, the country with the largest remaining rainforest area in Asia, now reveals that over 5.2 million hectares of forest and other vegetation was burned in the East Kalimantan region alone. This is much more than previously thought and may spell trouble. If land use policies stay as they are, the prospects are that forest fires, boosted by El Niño, could lead to an irrevocable loss of important forest resources within a matter of years.

Nature 414, 21 Nov. 2001

Increased damage from fires in logged forests during droughts caused by El Niño

F. SIEGERT*, G. RUECKER, A. HINRICHS & A. A. HOFFMANN
* GeoBio-Center-Member

Abstract

In 1997/98 fires associated with an exceptional drought caused by the El Niño-Southern Oscillation (ENSO) devastated large areas of tropical rain forests worldwide. Evidence suggests that in tropical rainforest environments selective logging might lead to an increased susceptibility of forests to fire. We investigated whether this assumption holds true for the case of the Indonesian fires, qualified as the largest fire disaster ever observed 5,6. We performed a multi-scale analysis using coarse and high resolution optical and radar satellite imagery assisted by extensive ground and aerial surveys to assess the extent of the fire damaged area and the impact on vegetation in East Kalimantan on the island of Borneo. A total of 5.2 ±0.3 Million ha including 2.6 Million ha forest was burned with varying degrees of damage. Forest fires affected primarily recently logged over forests while primary or old logged over forests were less affected. These results support the hypothesis of positive feedback between logging and fire occurrence. The fires strongly degraded the remaining forests and significantly increased the risk of recurrent fire disasters in the future by leaving huge amounts of dead biomass.

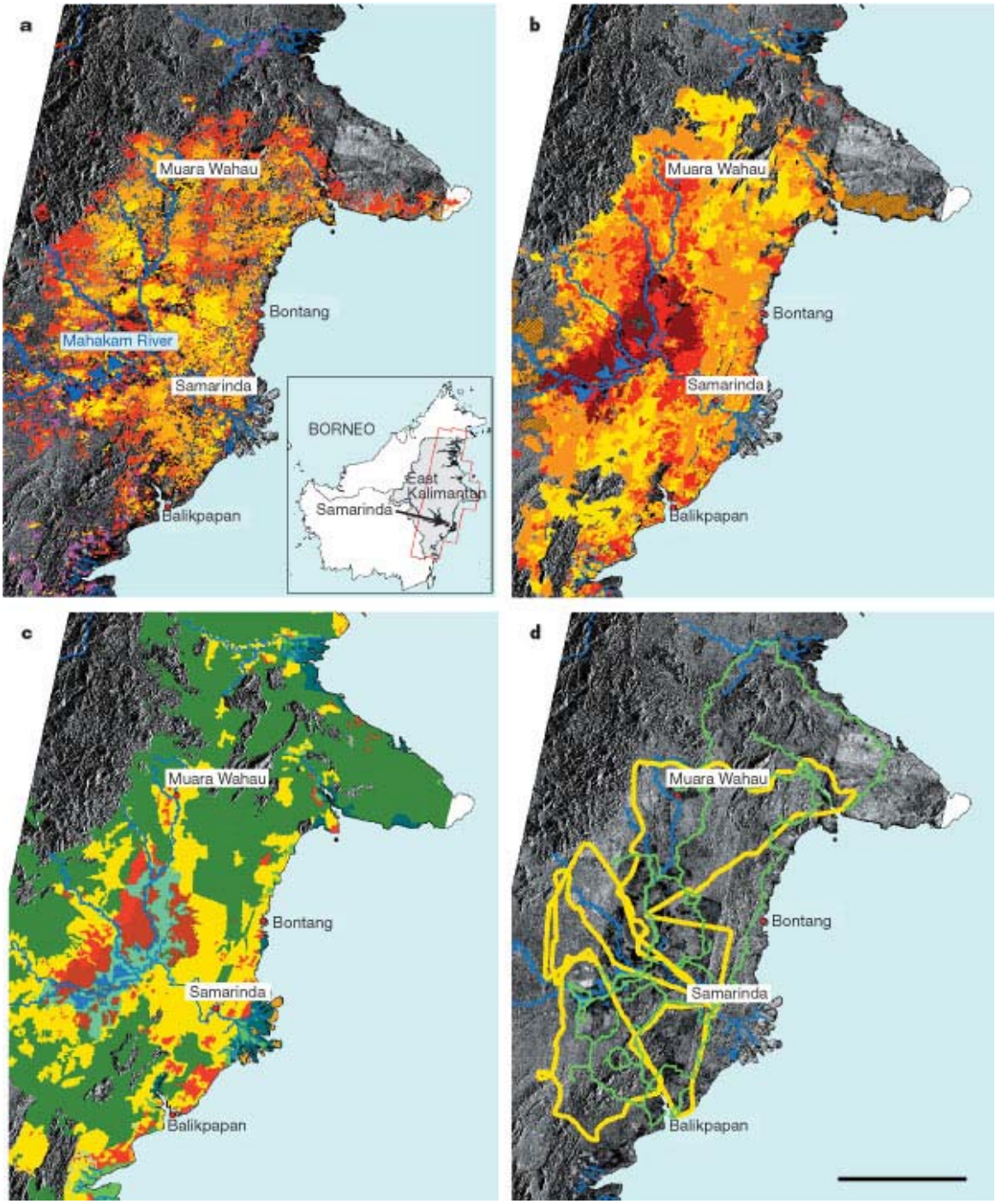


Figure 1 Fire occurrence and fire impact in 1997/98 in East Kalimantan, Borneo, Indonesia. Rivers are shown in blue. a, Time series of NOAA–AVHRR fire hot spots. Yellow–red colour gradient, January to April 1998; purple, August to November 1997. In 1998 the fires started in the densely populated Mahakam basin. Background is the ERS SAR mosaic, August 1997. Scale bar, 100 km. The inset shows a map of Borneo, East Kalimantan and the studied area (red outline). b, Fire scars and fire impact map. Damage levels are as follows: yellow, moderate; orange, severe; red, total damage of vegetation; brown, total damage of trees in peat swamp forests (see text). c, Pre-fire vegetation map derived from ERS SAR images. Green, pristine and logged dipterocarp forest; brown, peat swamp forest; light green, mangrove; yellow, degraded/secondary forests/plantations; red, grassland, bushland, clearings; and aqua, wetlands. No colouring, mountainous areas (mainly highland dipterocarp forest). d, GPS recorded aerial (yellow) and ground surveys (green).
Source: Nature 414, 437 - 440 (2001)

Burning bogs belch carbon

Global-warming models should account for peat in forest fires.
7 November 2002 TOM CLARKE

Wildfires in the tropics are spewing carbon dioxide and other greenhouse gases into the atmosphere, a new study finds. They could influence global warming, and look set to get worse. Fires ravaging parts of Indonesia during the 1997 El Niño-driven dry season pumped as much carbon into the atmosphere as all the living things on the planet remove from it in a year.

Indonesia's 1997 fires covered an area twice the size of Belgium, © Nature

Fires ravaging parts of Indonesia during the 1997 El Niño-driven dry season pumped as much carbon into the atmosphere as all the living things on the planet remove from it in a year. This is the same as Europe's annual carbon emissions from burning fossil fuel, says ecologist Susan Page of the University of Leicester, UK, who led the study[1].
"I was stunned," says David Schimel at the National Center for Atmospheric Research in Boulder, Colorado, recalling how he had to check the calculations for himself.
But another analysis backs up the results. Ray Langenfelds of the Commonwealth Scientific and Industrial Research Organisation in Aspendale, Australia, and colleagues measured trace amounts of other fire-related gases in the atmosphere. They agree that a large part of the pulse of carbon dioxide seen in 1997-1998 came from wildfires - the largest being in Indonesia[2].

Wildfires must now be factored into models of global warming, says Schimel. Page's study will help scientists estimate how much carbon a burning bog is putting out, compared with fires in other types of forest.
For peat's sake

The powerful pulse of carbon came largely from smouldering peat swamps, which are up to 20 metres deep in some parts of Indonesia. Peat is compacted plant material preserved in bogs by acid. It is so rich in carbon it can be used as fuel. Most of the burning peat in Indonesia lost 25 to 85 centimetres of its depth. Page's team worked in the Central Kalimantan province of Borneo, where 8,000 square kilometres of swamp forest burnt. Fires covered about 60,000 square kilometres of Indonesia's peat swamp overall - an area twice the size of Belgium. This constitutes around one-third of the archipelago's total peat swamp.

The release contributed as much as 40% to the largest annual increase in carbon emissions since records began in 1957 says Schimel. Increasing fossil-fuel burning and wildfires in North America and Australia during this extremely dry El Niño year contributed to the total.

Smoke signals
The 1997 El Niño was only part of the reason why normally fireproof bogs turned into tinderboxes. "Peat swamps are under huge development pressure," Page says. Schemes to convert bogs to farms are drying them out by removing trees for timber and drainage.As Indonesia develops its remaining peat bogs, the situation can only get worse. And bogs like those which burned in 1997 still have life in their embers, because the peat extends so deep. "There's at least another ten fires left in many of them," says Page. Schimel is in no doubt that human intervention is fanning the flames. "There have

probably been El Niños for millions of years and they haven't all burned up."

References
1. Page, S. E. *et al.* The amount of carbon released from peat and forest fires in Indonesia during 1997. *Nature*, **420,** 61 - 65, (2002). **|Article|**
2. Langenfelds, R. L. *et al.* Interannual growth rate variations of atmospheric CO^2 and its d13C, H2, CH4, and CO between 1992 and 1999 linked to biomass burning. *Global Biogeochemical Cycles*, **16,** 1048, (2002). **|Homepage|**

Nature, 420, 61 - 65, (2002)

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

SUSAN E. PAGE, FLORIAN SIEGERT*, JOHN O. RIELEY, HEINZ-DIETER V. BOEHM & ADI JAYA

* GeoBio-Center-Member

Abstract

Tropical peatlands are one of the largest carbon stores on earth, release of which has implications for climate change. In a natural state, lowland tropical peatlands support a luxuriant growth of peat swamp forest (PSF) overlying peat deposits up to 20 metres thick, but any persistent environmental change, particularly decrease in wetness, threatens their stability and makes them susceptible to fire[6]. Here we report that fires were widespread on the extensive peatlands of Indonesia[7-10] during the 1997 El Ni™o. By using satellite imagery and ground measurements within a 2.5 million hectare study area in Central Kalimantan we determined that 32% (0.79 Mha) of the area burned, of which peatland accounted for 91.5% (0.73 Mha), releasing 0.19-0.23 Gt of carbon to the atmosphere through peat combustion. We estimate that between 0.81-2.57 Gt of carbon were released to the atmosphere from Indonesia's peatlands in 1997 as a result of burning peat and vegetation. This is equivalent to 13-40% of the mean annual global carbon emissions from fossil fuels and contributed greatly to the largest increase in atmospheric CO_2 content detected since records began in 1957.

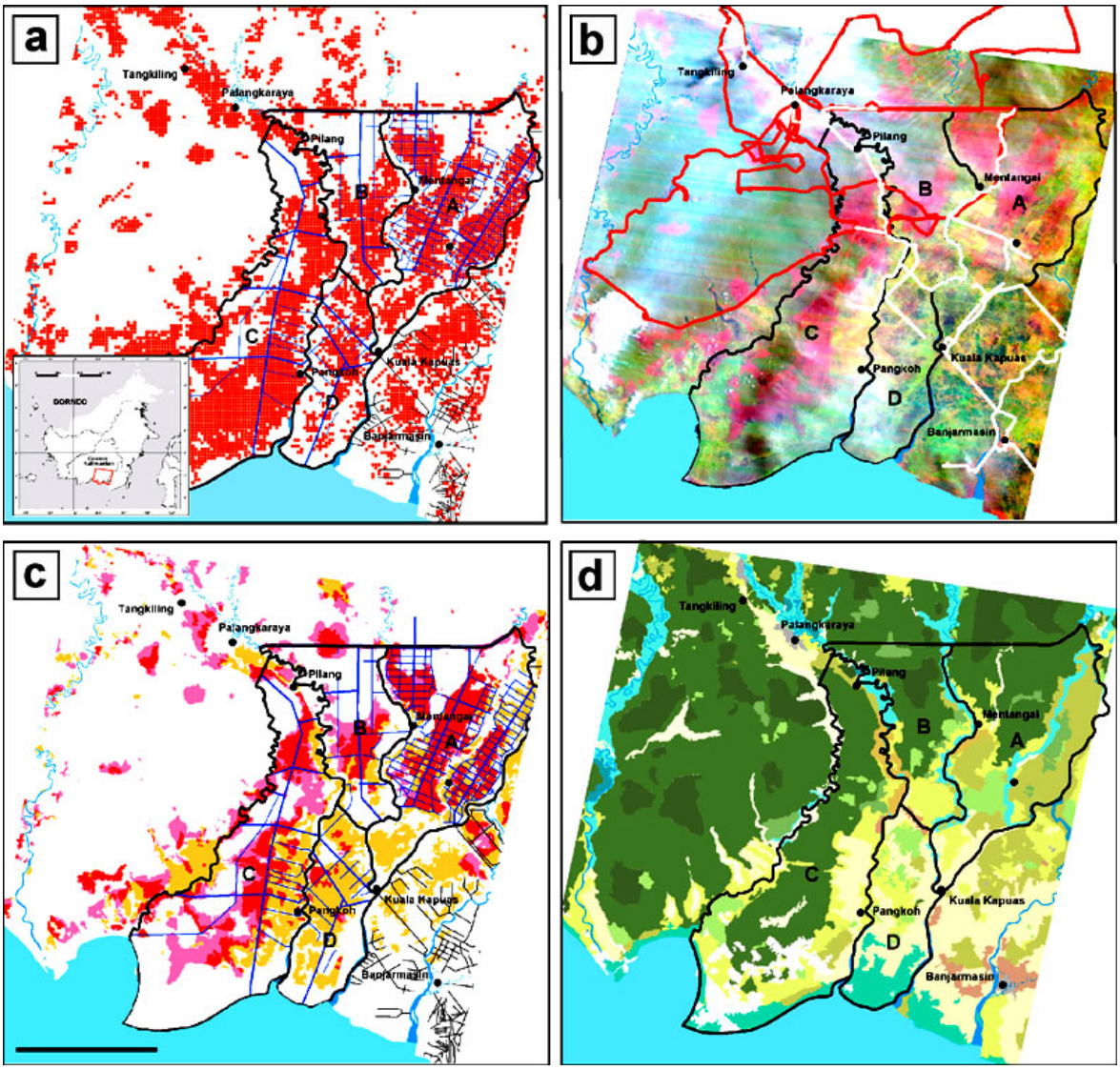


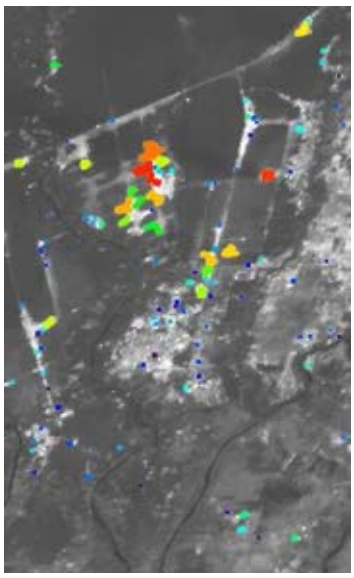
Figure 1. Study site in Central Kalimantan, Indonesia (location see insert). a. The four blocks of the 1 Mha MRP area are indicated by black outlines; irrigation canals constructed between 1996 and 1997 are indicated in blue; Superimposed (red dots) are NOAA AVHRR hotspots detected between June and December 1997; bar: 50 km. b. Post-fire Landsat TM 5 image 118-62, 29.3.1998; burn scars are visible in shades of red (RGB: TM 5 bands 5,4,3). c. Burned area derived from analysis of post-fire Landsat TM 5 and multitemporal ERS-2 SAR images; burnt areas undetectable by Landsat TM 5, owing to plant regrowth, but detected by ERS-2 SAR are shown in orange. d. Land cover map derived from pre-fire Landsat TM 5 image 118-62, 29.5.1997 (dark green: forest, beige: agriculture and fallow land, bright green: fragmented forest and forest mosaics, brown green: grass and bushland, blue green: pristine swamp forest (periodically inundated), pale green: Dry and swampy grasslands; white: clouds, blue: rivers.

Satellites to spot wildfire fallout

Infrared sensors gauge atmospheric pollutants from forest fires.

Nature, 19 November 2002

TOM CLARKE



Peat fires burning in Central Kalimantan, Indonesia. © F.Siegert

Satellites could soon monitor how much carbon dioxide, soot and other greenhouse gases and pollutants wildfires belch into the atmosphere1.

Currently, the only way to gauge the environmental impact of a forest fire such as those raging in Australia and Indonesia is to visit it. But many fires are too remote or burn out before researchers get to them.

"At the moment we're totally reliant on measuring fires on the ground," says Martin Wooster of King's College in London, UK. His experiments suggest infrared sensors on the latest Earth-observing satellites could be calibrated to measure the heat of a fire. From this researchers could infer how much carbon it is releasing.

Through an infrared camera, Wooster watched burning dried grass of different densities from Europe and Africa. Regardless of how tightly packed it was or where it originated, grass released more or less the same amount of heat, he found.

"Initial results look very good," says Florian Siegert of the Ludwigs-Maximilians-University in Munich, Germany. He's done similar work interpreting data on Indonesian fires from the German Aerospace Centre's new Bi-spectral Infrared Detection (BIRD) satellite. "We'll get a fuller picture by combining several satellite sources," says Siegert.

Soot particles and other chemicals also alter climate. At the moment - as in recent studies of Indonesian wildfires2 - these have to be measured on the ground. Newer satellites like the European Space Agency's ENVISAT, now returning its first data, can detect the types of chemicals fires release.

The infrared technique needs refinement. Some heat disappears into the ground and more is lofted away as it heats air above the fire. Comparing different fires - pine with tropical rain forests, say - should help researchers interpret data more accurately.

It is imperative that they do. Wildfires are on the increase as forests are cleared for agriculture or development. They are sparked all the time - "all over the globe and at somewhat unpredictable times", says Wooster. Those burning in Indonesia during 1997 released as much greenhouse gas as all of Europe's fossil-fuel consumption in a year.

We'll get a full picture by combining several satellite images

Florian Siegert
Ludwigs-Maximilians University

"Fires are going to become one of the greatest environmental threats caused by humans," predicts Siegert.

GeoBio-Center, Ludwigs-Maximilians University

References
1. 1: Wooster, M. J. Small-scale experimental testing of fire radiative energy for quantifying mass combusted in natural vegetation fires. *Geophysical Research Letters*, 29, 2027 - 2030, (2002).
2. Page, S. E. et al. The amount of carbon released from peat and forest fires in Indonesia during 1997. *Nature*, 420, 61 - 65, (2002).
Source: Nature

Editorial notes:

Members of the **GeoBio-Center**[LMU] are free to post interesting news in research, educational affairs or questions in the upcoming issues of the NewsFlash. Any GeoBio-related contribution is welcome! Send your papers to Uli Struck (u.struck@lrz.uni-muenchen). NewsFlash issues will be distributed among members, sent to press departments of the LMU, other selected addresses. It will also be posted on the Webpage of the GeoBio-Center