

# MMU- Distribution BA by size

Federico González-Alonso

CIFOR-INIA

GOFC-GOLD-Fire Stresa 18-19 Oct 2011



Contents lists available at [ScienceDirect](#)

## Remote Sensing of Environment

journal homepage: [www.elsevier.com/locate/rse](http://www.elsevier.com/locate/rse)



### An active-fire based burned area mapping algorithm for the MODIS sensor

Louis Giglio<sup>a,b,\*</sup>, Tatiana Loboda<sup>b</sup>, David P. Roy<sup>c</sup>, Brad Quayle<sup>d</sup>, Christopher O. Justice<sup>b</sup>

<sup>a</sup> Science Systems and Applications, Inc., Lanham, Maryland, USA

<sup>b</sup> Department of Geography, University of Maryland, College Park, Maryland, USA

<sup>c</sup> Geographic Information Science Center of Excellence, South Dakota State University, Brookings, South Dakota, USA

<sup>d</sup> USDA Forest Service Remote Sensing Applications Center, Salt Lake City, Utah, USA

nadir. However, given the growth in pixel size at larger view angles combined with resampling errors incurred in projecting pixels onto the MODIS sinusoidal grid, this minimum will increase by roughly a factor of three. Furthermore, to avoid elimination during the final contextual filtering step a burned patch must be at least approximately three times larger still, hence the minimum detectable burn size is in the neighborhood of 120 ha. This is very much larger than the typical size of agricultural waste and deforestation burns (Giglio et al., 2006, McCarty et al., 2007), hence our mapping algorithm is not expected to reliably capture these types of burned areas.

# Spain- BA>500ha

## Official fire statistics

Año	N° Siniestros	N° Siniestros ≥ 500 ha.	Superficie Forestal	Sup. afectada por GIF	
				ha	%
1970	3.155	30	87.438,50	32465,30	37,13%
1971	1.665	8	34.312,40	7.138,00	20,80%
1972	2.093	17	55.920,10	15.303,00	27,37%
1973	3.724	20	95.072,50	25.341,90	26,66%
1974	3.920	45	139.927,50	47.718,00	34,10%
1975	4.128	57	180.136,90	87.535,00	48,59%
1976	4.356	37	121.514,10	34.450,00	28,35%
1977	2.064	19	68.870,90	26.717,50	38,79%
1978	8.193	153	424.957,90	182.614,80	42,97%
1979	6.171	66	197.423,90	58.497,20	29,63%
1980	7.075	76	261.514,80	103.550,00	39,60%
1981	10.688	74	291.417,10	90.711,00	31,13%
1982	6.308	40	149.077,10	47.821,70	32,08%
1983	4.736	27	107.551,40	42.293,30	39,27%
1984	7.073	51	164.166,10	53.410,70	32,53%
1985	12.235	159	484.475,20	198.994,80	41,07%
1986	7.514	103	264.787,40	135.756,00	51,27%
1987	8.816	35	147.340,40	36.562,90	24,82%
1988	9.440	37	137.272,60	35.205,00	25,65%
1989	20.250	95	407.122,10	93.592,60	22,99%
1990	12.914	56	203.641,40	66.183,80	32,50%
1991	13.529	80	260.303,00	138.928,10	53,37%
1992	15.966	19	105.277,70	30.918,60	29,37%
1993	14.253	25	89.331,10	43.532,30	48,73%
1994	19.249	93	437.602,50	335.359,20	76,64%
1995	25.557	26	141.082,17	31.699,80	22,47%
1996	16.586	10	58.919,27	6.962,40	11,82%
1997	22.320	7	98.503,17	5.309,40	5,39%
1998	22.003	27	132.892,34	41.761,62	31,43%
1999	17.943	16	81.680,67	17.399,05	21,30%
2000	23.574	49	187.567,06	63.634,69	33,93%
2001	19.099	16	92.386,01	20.325,20	22,00%
2002	19.929	18	107.464,05	16.993,35	15,81%
2003	18.616	45	148.172,47	73.626,70	49,69%
2004	21.396	22	134.192,64	56.725,80	42,27%
2005	25.492	49	188.697,49	84.593,78	44,83%
2006	16.334	59	155.344,83	72.119,08	46,43%
2007	10.936	16	86.122,03	52.233,72	60,65%
2008	10.164	6	47.088,67	5.499,74	11,68%
2009	15.642	35	119.891,74	56.266,49	46,92%

CUADRO 8: EVOLUCIÓN DE LOS GRANDES INCENDIOS. AÑO 2009.

1970-1979 el 33,43,%  
1980-1989 el 34,04 %  
1990-1999 el 33,3 %  
2000-2004 el 32,74 %  
2005-2009 el 42,1 %

Portugal. BA>500ha  
J.M. Pereira+ESA-CCI-Fire

We performed the calculation that Federico González-Alonso had suggested, to quantify the percentage of total area burned that is above the 500ha minimum mapping unit threshold, in Portugal. We also did it for 1000ha.

The calculations were done for a total of 25 years of Landsat-based burned area maps, with a minimum mapping unit of 5ha.

1984-2008  $\geq$  5 ha: 3.253 166 ha

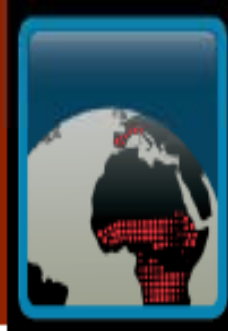
1984-2008  $\geq$  500 ha: 1.655 471 ha

1984-2008  $\geq$  1000 ha: 1.214 267 ha

So, 51% of the area burned in fires larger than 500ha, and 37% burned in fires larger than 1000ha. Obviously, these percentages will vary with the fire size distribution characteristic of each fire regime.



# Conclusions



- **Burned patches detected (Portugal test site):**

	Burned patches	P-10	P-15	SA	Hectares	% Area
All	100%	46.4%	40%	31.9%	346,395.6	100%
> 100 ha	39.3%	92.4%	88%	82.7%	315,947.8	91.2%

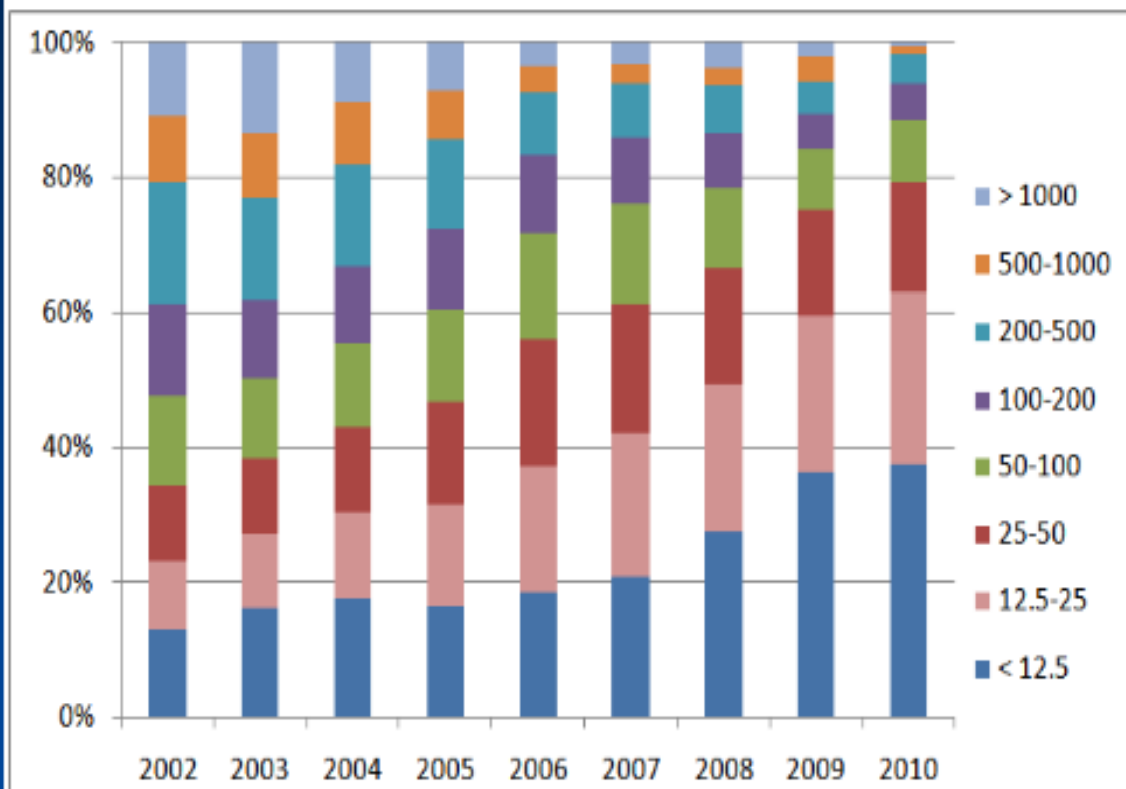
# Brasil

## INPE+ De Fries



## Challenges to further deforestation control:

### Dominance of small deforestation events



Dynamics of percentual contribution to total deforestation rate by size classe

GEOPHYSICAL RESEARCH LETTERS, VOL. 35, L22705, doi:10.1029/2008GL035689, 2008



## **Fire-related carbon emissions from land use transitions in southern Amazonia**

R. S. DeFries,<sup>1</sup> D. C. Morton,<sup>2</sup> G. R. van der Werf,<sup>3</sup> L. Giglio,<sup>2</sup> G. J. Collatz,<sup>4</sup>  
J. T. Randerson,<sup>5</sup> R. A. Houghton,<sup>6</sup> P. K. Kasibhatla,<sup>7</sup> and Y. Shimabukuro<sup>8</sup>

Received 12 August 2008; revised 5 October 2008; accepted 14 October 2008; published 25 November 2008.

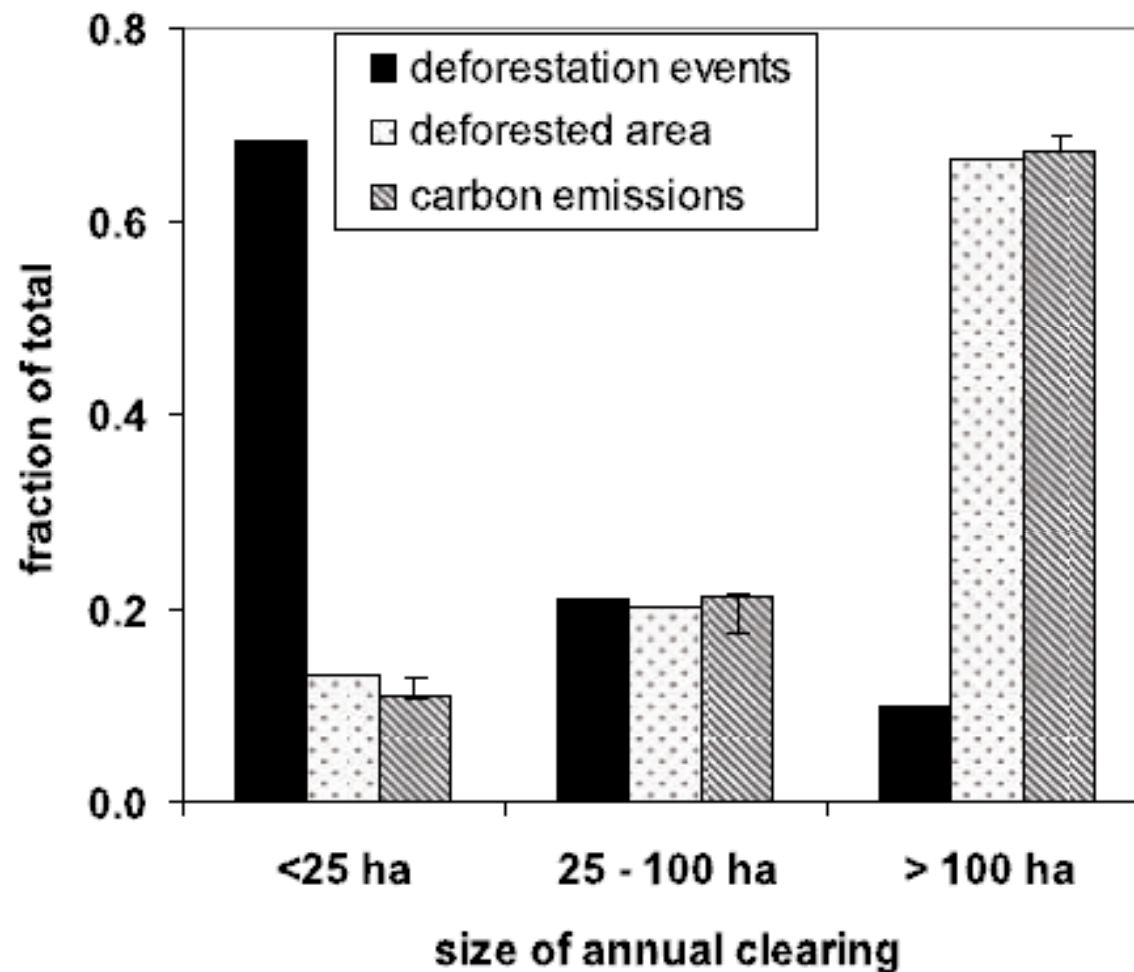


Figure 2. Mean annual fraction of total deforestation events, deforestation area, and carbon emissions from all deforestation transitions from annual clearings less than 25 ha, 25 to 100 ha, and greater than 100 ha for 2001 to 2005.

# GALICIA 2006

## F. Gonzalez-Alonso

AWiFS	nº polígonos	superficie total (ha)	tesela + pequeña (ha)	tesela + grande (ha)		
		<b>594</b>	<b>93260,83</b>	0,18	6013,8	
		valores en ha				
	nº polígonos	umbral inferior (mayor)	umbral superior (menor o igual)	superficie parcial (ha)	superficie acumulada (ha)	%
	415	min	50	5567,18	5567,18	5,97%
	117	50	250	13129,55	18696,73	14,08%
	24	250	500	8205,84	26902,57	8,80%
	12	500	750	7889,22	34791,79	8,46%
	5	750	1000	4144,45	38936,24	4,44%
	21	1000	max	54324,59	93260,83	58,25%
total	594			93260,83		100,00%

MERIS	nº polígonos	superficie total (ha)	tesela + pequeña (ha)	tesela + grande (ha)		
		<b>578</b>	<b>79424,05</b>	5,29	3845,83	
		valores en ha		superficie parcial (ha)	superficie acumulada (ha)	%
	nº polígonos	umbral inferior (mayor)	umbral superior (menor o igual)			
	413	min	50	6379,74	6379,74	8,03%
	108	50	250	11791,40	18171,14	14,85%
	21	250	500	7538,25	25709,39	9,49%
	10	500	750	6400,90	32110,29	8,06%
	2	750	1000	1639,90	33750,19	2,06%
	24	1000	max	45673,86	79424,05	57,51%
total	578			79424,05		100,00%



<b>MCD45</b>	nº polígonos	superficie total (ha)	tesela + pequeña (ha)	tesela + grande (ha)		
	<b>251</b>	<b>154275,00</b>	25,00	18075,00		
		valores en ha				
	nº polígonos	umbral inferior (mayor)	umbral superior (menor o igual)	superficie parcial (ha)	superficie acumulada (ha)	%
	120	min	50	3750,00	3750,00	2,43%
	66	50	250	8150,00	11900,00	5,28%
	20	250	500	8250,00	20150,00	5,35%
	10	500	750	6000,00	26150,00	3,89%
	5	750	1000	4650,00	30800,00	3,01%
	30	1000	max	123475,00	154275,00	80,04%
	total			154275,00		100,00%

<b>GLOBCARBON</b>	nº polígonos	superficie total (ha)	tesela + pequeña (ha)	tesela + grande (ha)		
	<b>65</b>	<b>84394,47</b>	71,89	12527,84		
		valores en ha				
	nº polígonos	umbral inferior (mayor)	umbral superior (menor o igual)	superficie parcial (ha)	superficie acumulada (ha)	%
	0	min	50	0,00	0,00	0,00%
	32	50	250	3652,08	3652,08	4,33%
	3	250	500	1089,50	4741,58	1,29%
	3	500	750	1897,82	6639,40	2,25%
	4	750	1000	3362,48	10001,88	3,98%
	23	1000	max	74392,59	84394,47	88,15%
	total			84394,47		100,00%

<b>L3JRC</b>	nº polígonos	superficie total (ha)	tesela + pequeña (ha)	tesela + grande (ha)		
	<b>144</b>	<b>42648,49</b>	0,51	2701,30		
		valores en ha				
	nº polígonos	umbral inferior (mayor)	umbral superior (menor o igual)	superficie parcial (ha)	superficie acumulada (ha)	%
	5	min	50	87,03	87,03	0,20%
	105	50	250	10318,45	10405,48	24,19%
	13	250	500	4615,49	15020,97	10,82%
	5	500	750	3145,80	18166,77	7,38%
	1	750	1000	803,12	18969,89	1,88%
	15	1000	max	23678,60	42648,49	55,52%
total	144			42648,49		100,00%

Indonesia

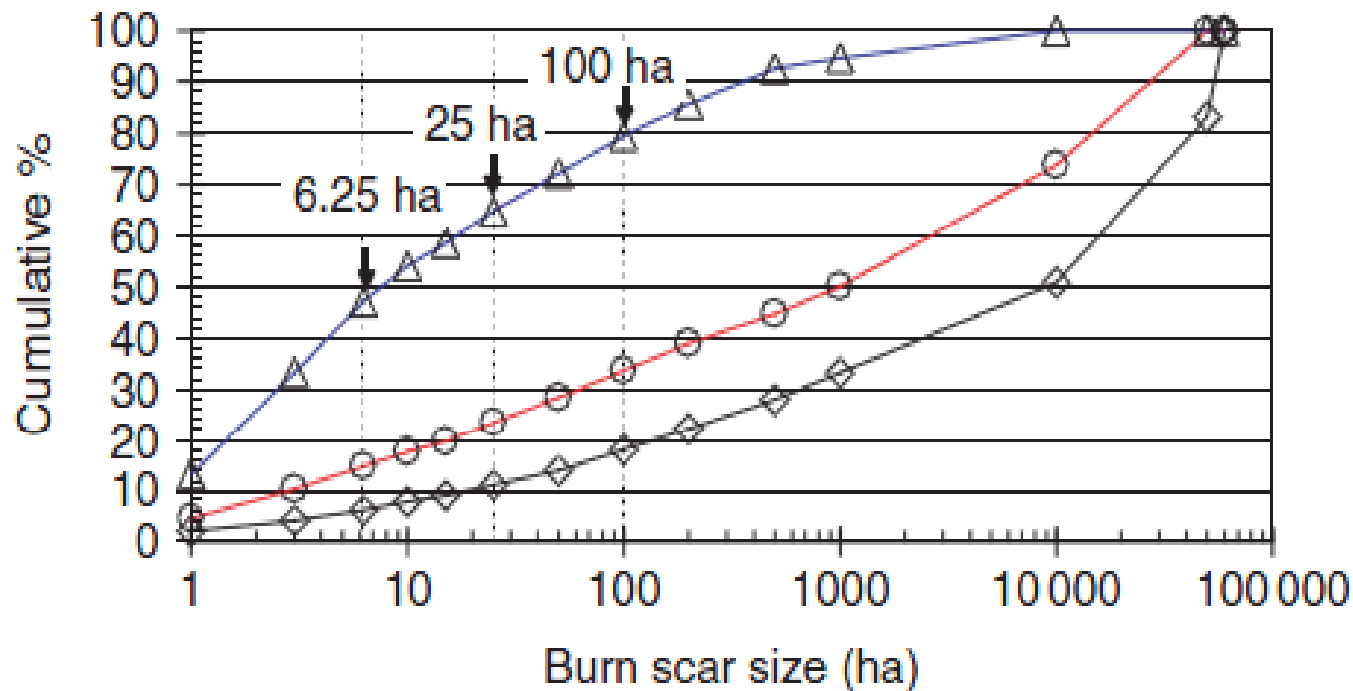
## Burn-scar patterns and their effect on regional burnt-area mapping in insular South-East Asia

*Jukka Miettinen<sup>A,C</sup> and Soo Chin Liew<sup>B</sup>*

<sup>A</sup>Department of Forest Resource Management, University of Helsinki, Latokartanonkaari 7 (PL27), 00014 Helsingin Yliopisto, Helsinki, Finland.

<sup>B</sup>Centre for Remote Imaging, Sensing and Processing (CRISP), National University of Singapore, Lower Kent Ridge Road, 119260 Singapore.

<sup>C</sup>Corresponding author. Email: crsjim@nus.edu.sg



**Fig. 4.** Cumulative percentage of burnt area by burn scar size (ha). Diamonds refer to peat soil, circles to alluvial soil and triangles to non-wetland areas. The x-axis scale is set to logarithmic in order to create a more visually meaningful figure given the wide range of burn scar sizes. Note that burn scar sizes corresponding to typical spatial resolutions of medium to coarse-resolution satellite sensors (250 m  $\rightarrow$  6.25 ha, 500 m  $\rightarrow$  25 ha and 1000 m  $\rightarrow$  100 ha) have been marked.

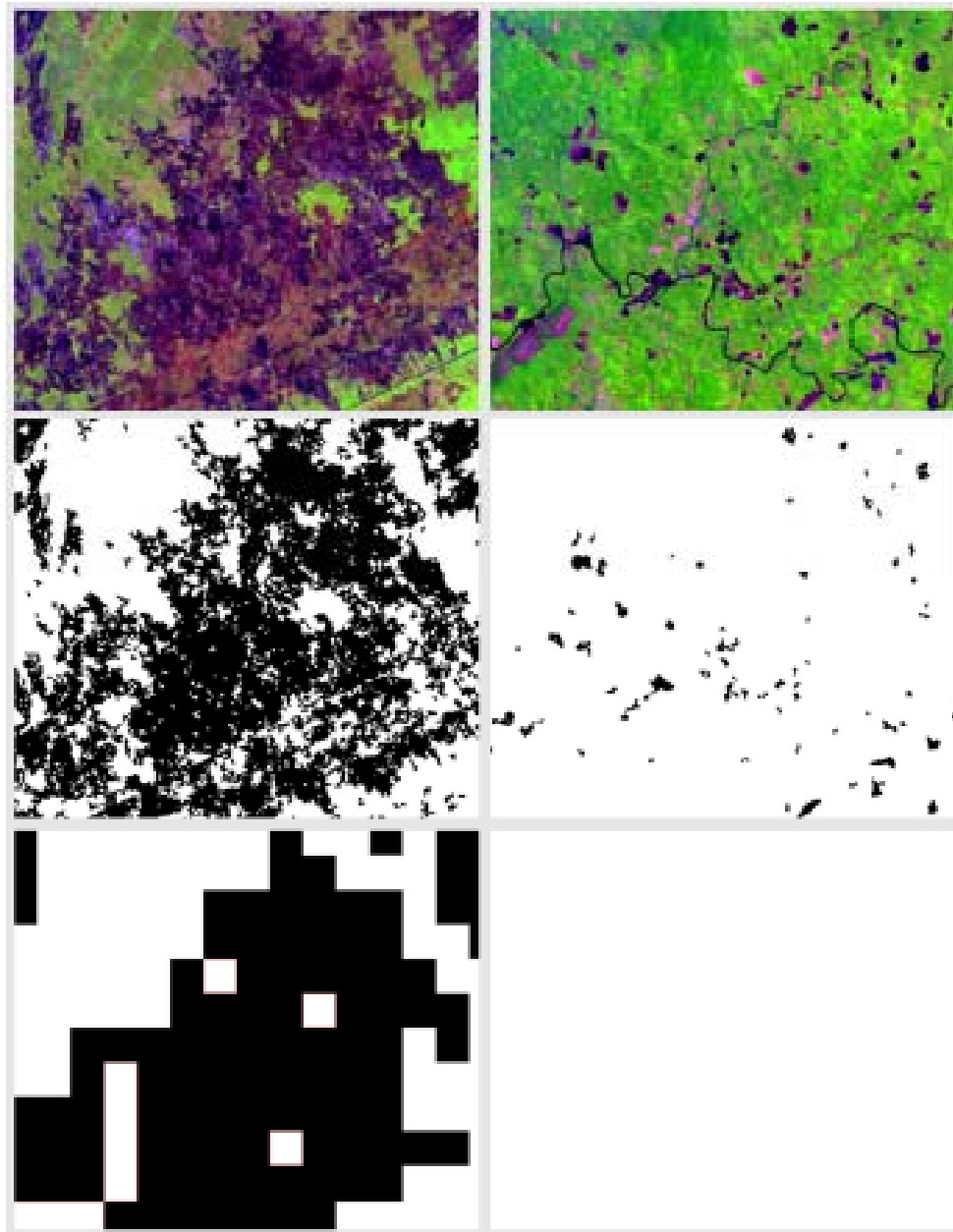


Fig. 5. Illustration of the effect of burn scar types on medium-resolution burn-area mapping in insular South-East Asia. On the left, typical wetland burn scars, and on the right, small-holder burning in non-wetland area. Both examples are from South Kalimantan (study site 16, SPOT 4). From top to bottom: SPOT 4 HRVIR image, reference burn-area mapping and medium resolution (500 m) burn-area mapping simulation. (Colour composition for SPOT images, RGB: band 4, band 3, band 2.) (SPOT image © 2006 Centre National d'Etudes Spatiales (CNES).)

Colombia MCD45 Feb. 2007

F. Gonzalez-Alonso



### Datos de área quemada por niveles

	Tamaño	Área	Porcentaje	No. Polígonos
Ba_q1	0-50	104.184	10,30	3.511
	50-100	52.418	9,42	656
	100-500	155.564	24,91	689
	>500	378.915	55,47	236
	<b>Total</b>	<b>691.081</b>	<b>100</b>	<b>5.092</b>
Ba_q123	0-50	257.937	16,30	8.697
	50-100	117.602	14,56	1.487
	100-500	266.062	27,96	1.264
	>500	437.068	41,17	292
	<b>Total</b>	<b>1.078.669</b>	<b>100</b>	<b>11.740</b>
Ba_q3	0-50	152.936	10,30	5.154
	50-100	65.184	9,42	831
	100-500	110.498	24,91	575
	>500	58.153	55,47	56
	<b>Total</b>	<b>386.771</b>	<b>100</b>	<b>6.616</b>
		<b>2.156.521</b>	<b>1.078.669</b>	