Spatial and temporal patterns of fires at the wildland- rural-urban interface. Study case of Santiago del Estero, in Argentina´s chaco dry forest region

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Deforestation: problem, drivers

- Growing commodity economy to produce meat, especially in Asian countries (soybean, corn)

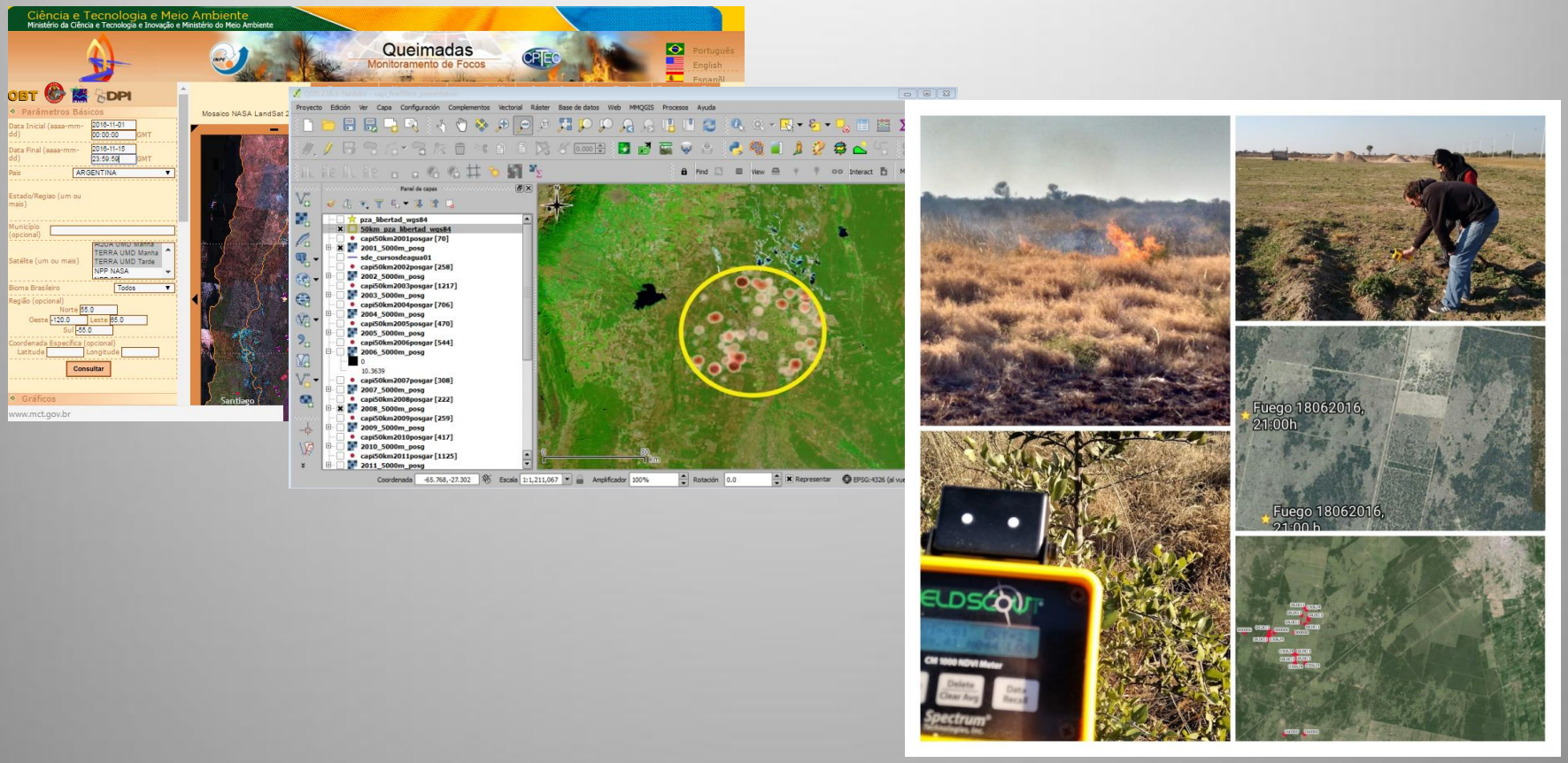
- Use of marginal areas for livestock

- Fire: a complement to eliminate residual biomass and regrowth of pasture

- Fire: soil erosion, burn scars & landscape modificactions

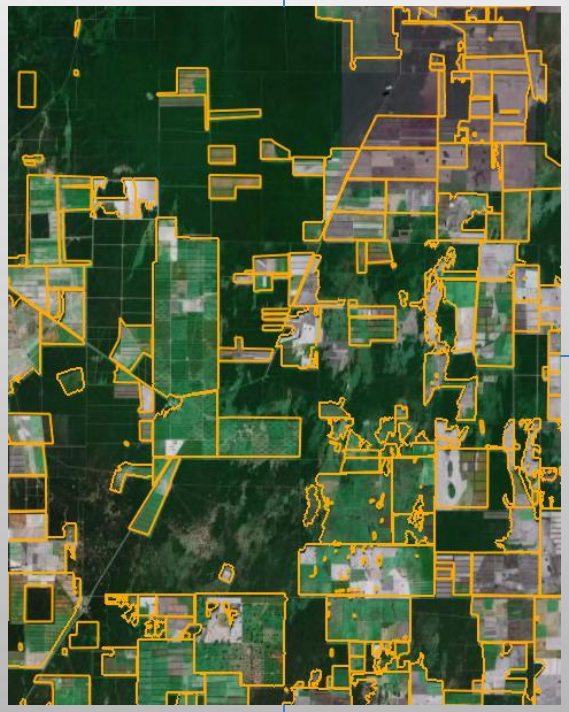
- Habitat decline

Data, software, control



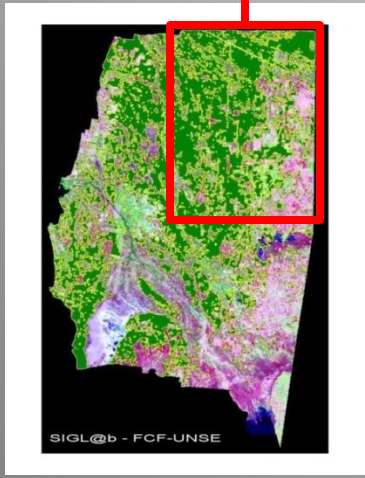
The processing, data analysis and cartographic outputs was made using the software QGIS v. 2.16.2: i) geometric transformations, ii) data clipping to area of study, iii) time classification, iv) density analysis per annual period, and extraction of the basics statistics.

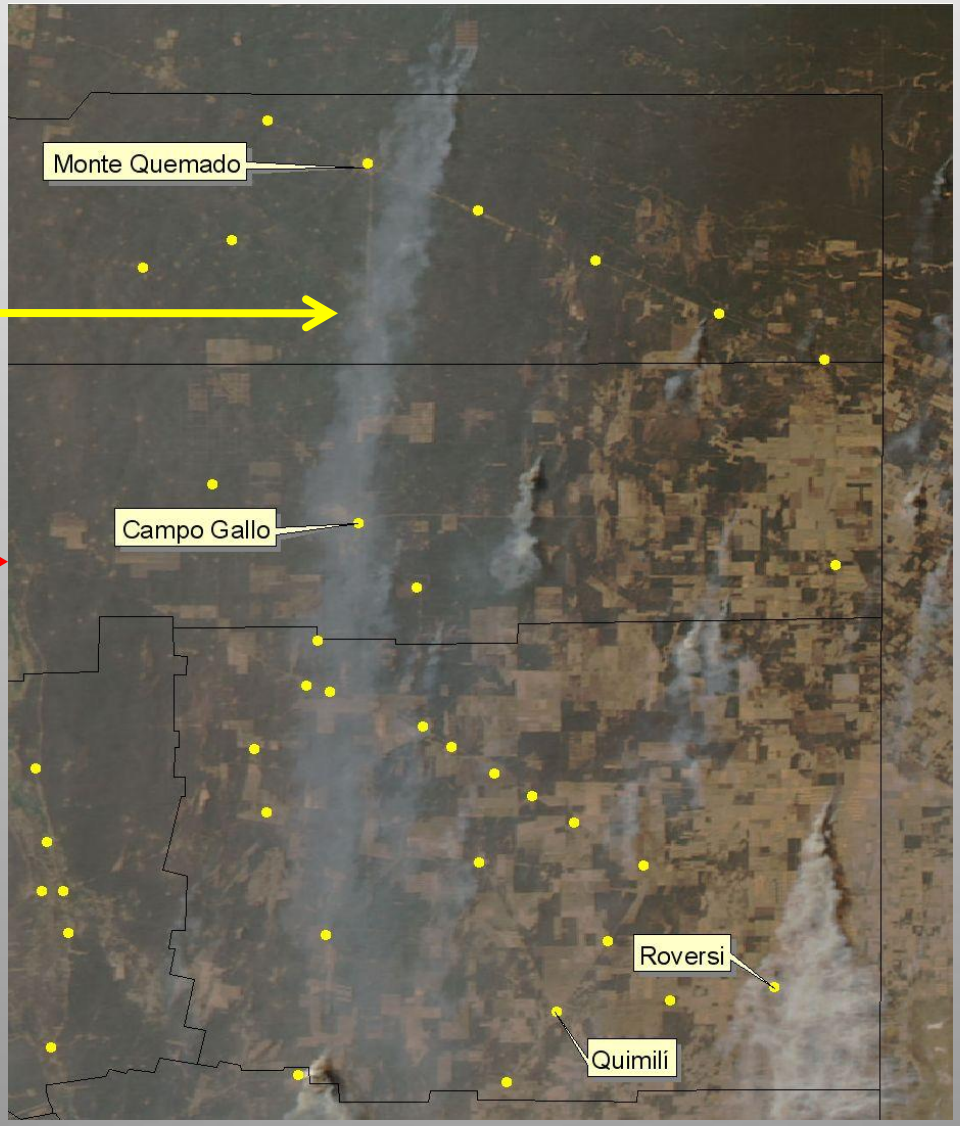
Land cover/land use change



A common day in the fire period in Santiago del Estero

> 200 km lenght





Towns

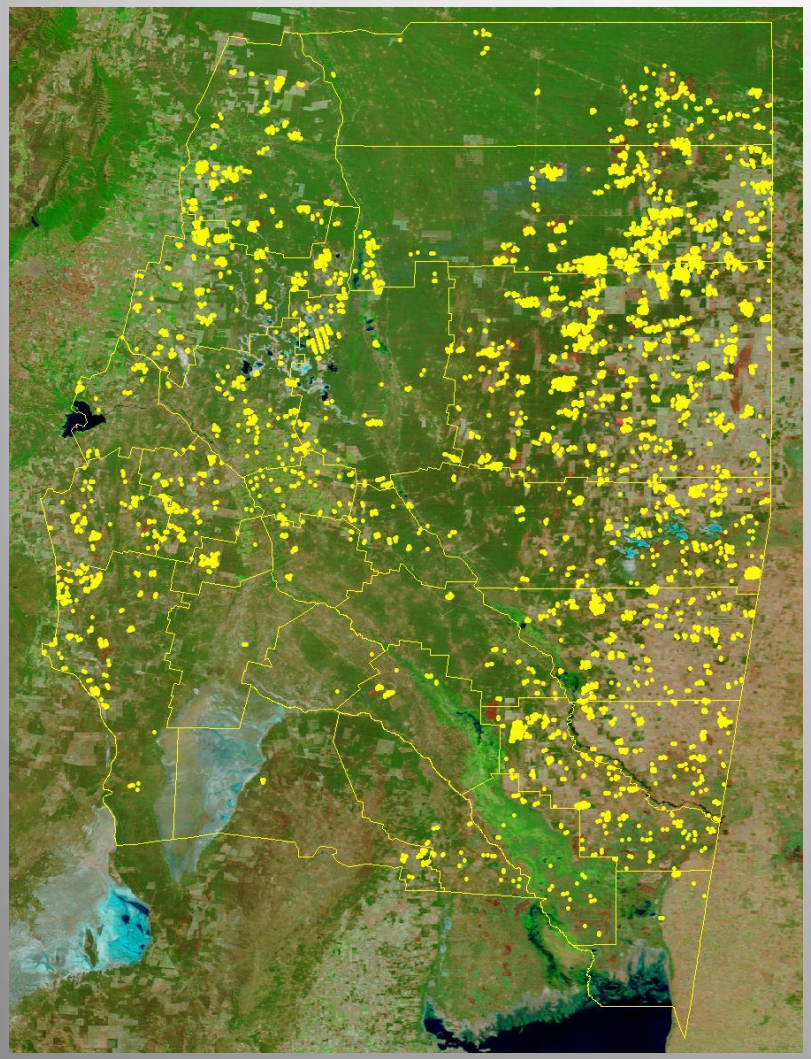
MODIS TERRA, June 26.2008

Fire detection with remote sensing

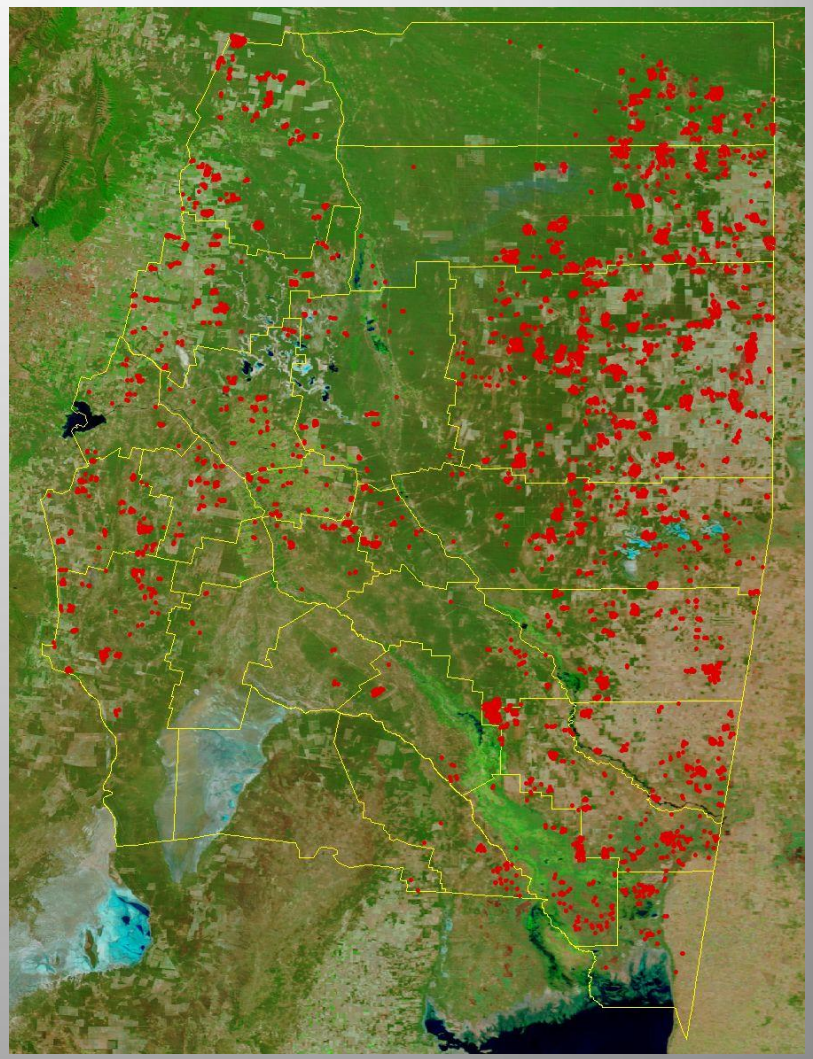
- Detection of high temperature/thermal anomalies of the earth cover
- Detection of burn areas (carbon/burn vegetación)
- Detection of plumes of smoke

Cartography and Statistics

Spatial distribution of MODIS hot-spot

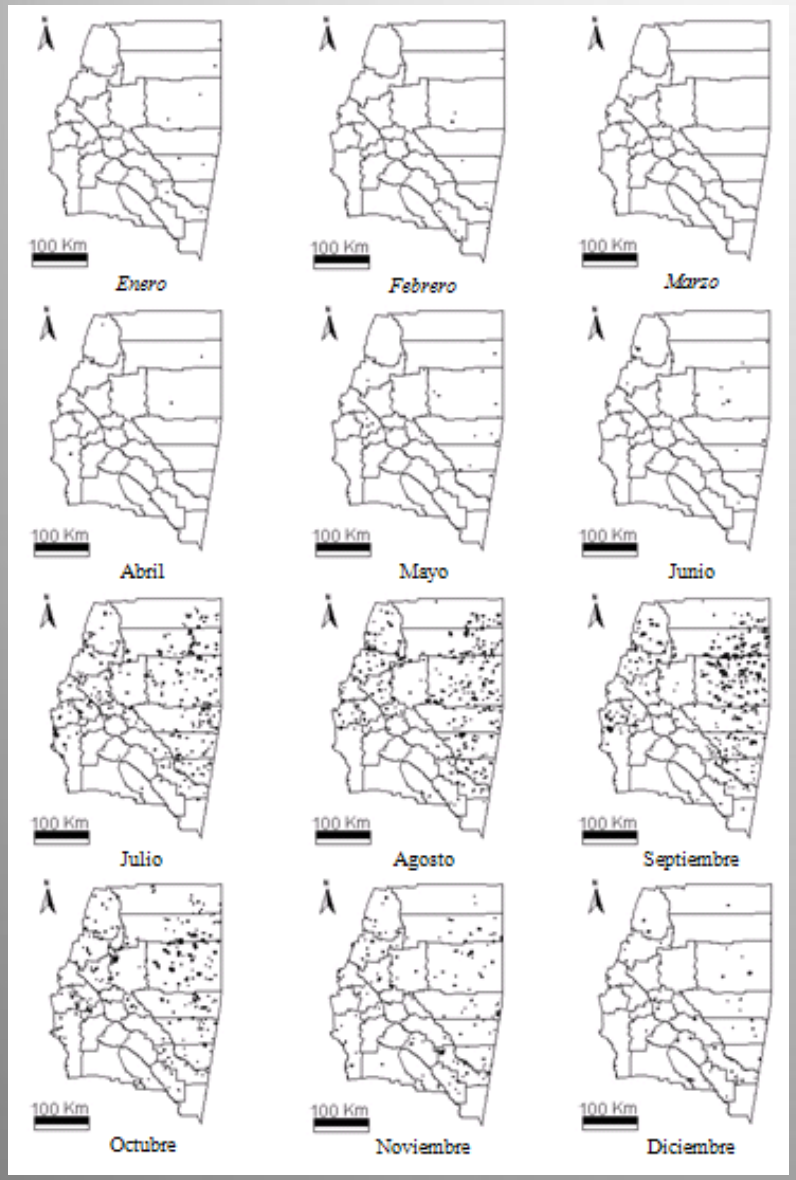


2007

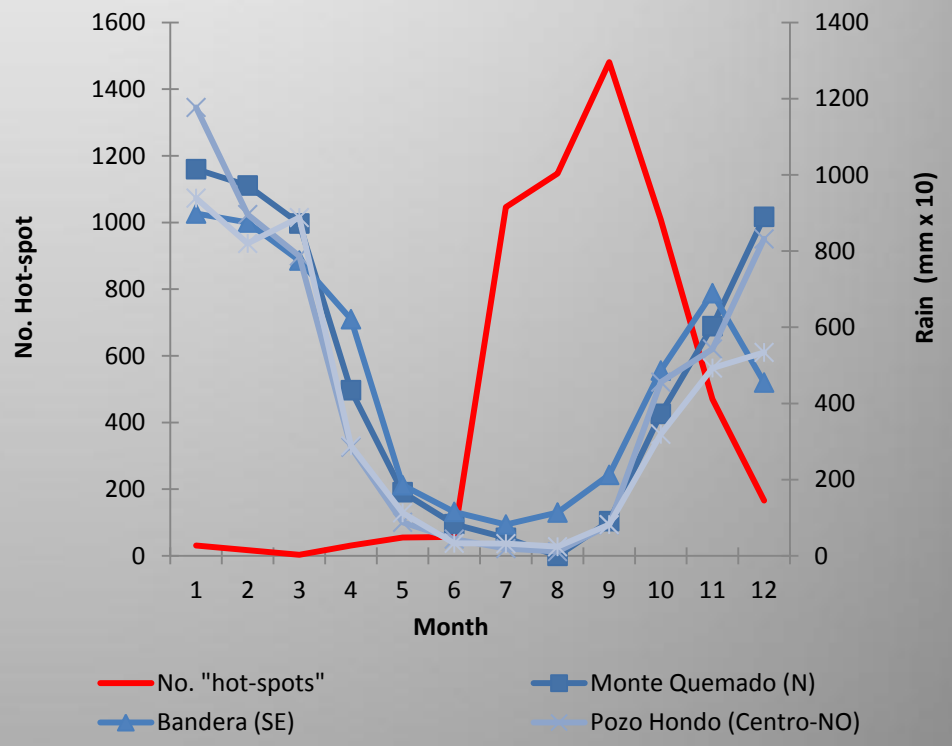


2008

Spatial and temporal distribution of MODIS hot-spot

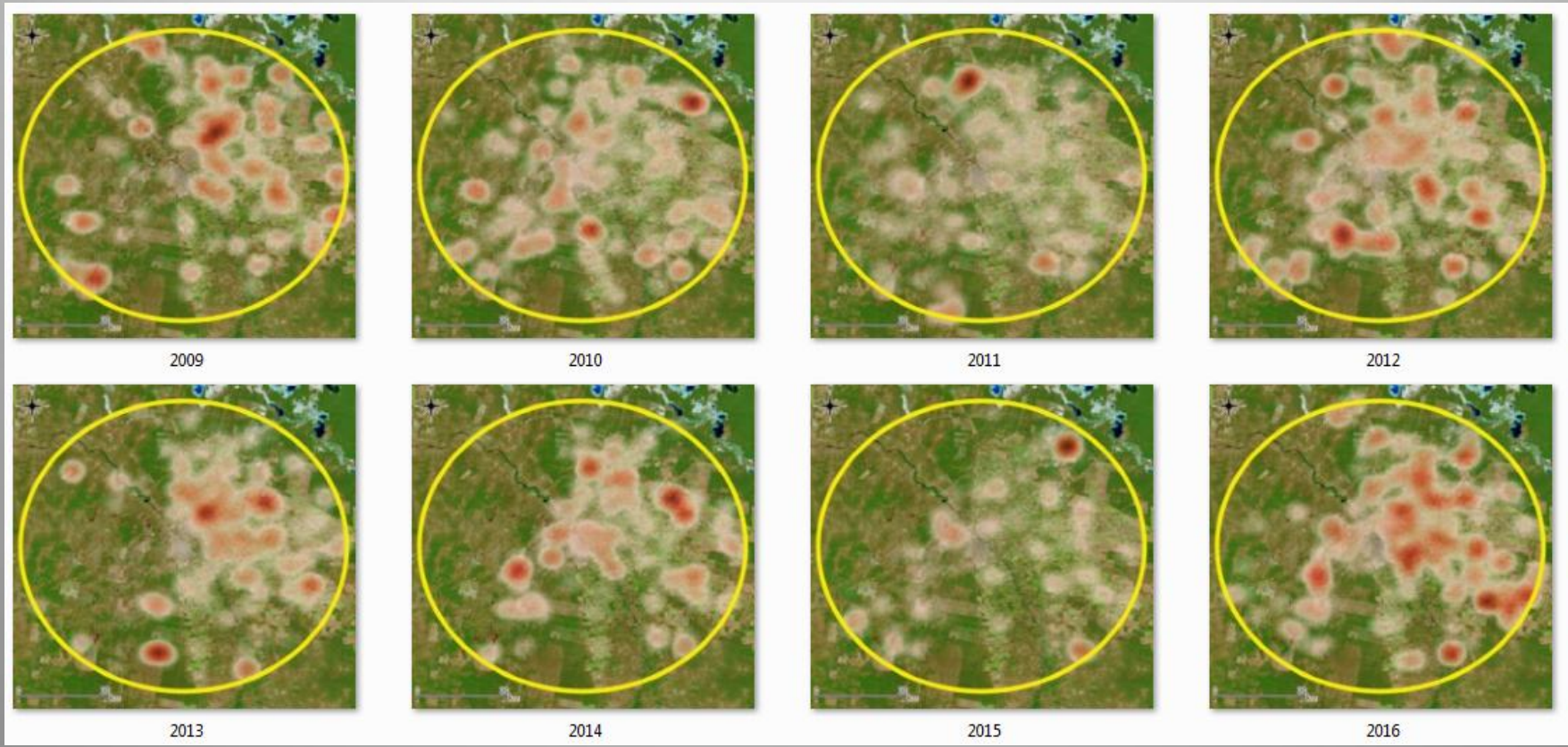


Example year 2007



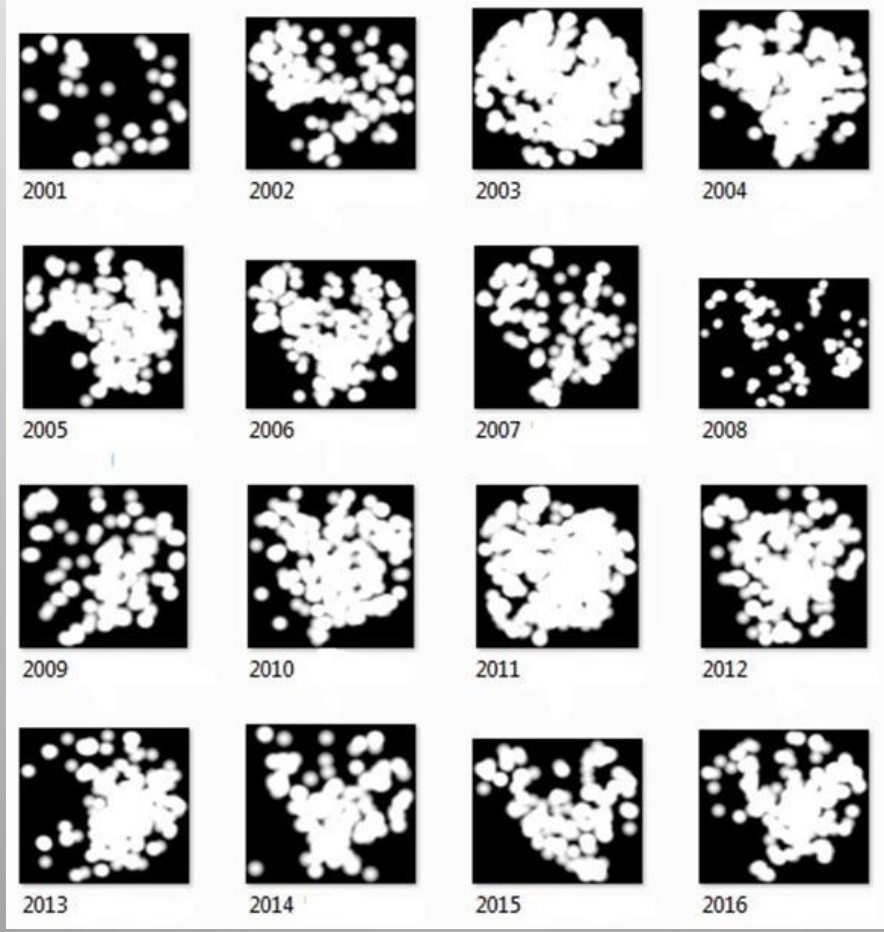
City Santiago del Estero (radio circle 50 km)

Heat mapping/density of hot-spot



Spatial and temporal distribution of hot-spot MODIS from 2000 to 2016, 50 km around the city Santiago del Estero. Background: MODIS Terra 721RGB.

Heat mapping/density of hot-spot

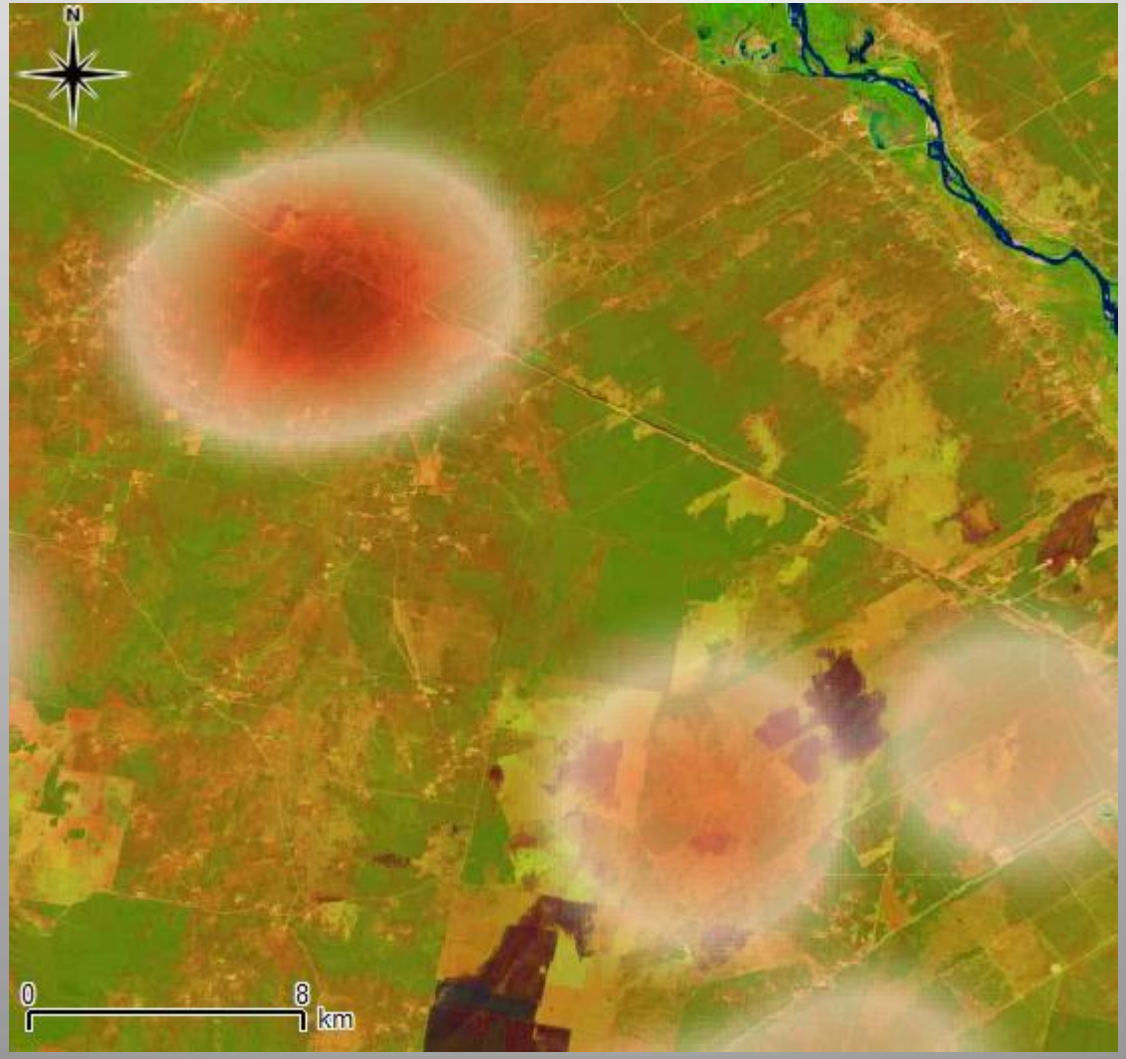


Hot-spot MODIS, representation of the spatial density of the surface thermal anomalies associated to fires , from 2000 to 2016. (W/E, N/S, densities areas)

Hot-spot: comparison province/City 50 km

	Province	*City 50 km*	*Province (1)*	*City 50 km (2)*	(1)-(2)	*City 50 km*
Year	**Hot-spot**	**Hot-spot**	**Hot-spot / km2**	**Hot-spot / km2**		**Heat map (max. value)**
2001	2007	70	0.015	0.009	0.006	3.6
2002	3443	258	0.025	0.033	-0.008	5.7
2003	17409	1217	0.128	0.155	-0.027	14.3
2004	16158	706	0.119	0.090	0.029	15.5
2005	9872	470	0.072	0.060	0.013	10.4
2006	11158	544	0.082	0.069	0.013	10.3
2007	5513	308	0.040	0.039	0.001	7.6
2008	4939	222	0.036	0.028	0.008	5.4
2009	6228	259	0.046	0.033	0.013	6.1
2010	7844	417	0.058	0.053	0.004	7.2
2011	12421	1125	0.091	0.143	-0.052	16.9
2012	6167	450	0.045	0.057	-0.012	8.7
2013	7587	486	0.056	0.062	-0.006	11.6
2014	4265	246	0.031	0.031	-0.000	7.8
2015	5012	294	0.037	0.037	-0.001	9.5
2016	6055	367	0.044	0.047	-0.002	7.9
	Total = 126078	Total = 7439	Average = 0.058	Average=0.059	-0.001	Average = 9,2
						(cell scan 5 km)

Fire scars patterns



Conclusions

- There is no difference in the density of hot'spot in the forest and wildland-perirular environments

- RS data & GIS can provide basic information for the control and management of fire, preserving the forest landscape

- The fire is spatially distributed in regions with high deforestation and pastoral use

- The highest frequencies correspond to the winter period

- There is a link with the phenological rhythm of vegetation