



MINISTÉRIO DA CIÊNCIA E TECNOLOGIA
INSTITUTO NACIONAL DE PESQUISAS ESPACIAIS



Deployment Platform, TerraMA² in the Amazon

Eymar S.S. Lopes

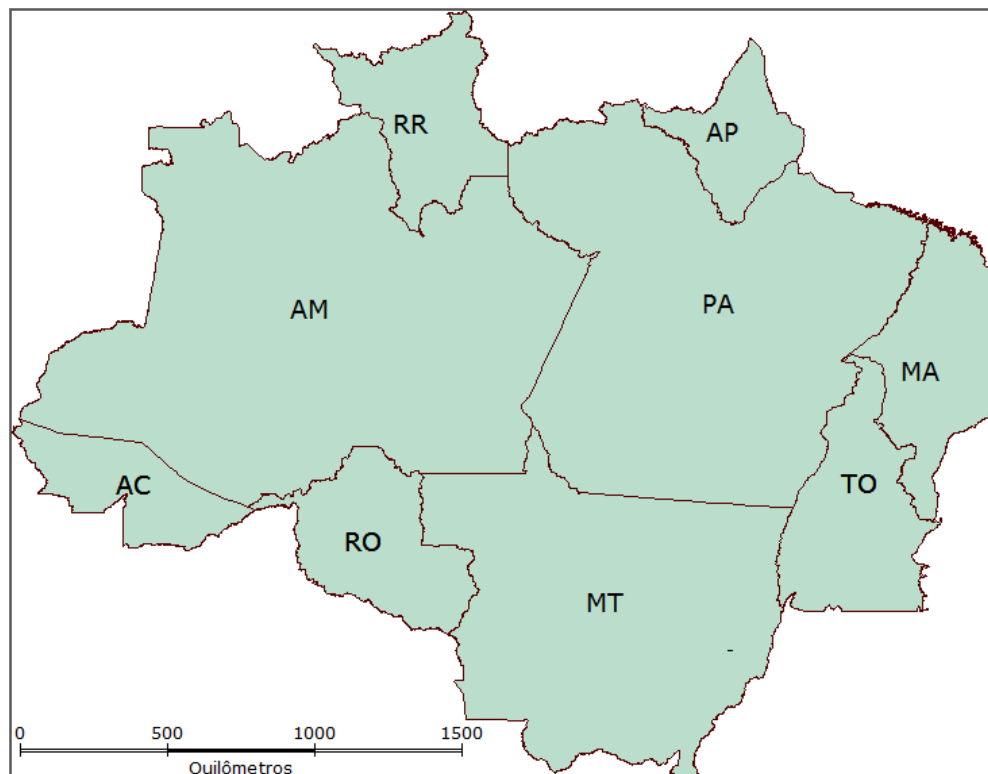


16 de agosto de 2012



Objetivo.....

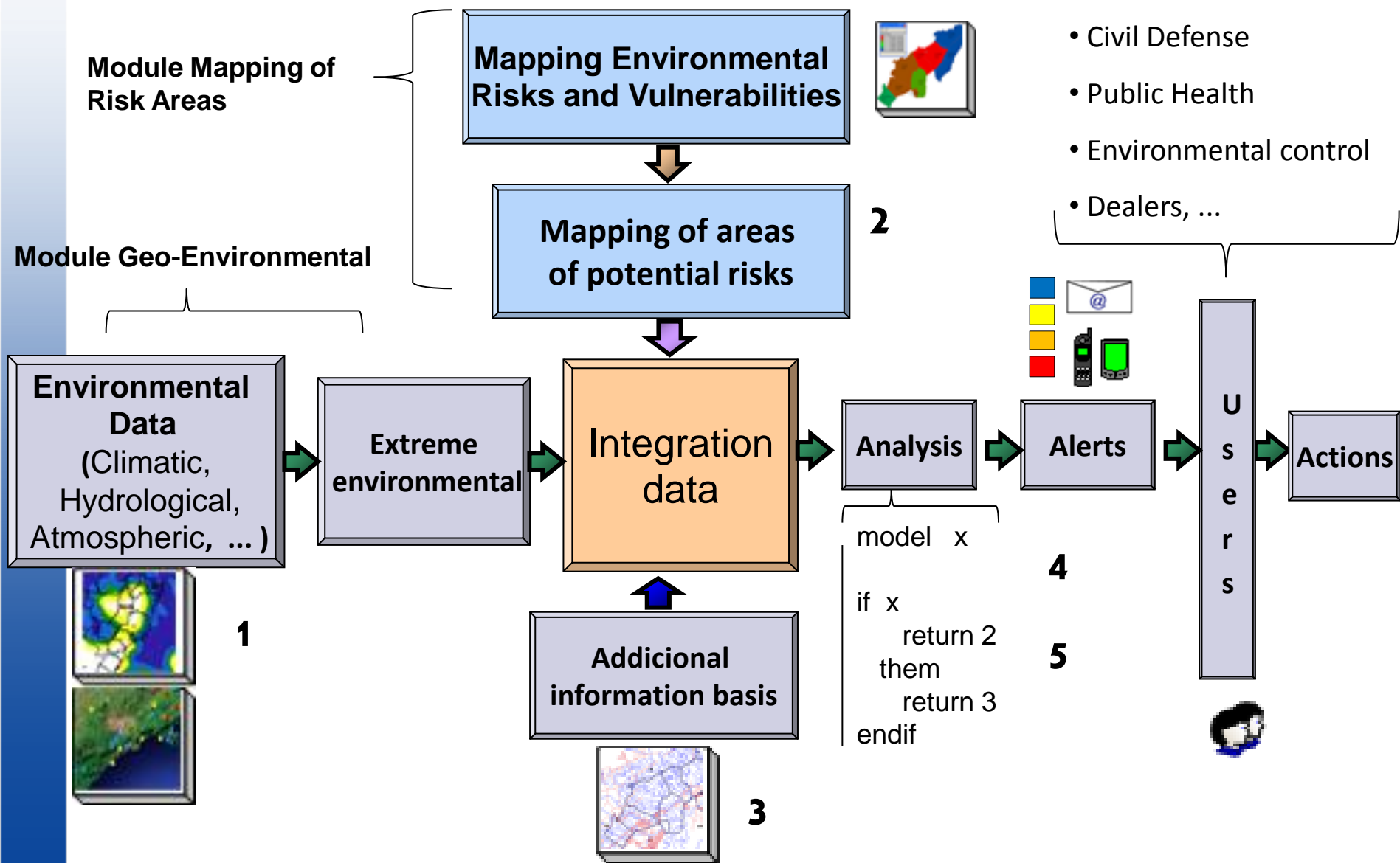
IMPLANTAÇÃO DA PLATAFORMA DE MONITORAMENTO, ANÁLISE E ALERTA – TERRAMA² APLICADA A PREVENÇÃO DE DESASTRES NATURAIS NA AMAZÔNIA

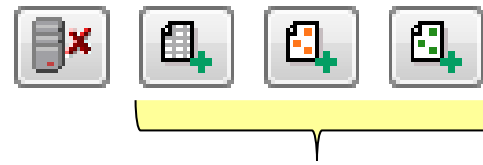


Metas...

1. Acesso a dados dinâmicos para o monitoramento
2. Definição dos dados estáticos (planos de risco) a serem monitorados
3. Definição dos dados adicionais para detalhes dos alertas
4. Análises sobre áreas de risco
5. Análises baseadas em modelos
6. Alertas a tomadores de decisão

Framework





- Dynamic Data input

Dados Ambientais

Planos de Risco

Servidores cadastrados:

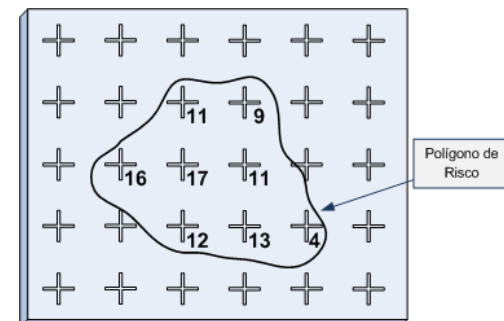
Servidores remotos

- dsa
 - hidro
 - raio
 - PCD_sp
- CPTEC**
 - eta5km
 - umrl
 - eta15km
- CPTEC_focos
 - Focos_Noaa

Multidimensional numerical grids



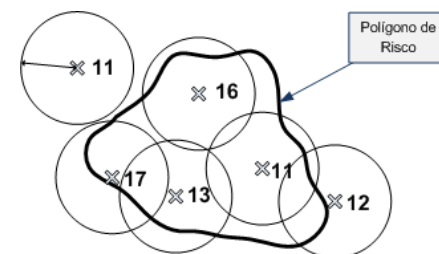
(BIN, TIFF, ASCII)



Data points fixed



(ASCII)



Event data

(PROARCO ASCII)



Dynamic Data input

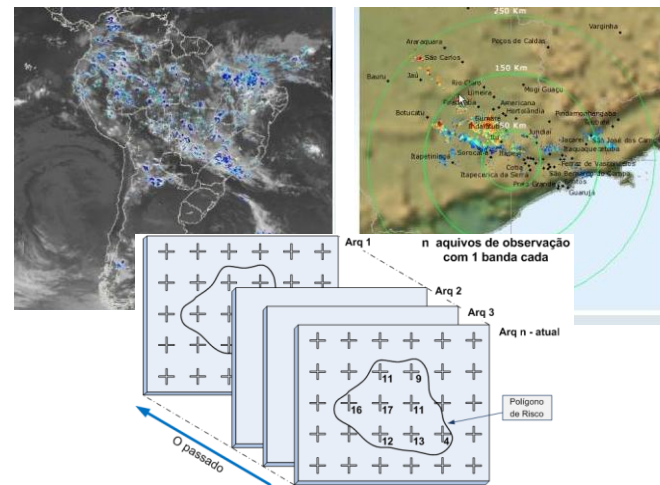
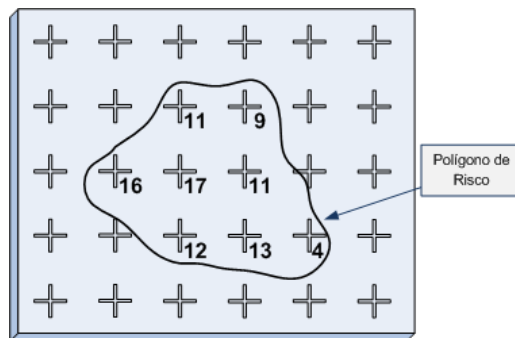
Multidimensional numerical grids

(BIN, TIFF, ASCII)



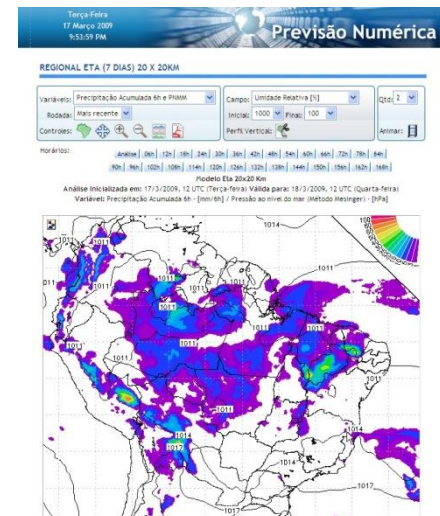
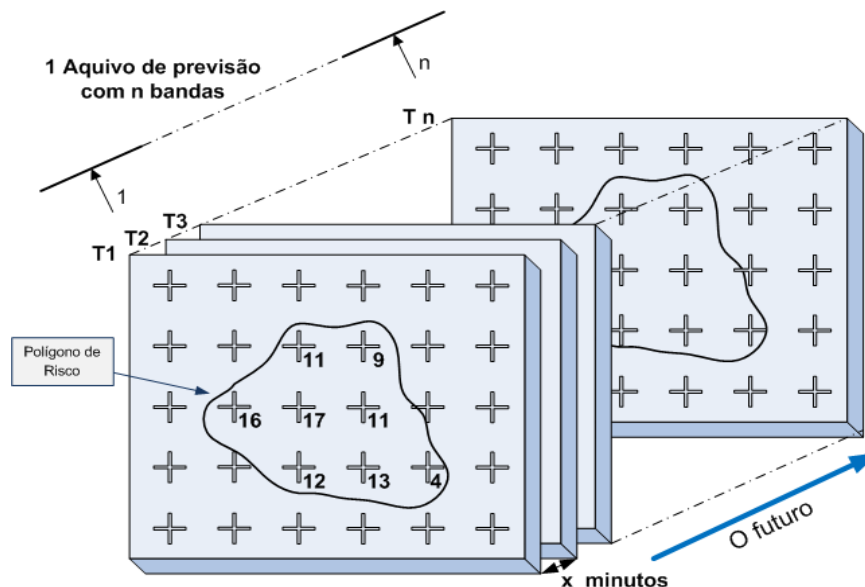
Observation

- Hydroestimator
- Lightning
- Weather Radar



FORECAST

- Eta 5 km
- Eta 10 km
- Eta 15 km



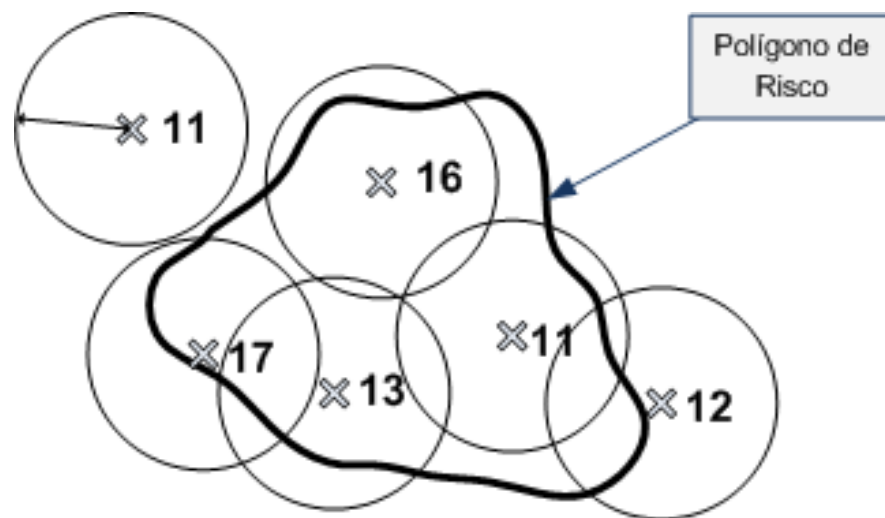


Dynamic Data input

Data points fixed (ASCII)



- Weather station
- Probe water quality
- Ocean buoy
- Air quality stations



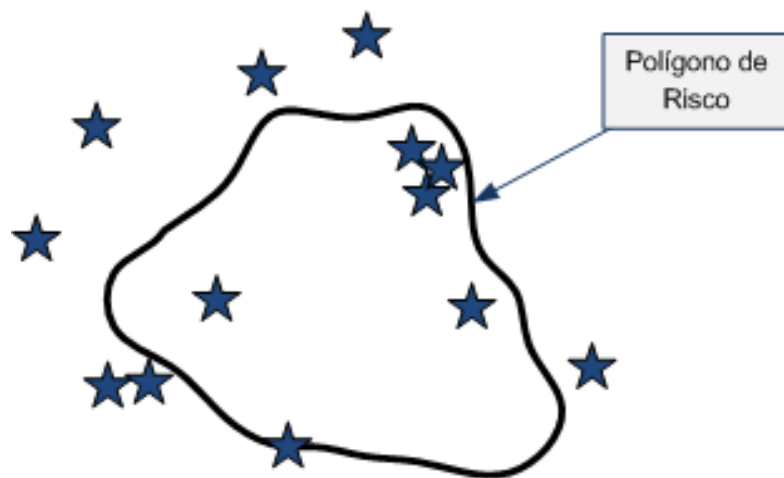
Dynamic Data input

Event data

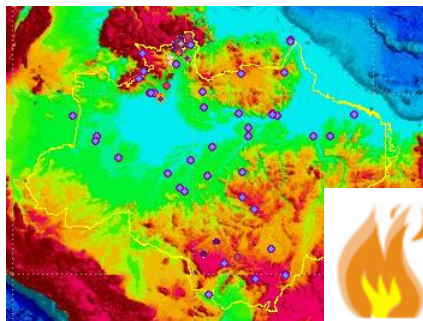
(PROARCO ASCII)



X,Y
Longitude, Latitude

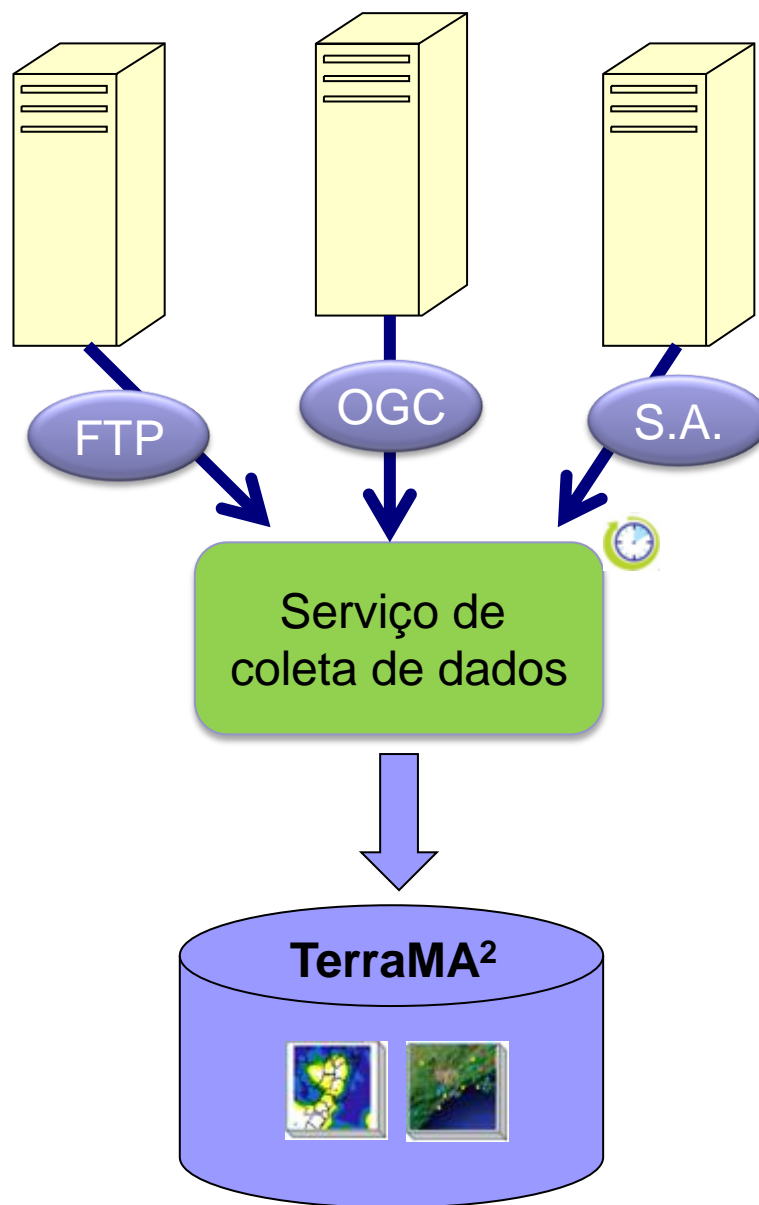


- Outbreaks of fire
- Outbreaks of epidemics
- Earthquakes
- Lightning
- General Events



Formas de recebimento de dados

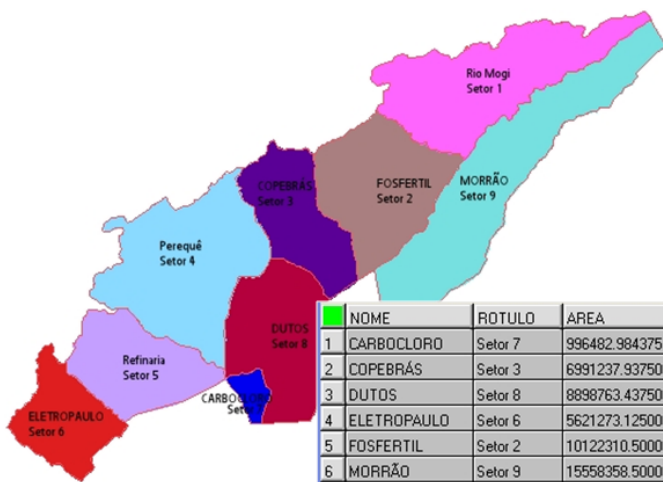
- FTP
 - CPTEC
- Serviços OGC
 - WCS (grades)
 - WFS (pontos)
- Sistema de arquivos
- Extensível



Static Data (Riscos Ambientais)

Dados Estáticos (planos de risco e grades)

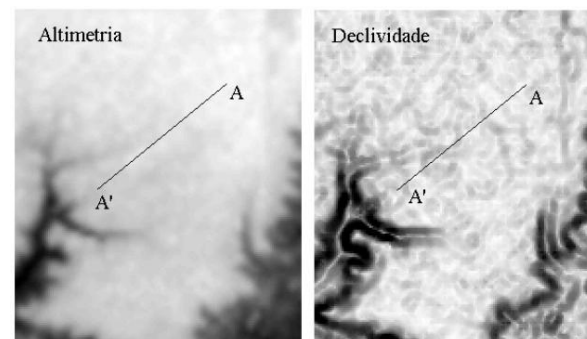
Risk Layer – map polygons with attributes



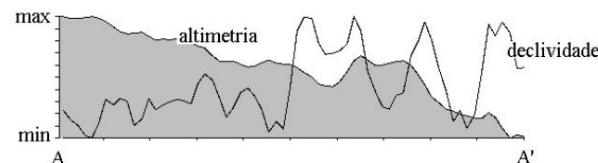
Atributos disponíveis para serem utilizados nas regras de análise

	NOME	ROTULO	AREA	K	POSTO1	POSTO2
1	CARBOCLORO	Sector 7	996482.984375	2500.00000		
2	COPEBRÁS	Sector 3	6991237.937500	2033.00000	29	26
3	DUTOS	Sector 8	8898763.437500	2700.00000		
4	ELETRIPAULO	Sector 6	5621273.125000	3467.00000	24	
5	FOSFERTIL	Sector 2	10122310.500000	2033.00000	29	26
6	MORRÃO	Sector 9	15558358.500000	3945.00000	26	
7	Perequê	Sector 4	13891532.875000	2357.00000	25	
8	Refinaria	Sector 5	7559360.437500	2603.00000	28	
9	Rio Mogi	Sector 1	12707225.875000	3945.00000	26	

Planos matriciais

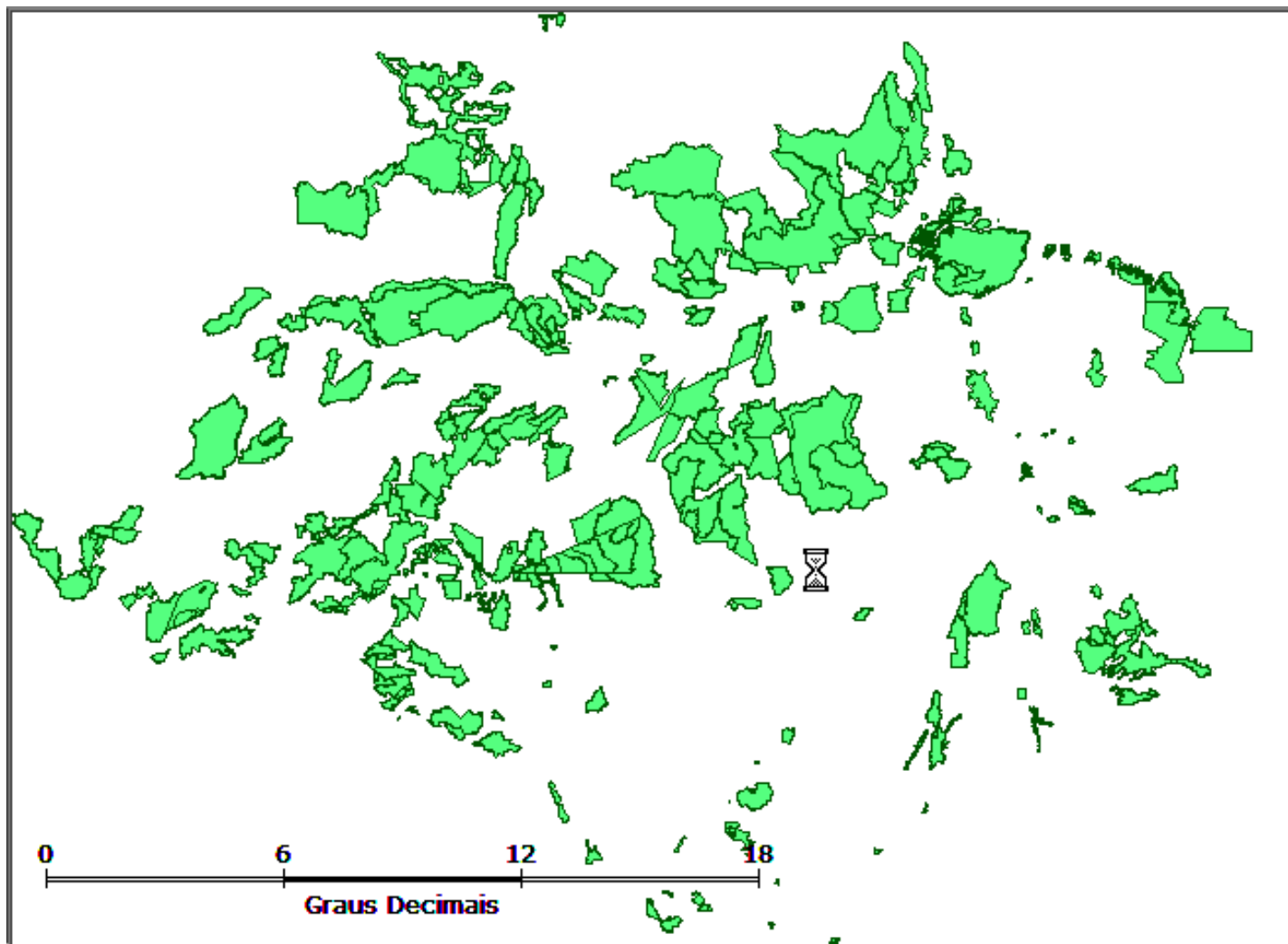


Inseridos no BDG com



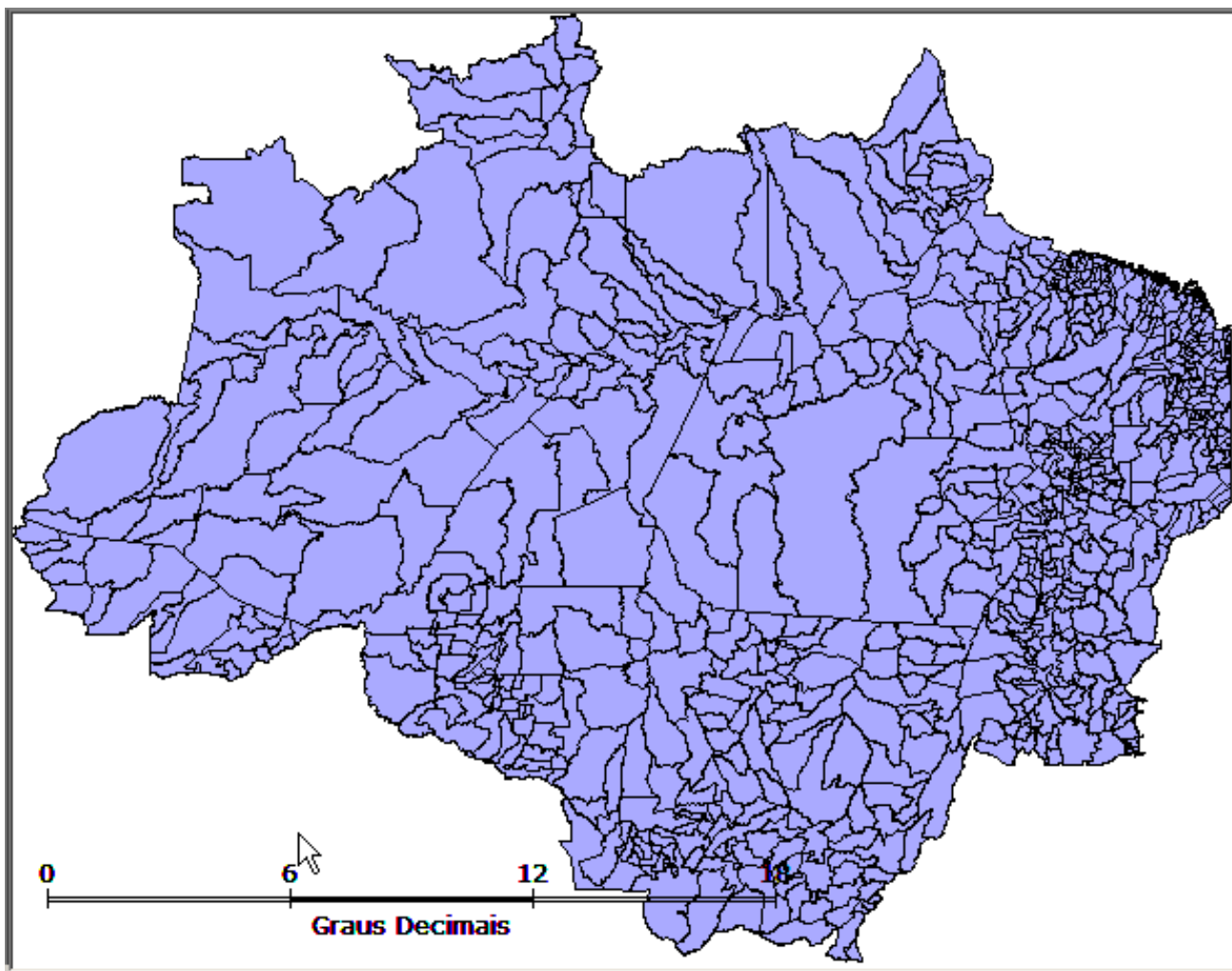
Dados estáticos (planos de risco) a serem monitorados

- Unidades de Conservação (IBAMA)



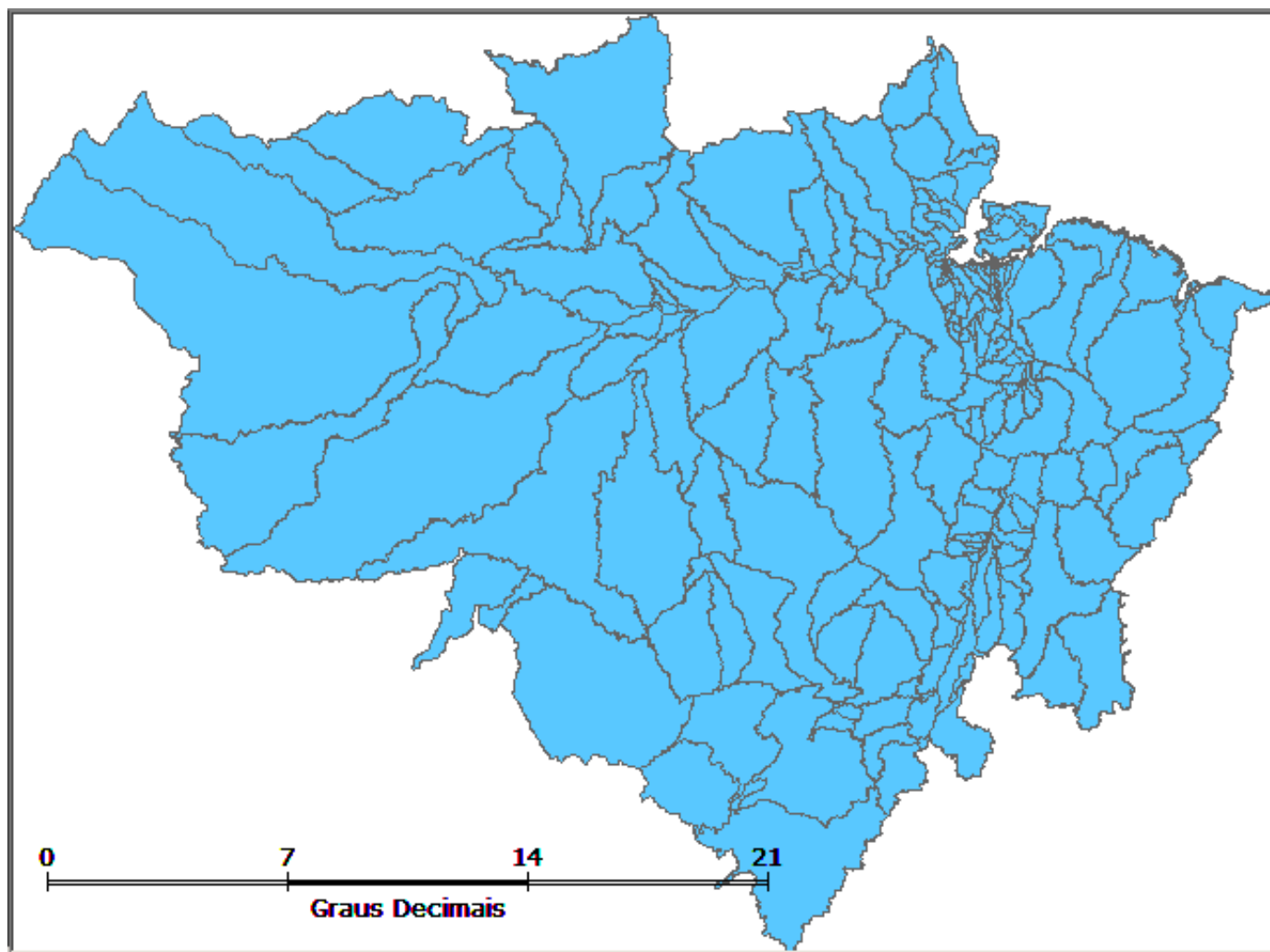
Dados estáticos (planos de risco) a serem monitorados

- Limites municipais (IBGE)



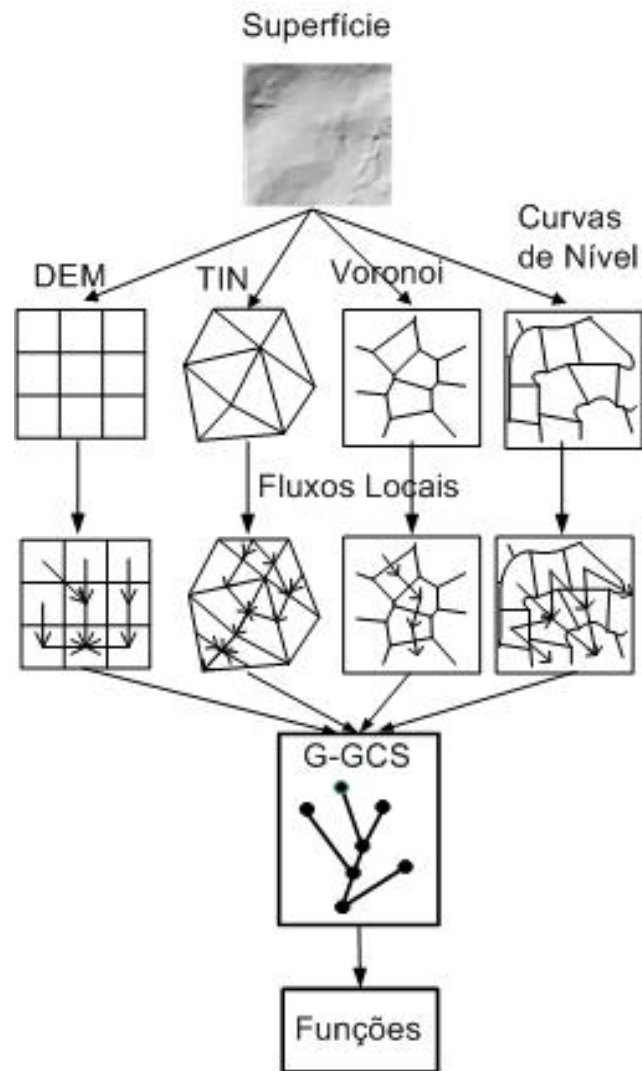
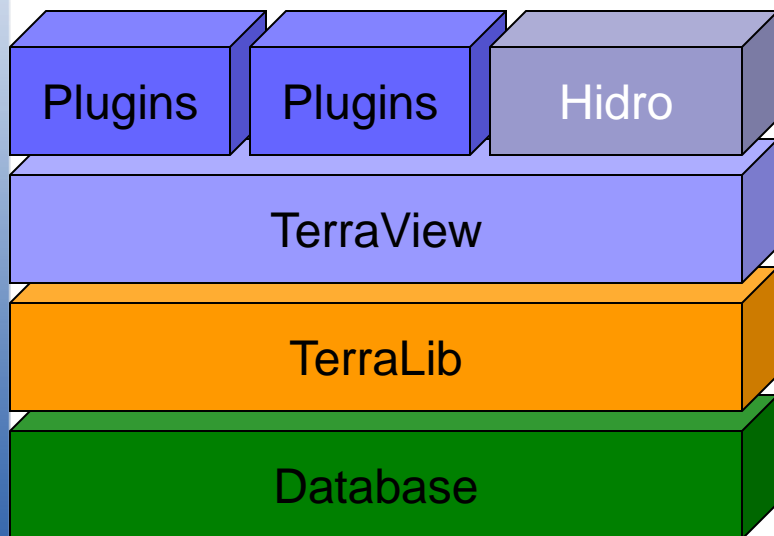
Dados estáticos (planos de risco) a serem monitorados

- Micro e Macro bacias (TerraHydro)



TerraHidro - TerraView

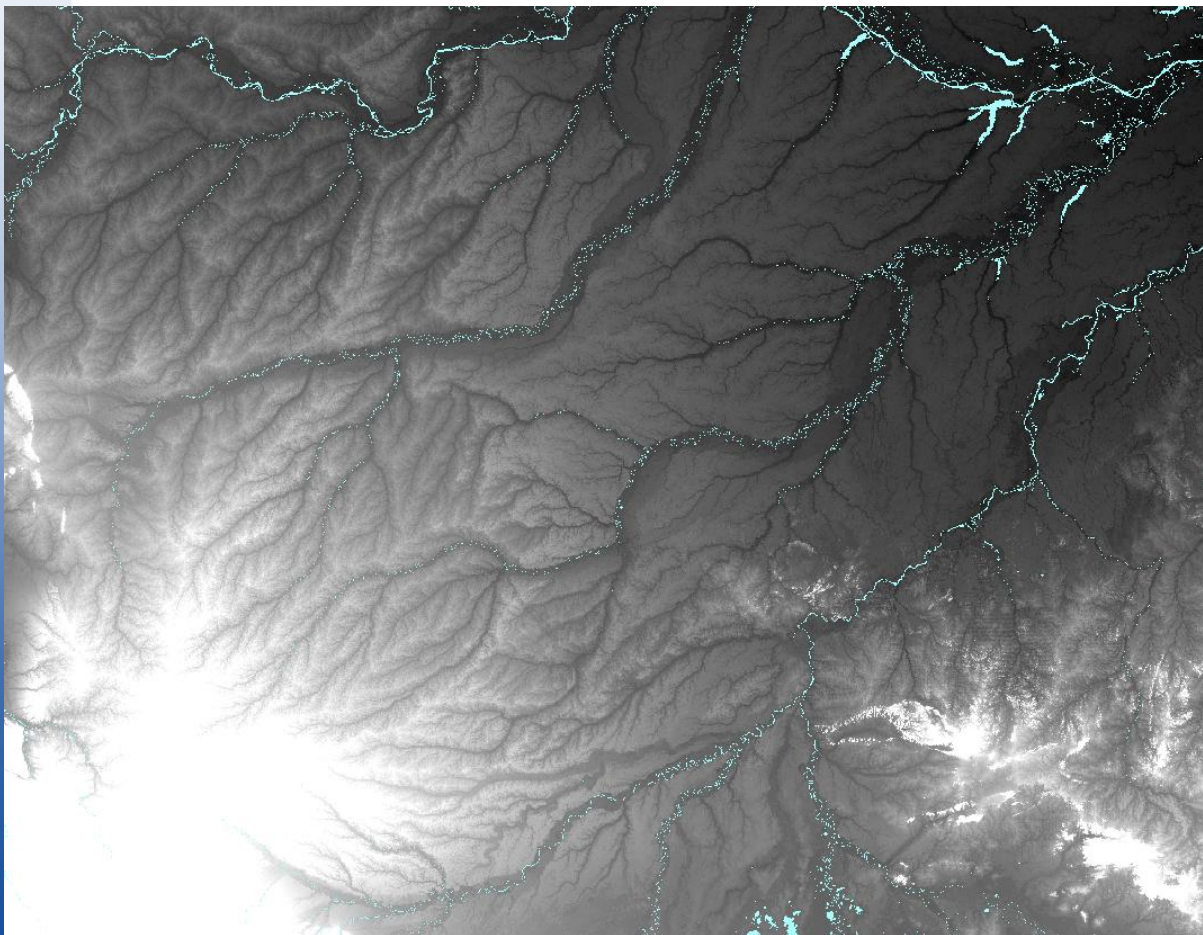
Uma única estrutura para desenvolver aplicações



Graph -> drenagem

Boost Graph Library - BGL

Exemplo TerraHidro: Purus



Saturado em 350 metros

x1: -74.00

y1: -12.99

x2: -61.00

y2: -2.99

Pixels: 187.200.000

Linhas: 12.000

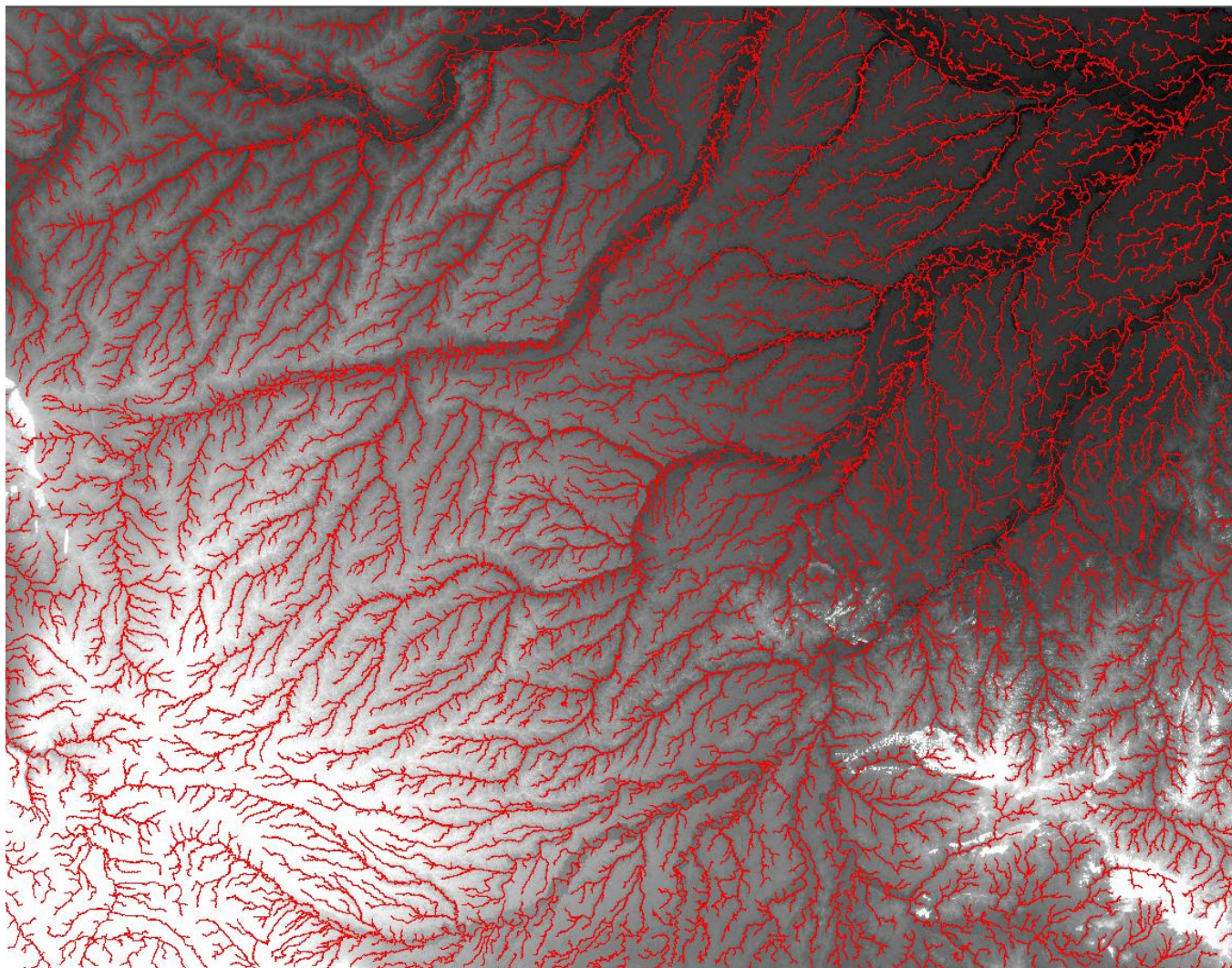
Colunas: 15.600

Fossos: 13.279.394

Tempo: 5:40:31 h

Acumulada: 12:07
min

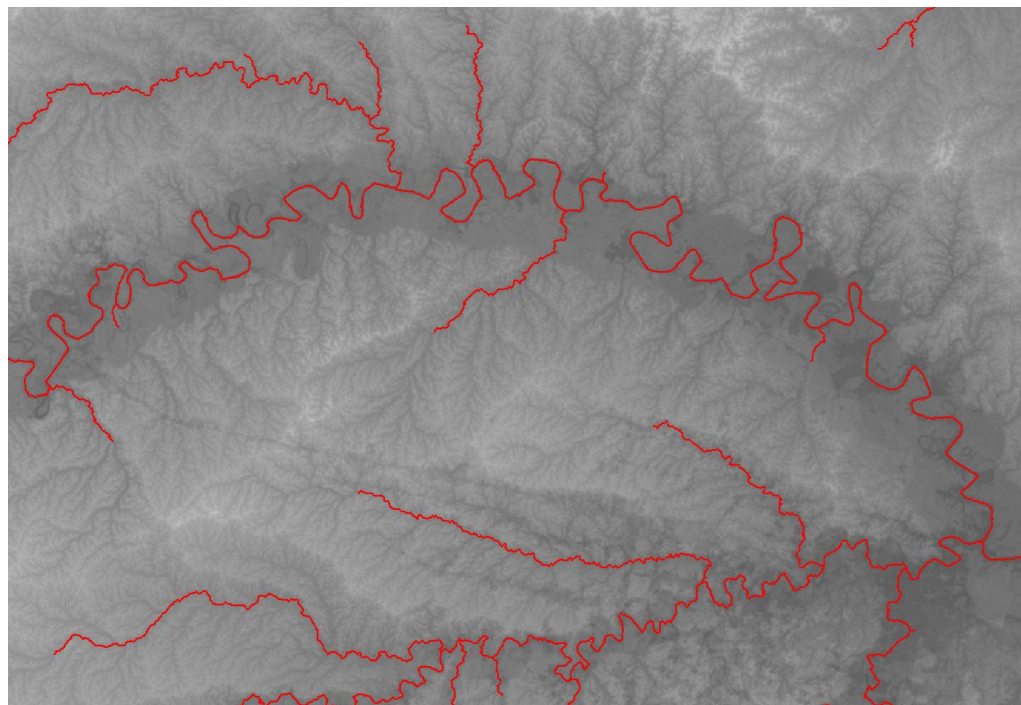
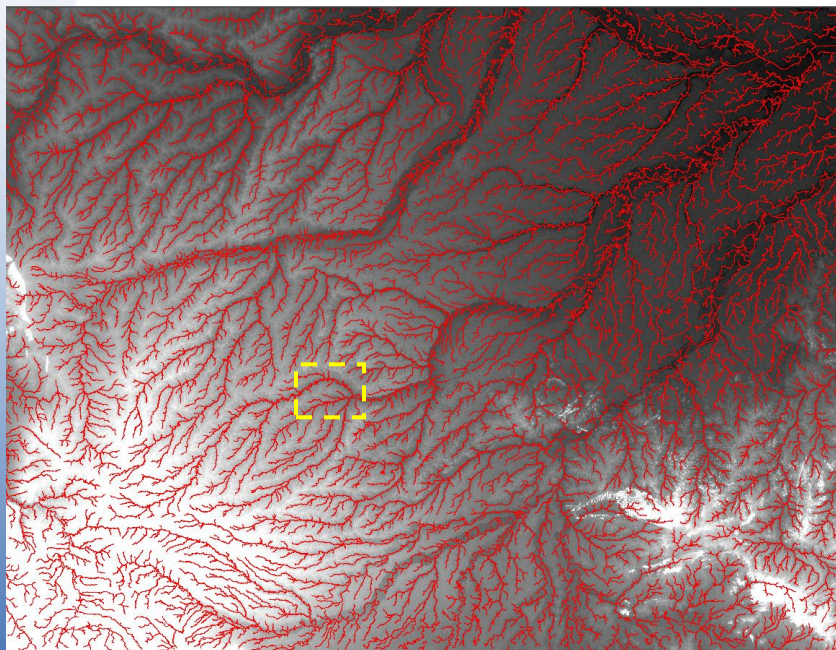
Purus Drenagem



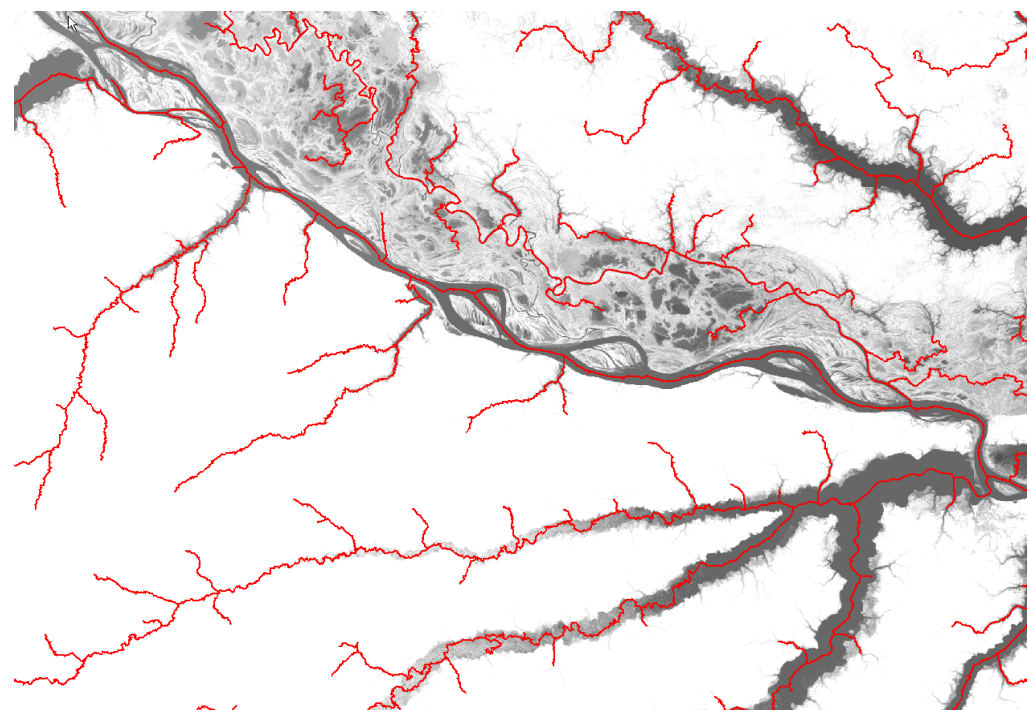
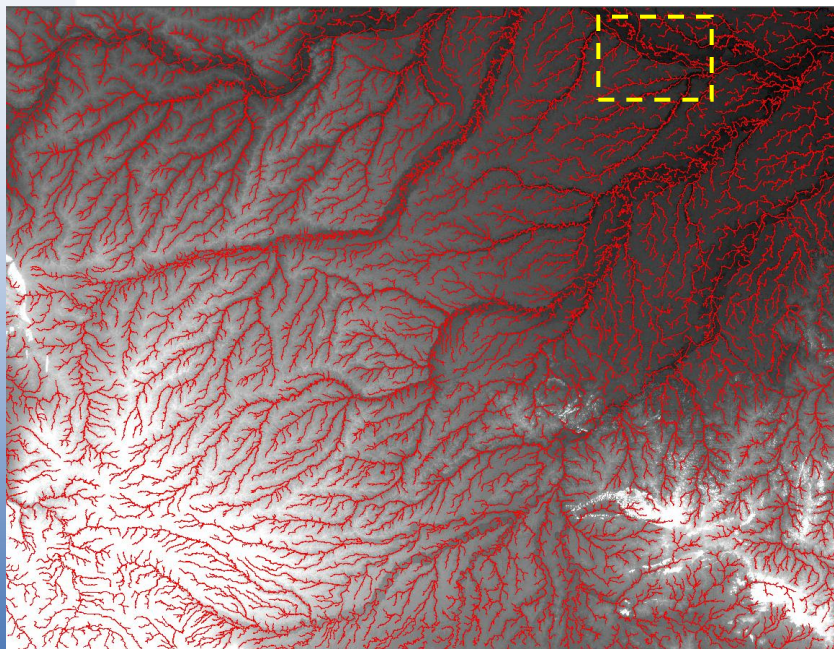
Valor de corte: 10.000

Maior Ordem: 6

Purus Drenagem Zoom1

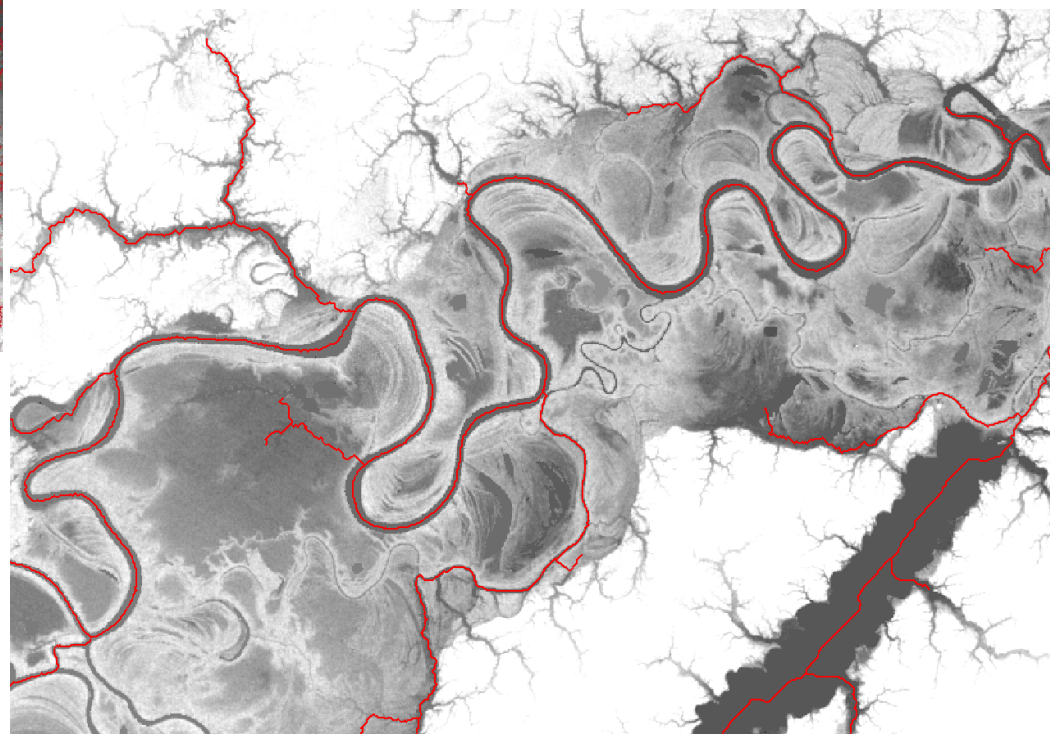
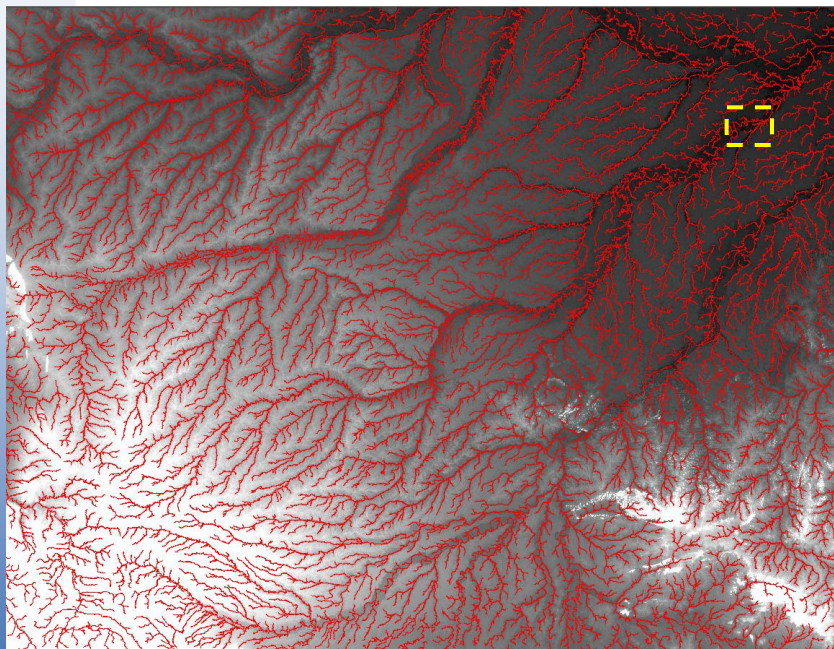


Purus Drenagem Zoom2



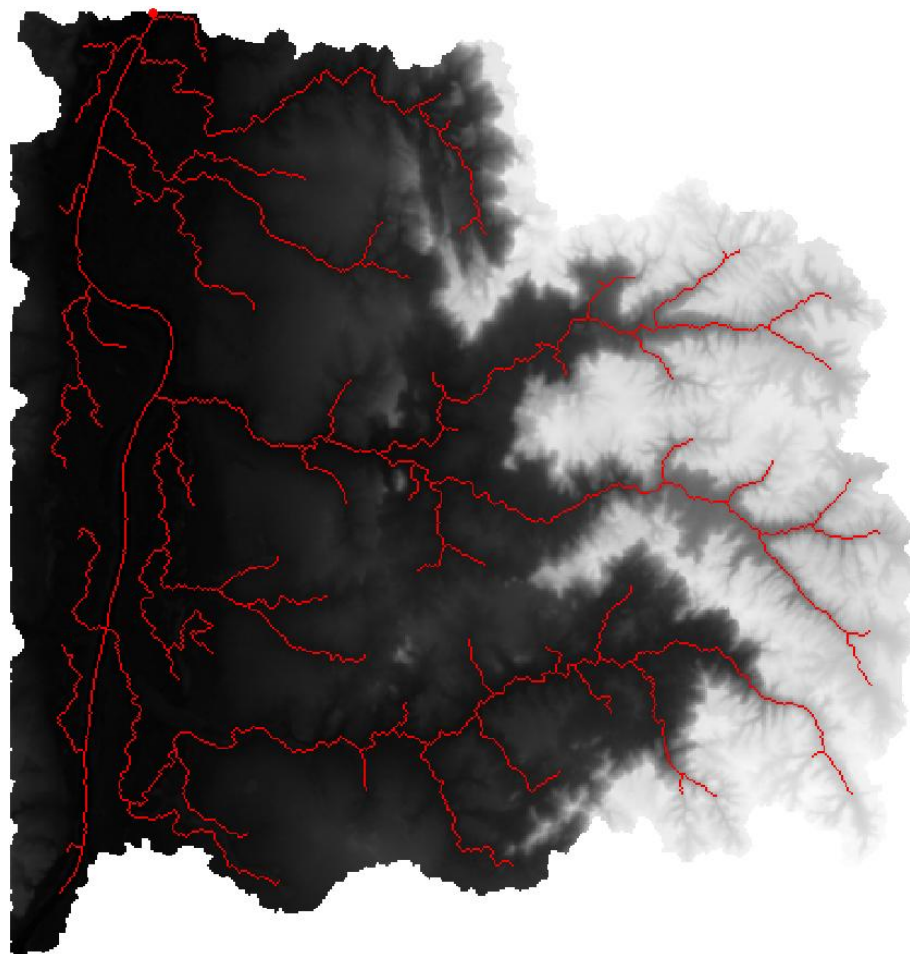
Zoom saturado em 50 metros

Purus Drenagem Zoom3

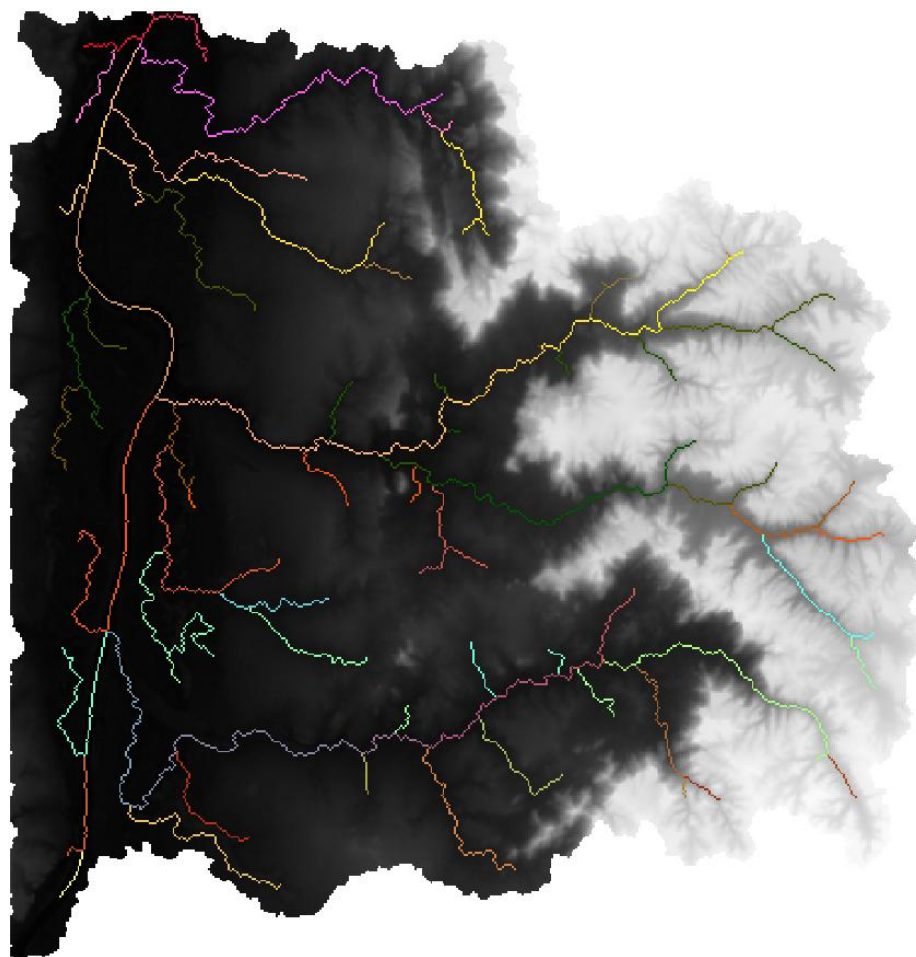


Saturado em 50 metros

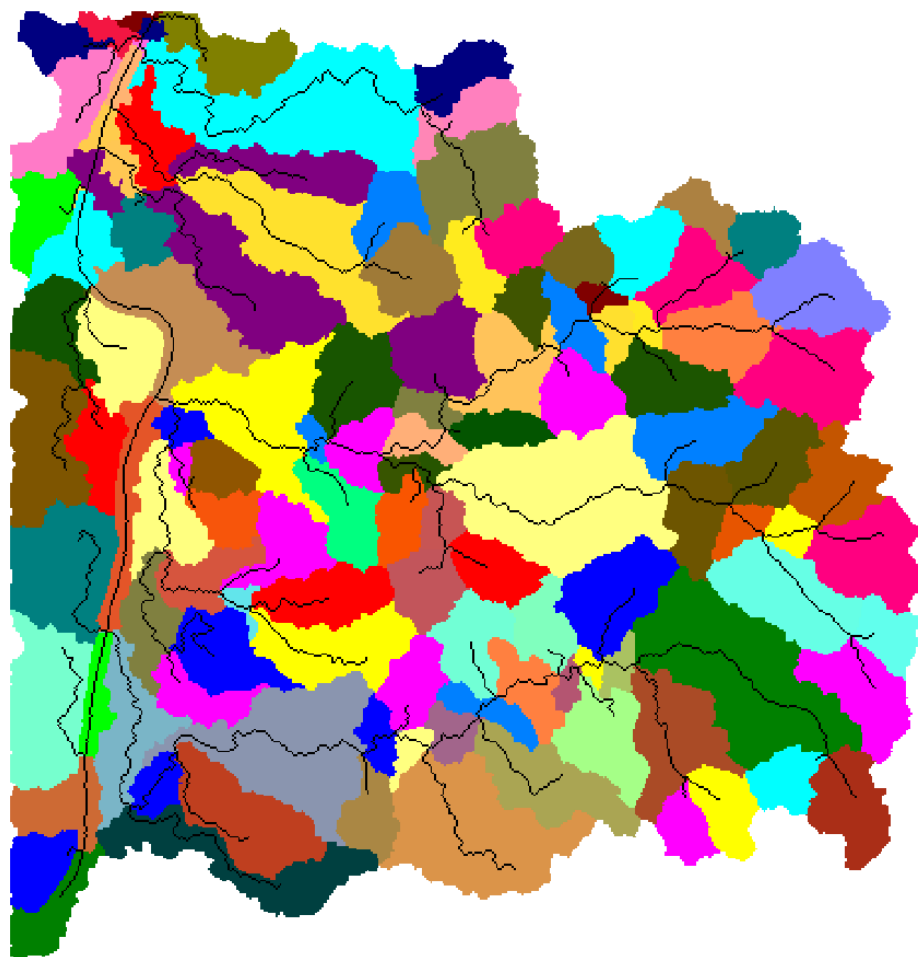
Delimitar a Bacia com TerraHidro



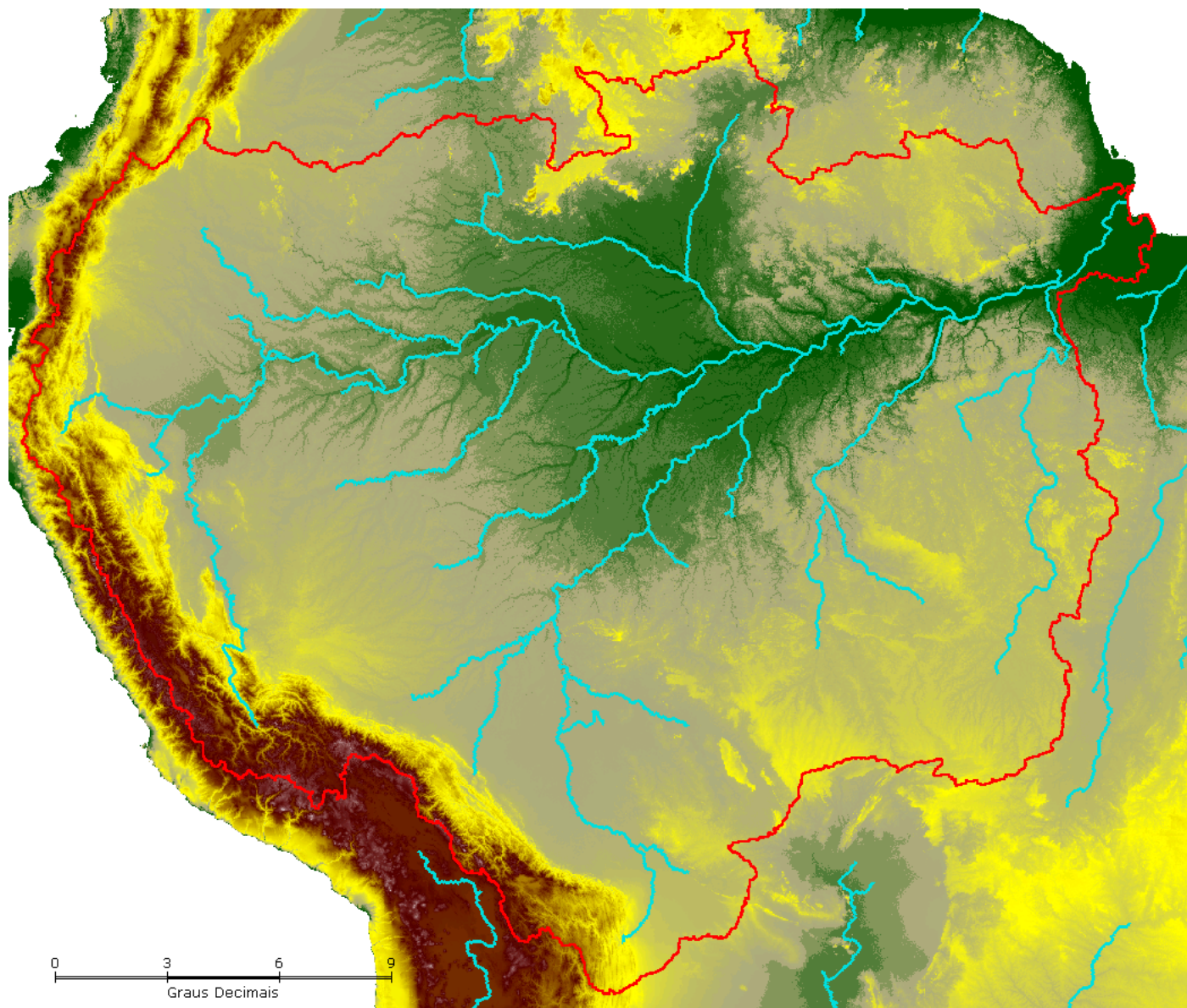
Trechos de Drenagem com TerraHidro



Minibacias com TerraHidro



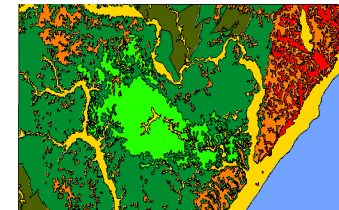
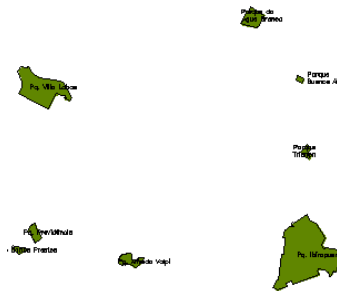
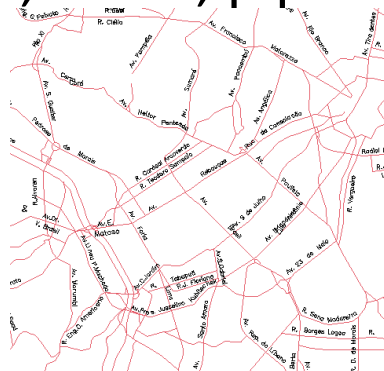
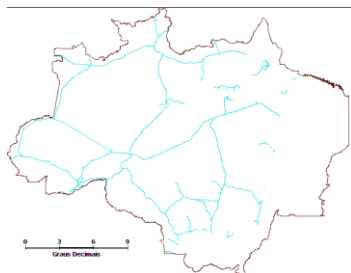
Bacia Amazônica com TerraHidro



Additional Data

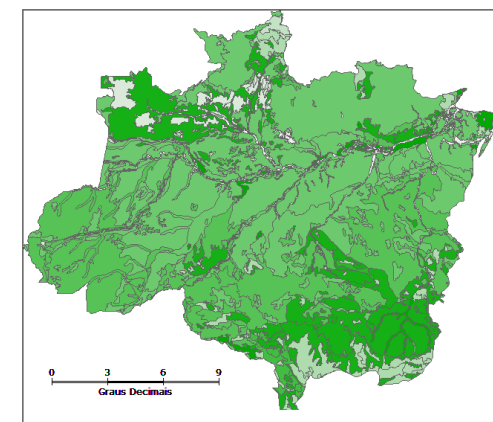
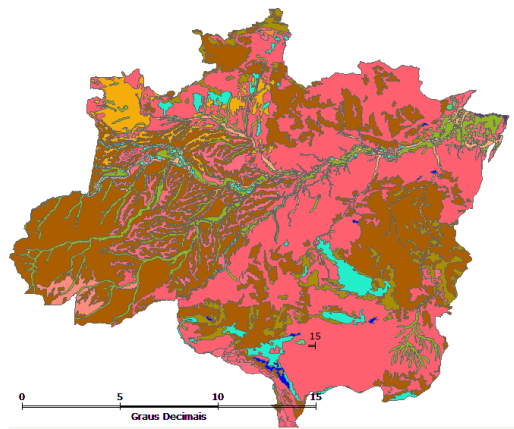
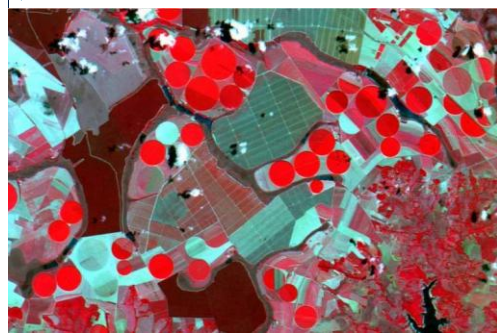
(ponto, linha, polígono e grades)

Vector Layers - rivers, roads, pipelines, human areas ...

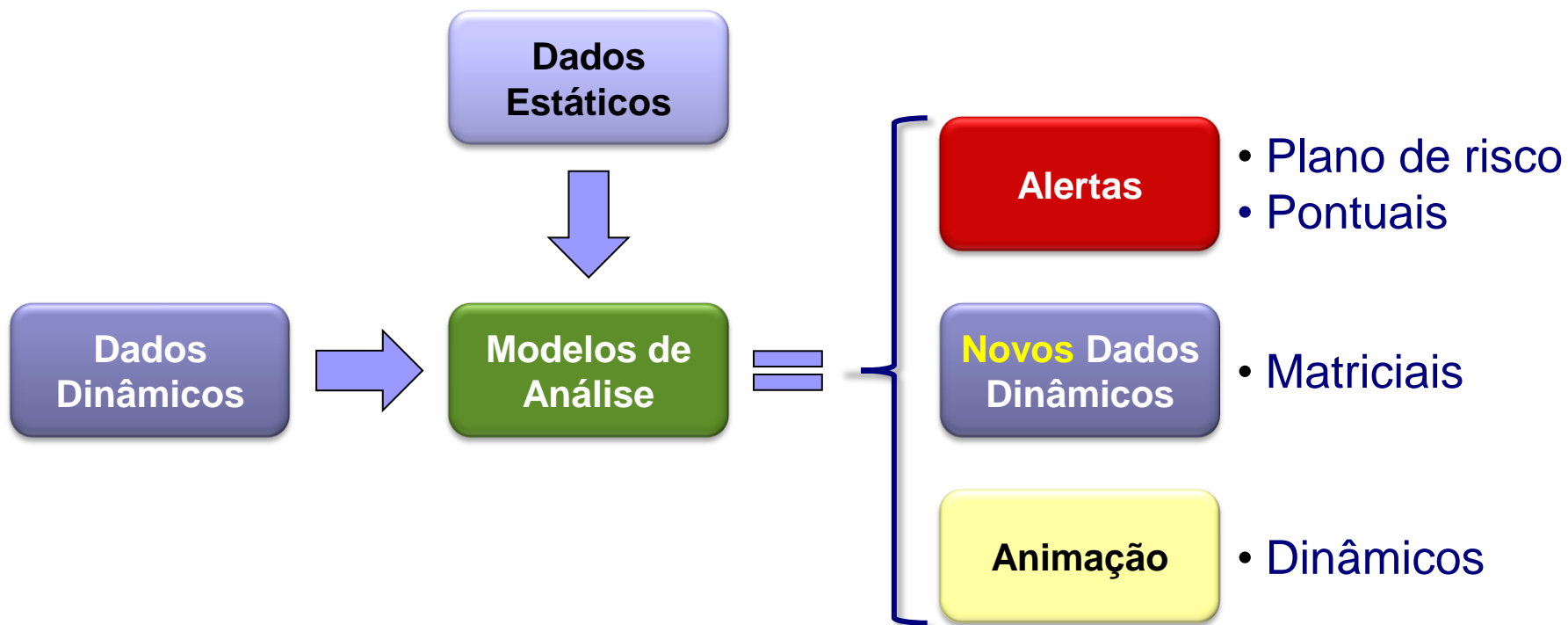


Grids Layers (Background Images)

CBERS-2 CCD, Minas Gerais, Brazil



Modelos de Análise



- Modelo definido **pelelo usuário**

- Lua

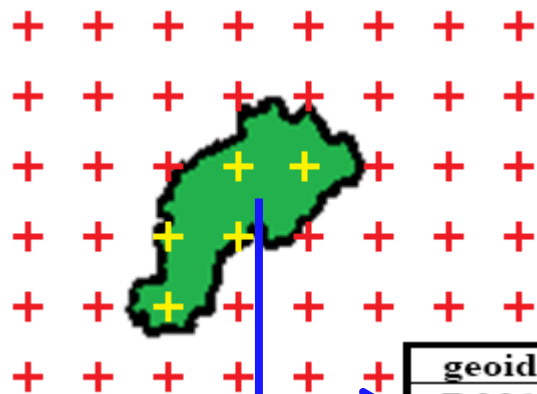


Um modelo simples (com plano de risco)

```

local ca = media_pn('eta5km', 24)
if ca < risco_esc * 0.35 then
  return 0 -- Ok
elseif ca < risco_esc * 1.2 then
  return 2 -- Estado de atenção
else
  return 3 -- Estado de alerta
end

```



geoid	area	resp	tecnica	risco_esc	vuln
R001	195689	Guimarães, M.	fuzzy	80	alta

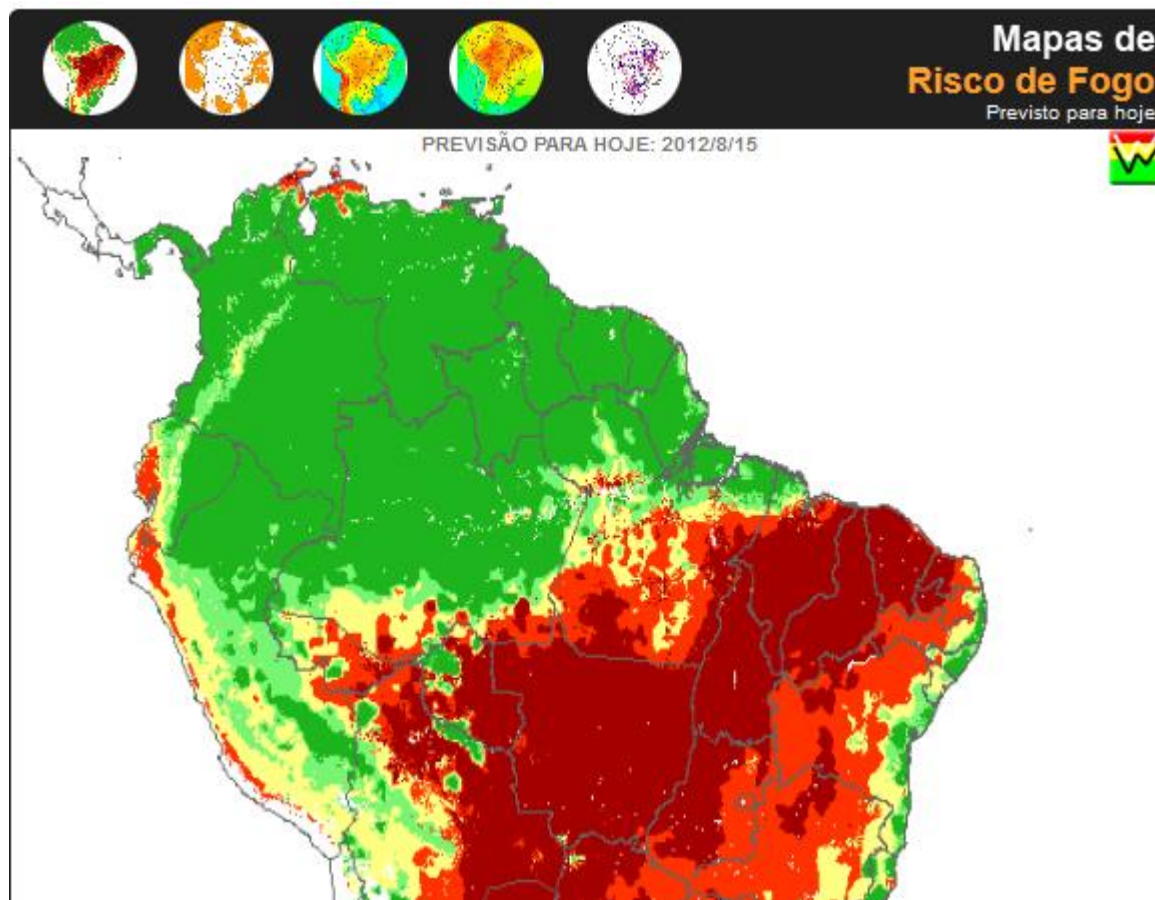
Analysis Model-based on risk layer

- Análise sobre Unidades de Conservação
 - Focos de queimadas por satélite : Modis, Goes, etc



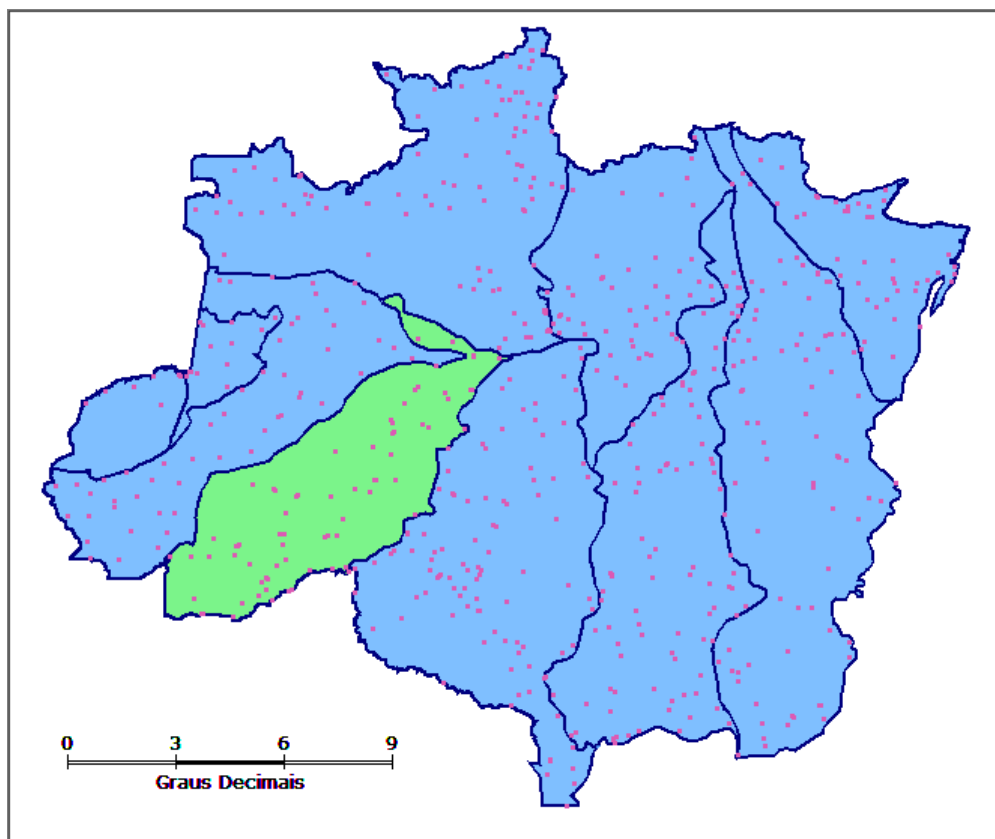
Analysis Model-based on risk layer

- Análise sobre Unidades de Conservação
 - Risco de fogo



Analysis Model-based on risk layer

- Análise sobre Bacias
 - Risco de enchente
 - Pluviometria + Previsão de chuva

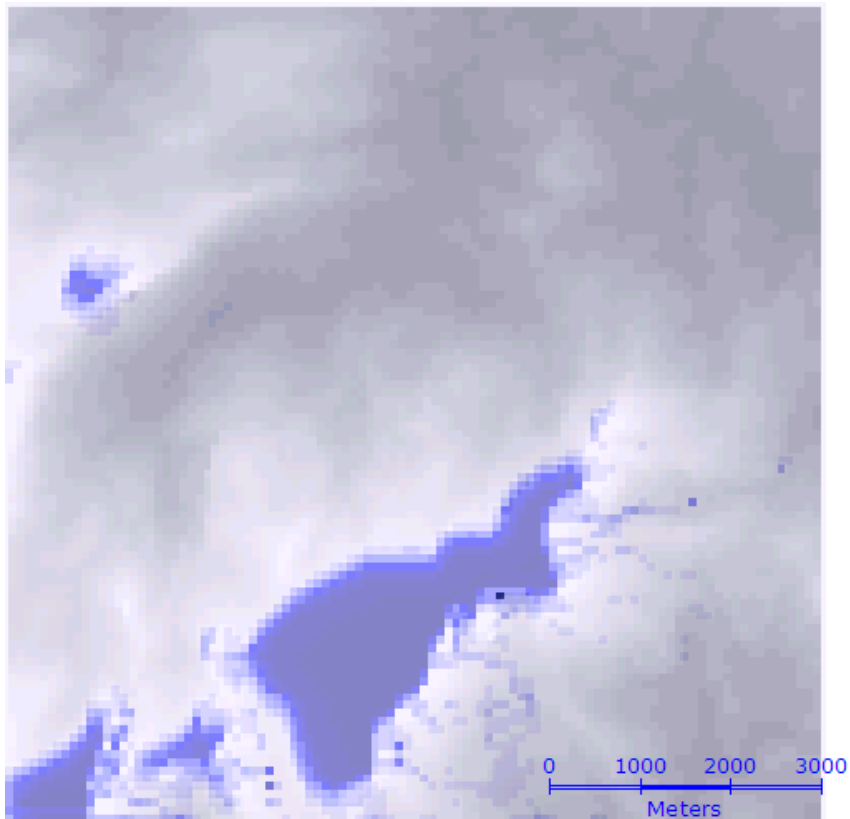


Dynamic Model-based analysis

- Aplicação de modelos com TerraME

Hydrological Models

Fonte: (Carneiro, 2006)



Alertas x Boletins

- Alertas
 - Enviados sempre que a classificação de risco de um polígono / ponto forem alteradas
- Bulletin embedded in PDF format
 - Enviados sempre em um horário pré-estabelecido
 - Agregam informações de diversas análises



Alert Web Application

Animation Dynamic Layer

The screenshot displays the Terra Web Application interface. The main map shows South America with several colored regions: red (Alerta Máximo), orange (Alerta), yellow (Atenção), and blue (Observação). A legend at the bottom identifies these colors. The interface includes a 'Camadas' (Layers) panel on the left with the following structure:

- Mapa de fundo
 - Nenhum
 - OpenLayers
 - Global Imagery
- Alertas
 - Hidro_Medio (warnings)
 - Focos_UC_100m (warnings)
 - Focos_UC (warnings)
- Planos de Risco
- Mapas Adicionais
- Dados de Entrada
 - PLEN_1_hidro_1_20120816070000
 - PLEN_2_FocosMODIS_5_2012081501
 - PLEN_2_dclo_4_20120815064634_5D
 - PLEN_2_eta15umi_2_2012081412000
- Outras Camadas

Callouts identify the following layers: Google Layer, Alert Layer, Adicional Layer, and Dynamic Layer. An inset map shows a weather forecast for South America with a color scale from green to red. The interface also features a toolbar with navigation and tool icons, a 'Sair' button, and a status bar at the bottom right showing coordinates (-70.02979, 6.33789).



Um projeto em parceria...



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SUDAM

SUPERINTENDÊNCIA DO DESENVOLVIMENTO DA AMAZÔNIA



UFPA
Universidade Federal do Pará



UNIVERSIDADE FEDERAL RURAL DA AMAZÔNIA

..... obrigado !

Contato : Eymar Lopes

email : eymar@dpi.inpe.br

tel : 12 3208 - 6500

EQUIPE

*Eymar Silva Sampaio Lopes¹;
Adelaide Maria Pereira Nacif²,
Everaldo Barreiros de Souza³,
Edson José Paulino da Rocha³,
Pedro Guerreiro Martorano⁴ e
Ricardo Pina da Rocha²*

¹Instituto Nacional de Pesquisas Espaciais – INPE

²Superintendência do Desenvolvimento da Amazônia – SUDAM

³Universidade Federal do Pará – UFPA

⁴Universidade Federal Rural da Amazônia – UFRA