

Civil Commercial Imagery Evaluation Workshop



A System for Visualization, Evaluation, Analysis and Quality Simulation of Satellite Images

Antonio Machado e Silva

Marcelo F. Santos

Frederico dos Santos Liporace

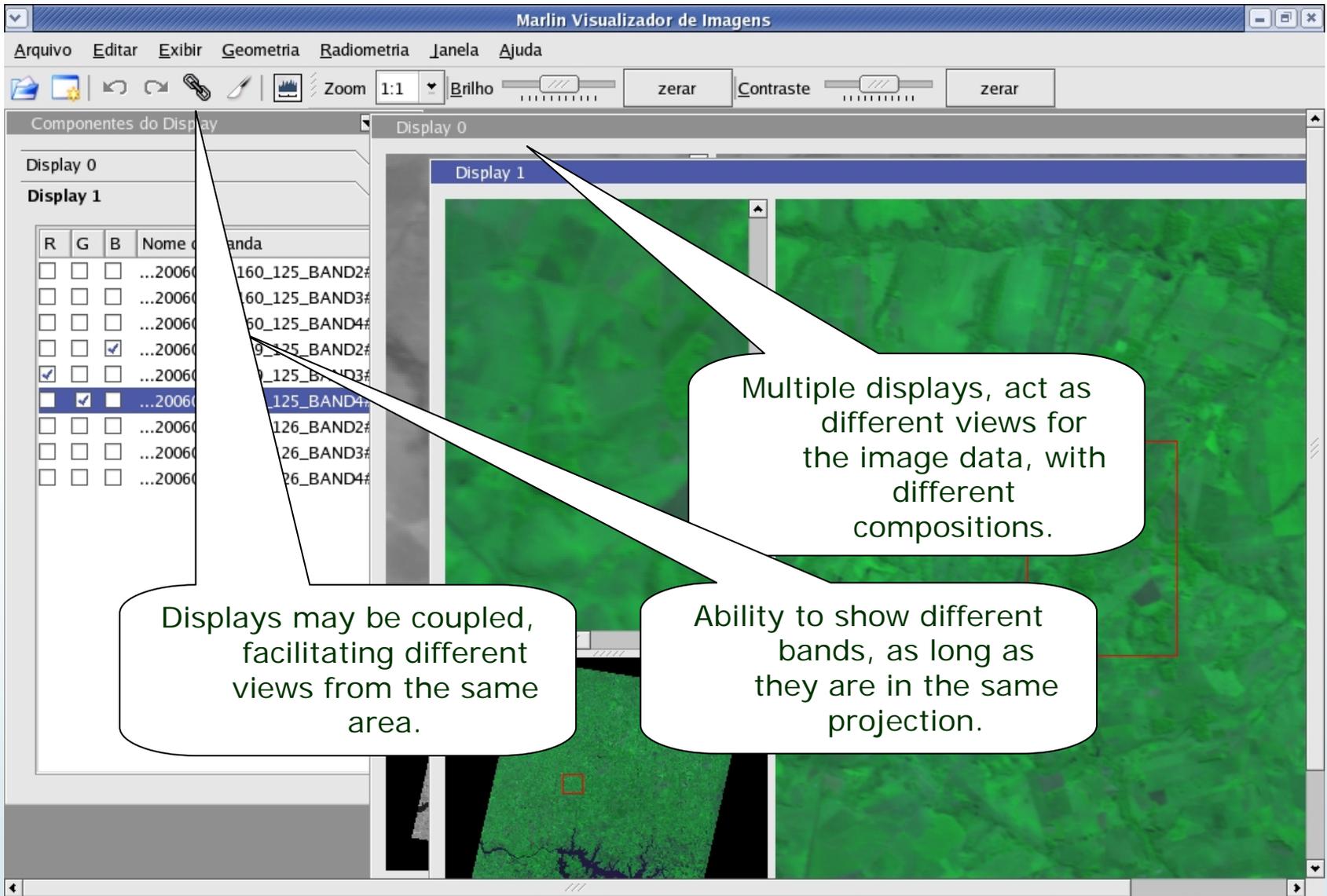
{antonio,marcelo,liporace}@gisplan.com.br

- Marlin
 - Visualization and Evaluation
- Sailfish
 - Analysis and Simulation
- Current work

FSL2

- Implements **Visualization** and part of **Evaluation**
- Requirements by INPE, developed by Gisplan
- Lightweight visualization
 - Started as a simple CBERS visualization tool
 - Works with any georeferenced image
 - Windows and Linux versions
 - English and Portuguese
- Uses INPE's Terralib technology
 - <http://www.terralib.org>
 - GIS classes and functions library, available as open source
- Freeware
 - Available soon from INPE
- Base for advanced applications
 - Sailfish
 - Current work

- Visualization
 - Multiple displays
 - Simple mosaics
 - Display coupling
 - Histogram manipulation
 - Contrast, brightness adjustment
 - Filters
- Evaluation
 - Radiometric
 - Inter band registration
 - Band autocorrelation
 - Geometric



Marlin Visualizador de Imagens

Arquivo Editar Exibir Geometria Radiometria Janela Ajuda

Zoom 1:1 Brilho zerar Contraste zerar

Componentes do Display

Display 0

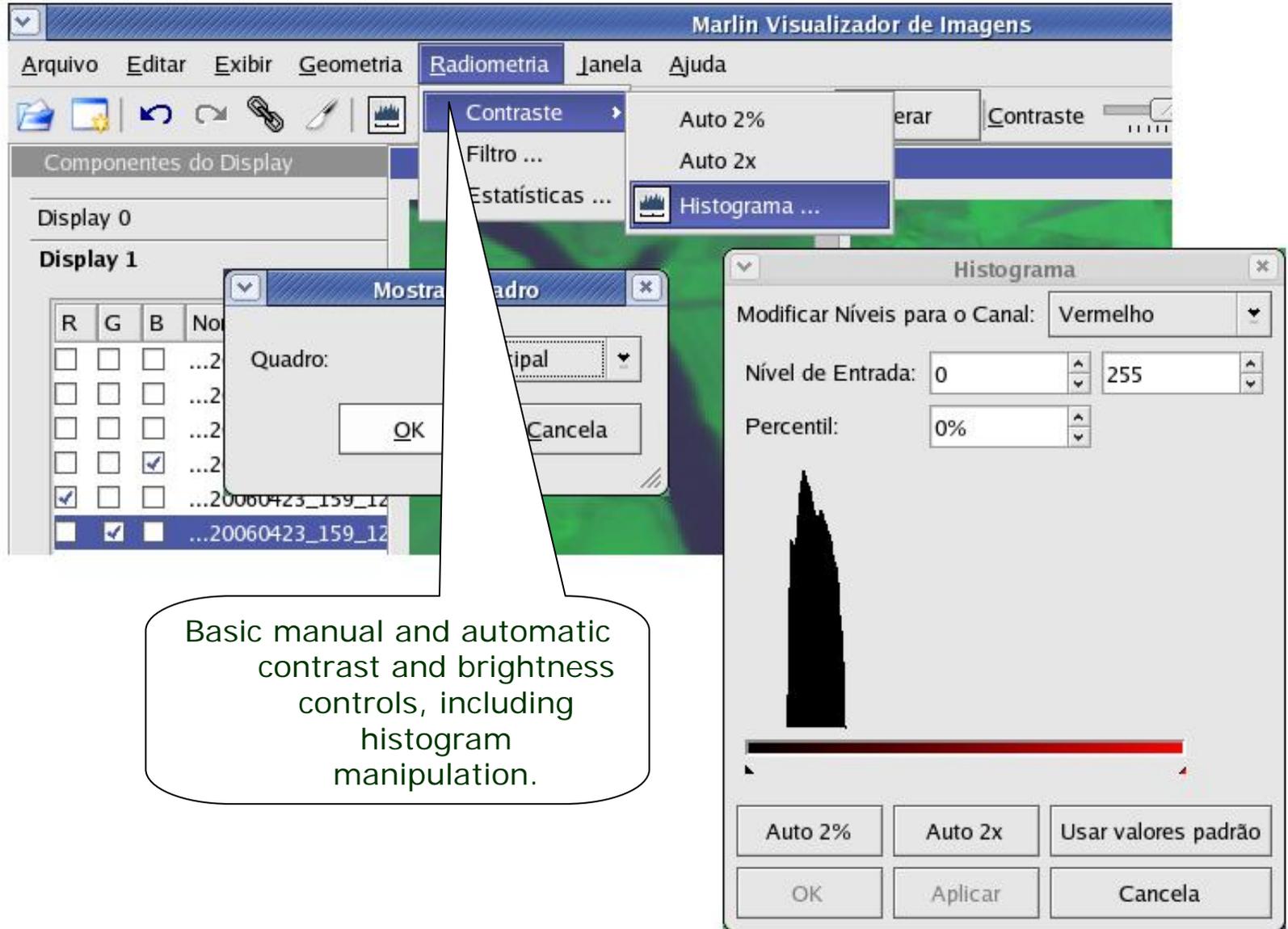
Display 1

R	G	B	Nome	Banda
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	...20060	160_125_BAND2#
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	...20060	160_125_BAND3#
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	...20060	160_125_BAND4#
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	...20060	19_125_BAND2#
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	...20060	19_125_BAND3#
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	...20060	125_BAND4#
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	...20060	126_BAND2#
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	...20060	126_BAND3#
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	...20060	126_BAND4#

Multiple displays, act as different views for the image data, with different compositions.

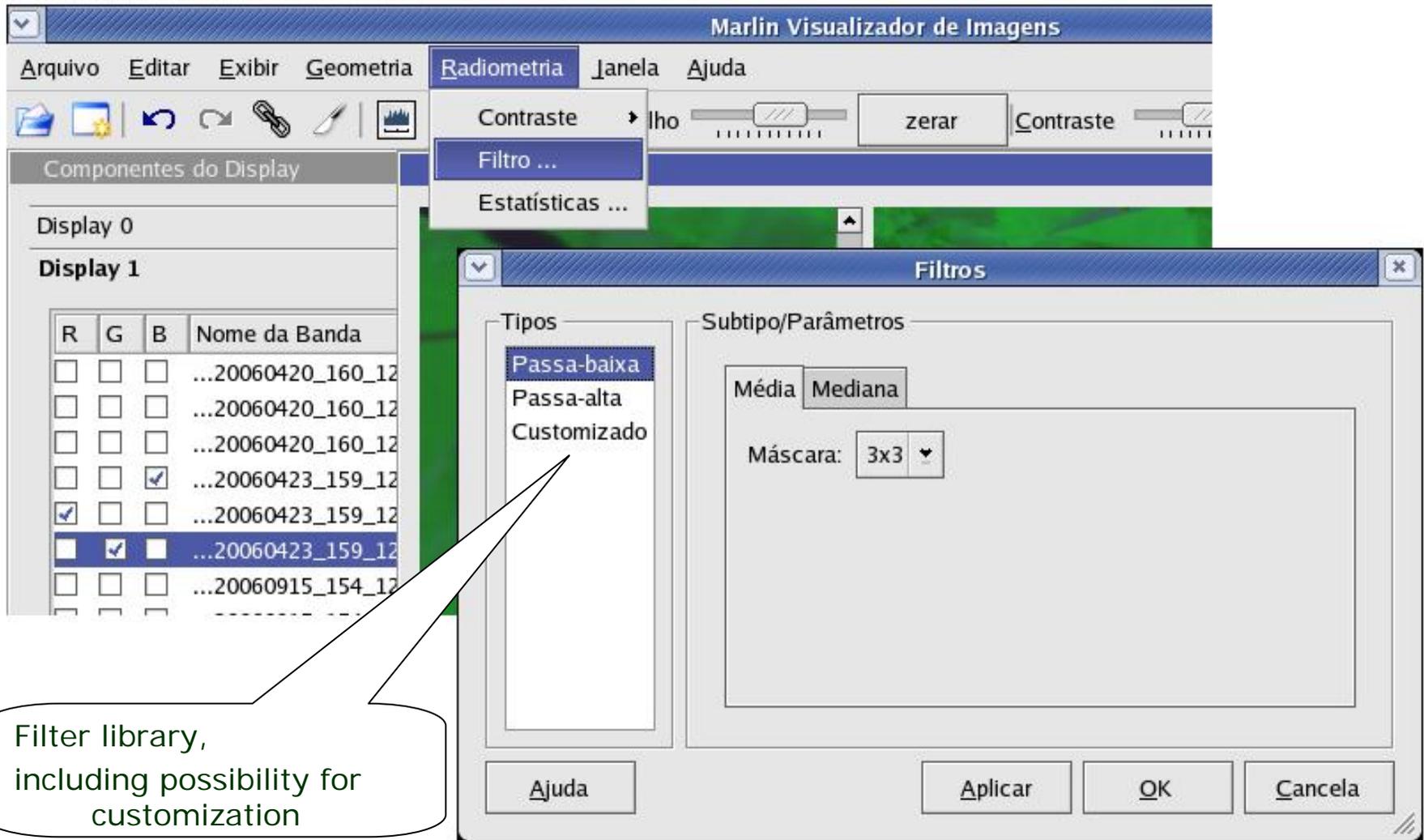
Displays may be coupled, facilitating different views from the same area.

Ability to show different bands, as long as they are in the same projection.



The screenshot displays the 'Marlin Visualizador de Imagens' application. The 'Radiometria' menu is open, showing options for 'Contraste', 'Filtro ...', and 'Estatísticas ...'. The 'Contraste' submenu is also open, showing 'Auto 2%', 'Auto 2x', and 'Histograma ...'. A 'Mostrar Quadro' dialog box is visible in the foreground. The 'Histograma' dialog box is also open, showing 'Modificar Níveis para o Canal: Vermelho', 'Nível de Entrada: 0' and '255', and 'Percentil: 0%'. The histogram shows a distribution of pixel values for the red channel. A red horizontal bar is visible at the bottom of the histogram dialog.

Basic manual and automatic contrast and brightness controls, including histogram manipulation.



The screenshot shows the 'Marlin Visualizador de Imagens' application. The 'Radiometria' menu is open, showing options: 'Contraste', 'Filtro ...', and 'Estatísticas ...'. The 'Filtros' dialog box is open, displaying a list of filter types and parameters.

Componentes do Display

Display 0

Display 1

R	G	B	Nome da Banda
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	...20060420_160_12
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	...20060420_160_12
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	...20060420_160_12
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	...20060423_159_12
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	...20060423_159_12
<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	...20060423_159_12
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	...20060915_154_12

Filtros

Tipos

- Passa-baixa
- Passa-alta
- Customizado

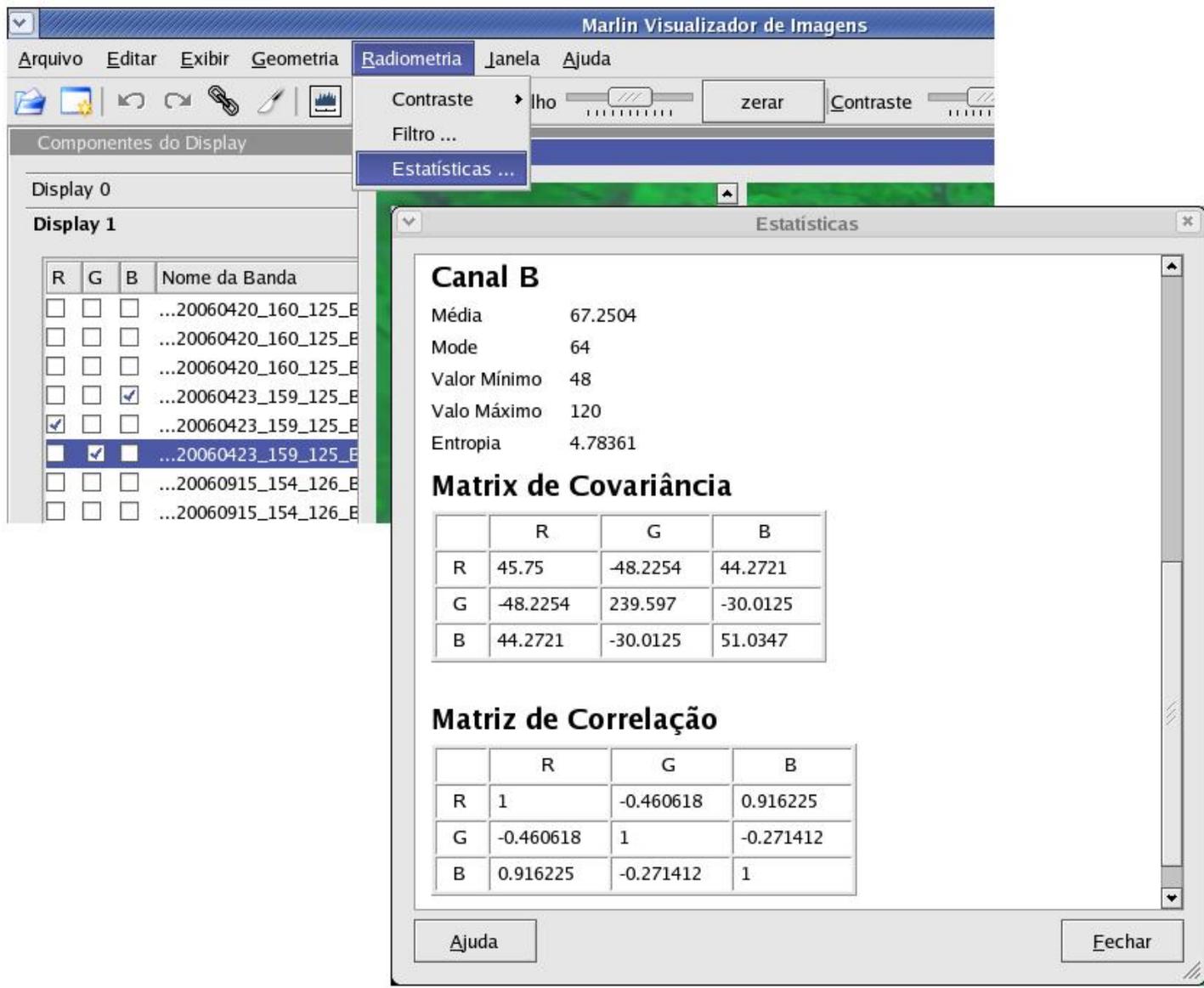
Subtipo/Parâmetros

Média Mediana

Máscara: 3x3

Ajuda Aplicar OK Cancela

Filter library,
including possibility for
customization



The screenshot shows the 'Marlin Visualizador de Imagens' application. The 'Radiometria' menu is open, showing options for 'Contraste', 'Filtro ...', and 'Estatísticas ...'. The 'Estatísticas' dialog box is displayed, showing the following data for 'Canal B':

Canal B

Média 67.2504
 Mode 64
 Valor Mínimo 48
 Valo Máximo 120
 Entropia 4.78361

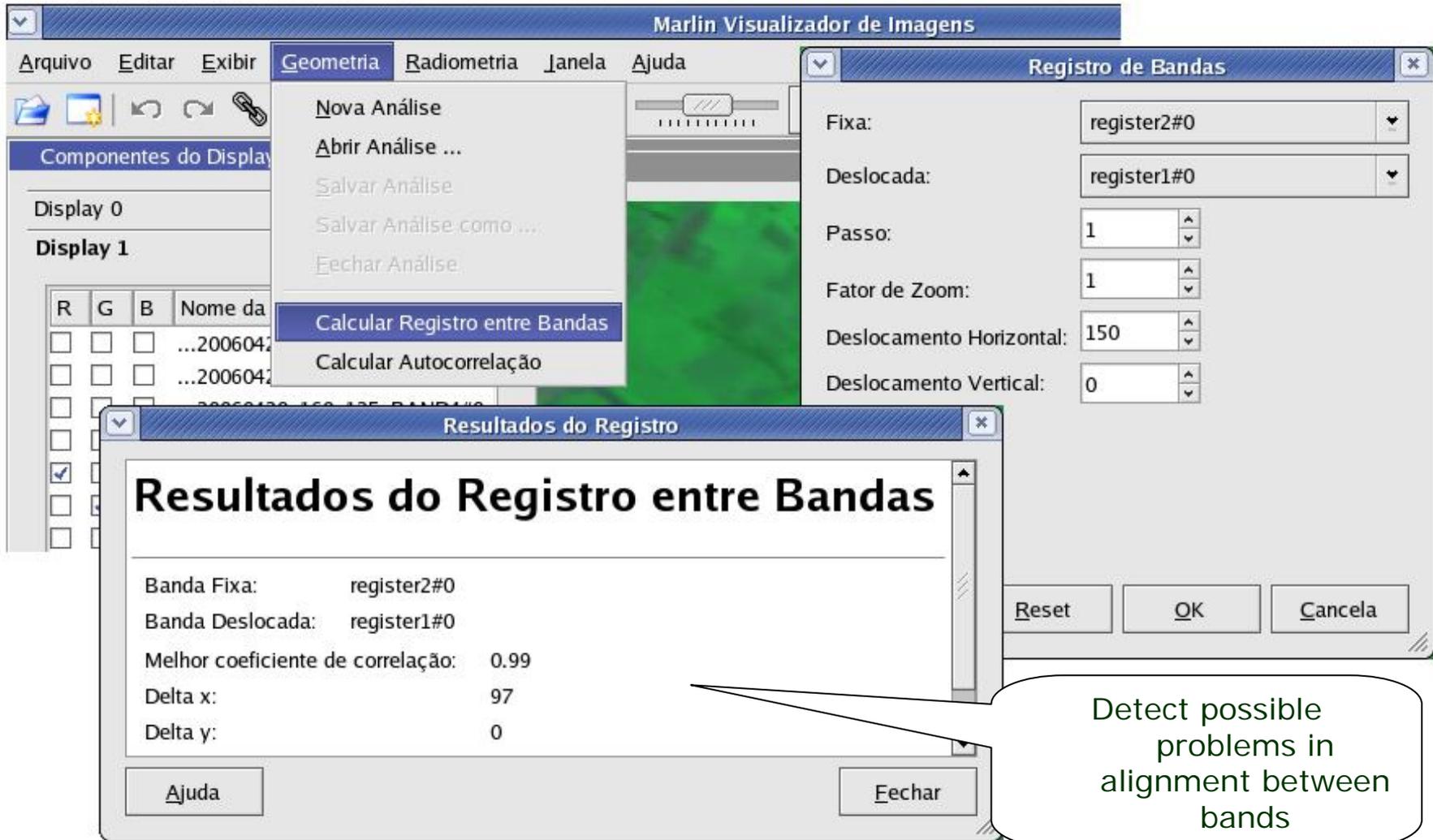
Matrix de Covariância

	R	G	B
R	45.75	-48.2254	44.2721
G	-48.2254	239.597	-30.0125
B	44.2721	-30.0125	51.0347

Matrix de Correlação

	R	G	B
R	1	-0.460618	0.916225
G	-0.460618	1	-0.271412
B	0.916225	-0.271412	1

The dialog box also includes 'Ajuda' and 'Fechar' buttons.



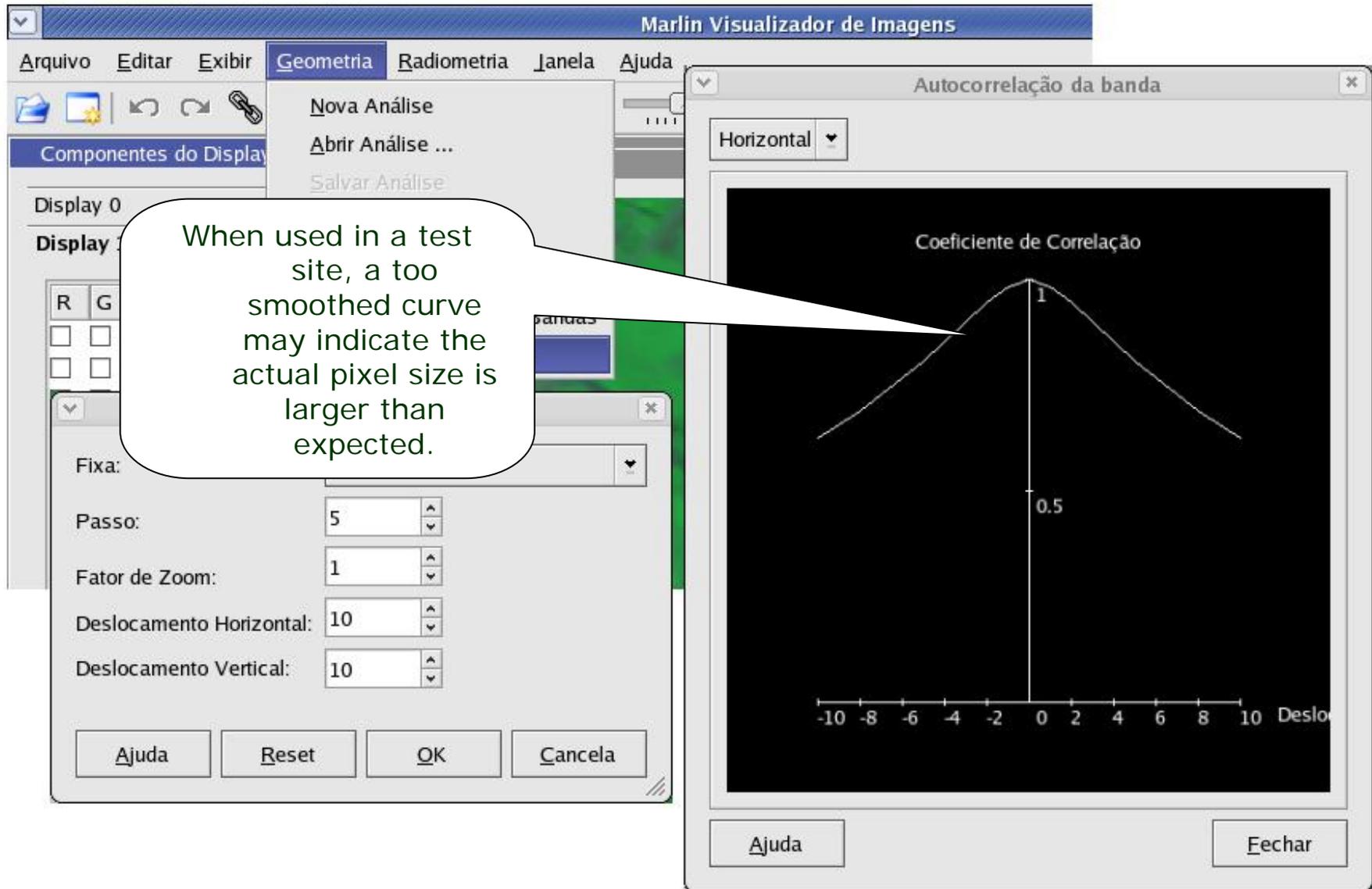
The screenshot shows the Marlin Visualizador de Imagens software interface. The 'Geometria' menu is open, highlighting 'Calcular Registro entre Bandas'. The 'Registro de Bandas' dialog box is active, showing the following settings:

- Fixa: register2#0
- Deslocada: register1#0
- Passo: 1
- Fator de Zoom: 1
- Deslocamento Horizontal: 150
- Deslocamento Vertical: 0

The 'Resultados do Registro' window displays the following results:

Banda Fixa:	register2#0
Banda Deslocada:	register1#0
Melhor coeficiente de correlação:	0.99
Delta x:	97
Delta y:	0

A callout bubble points to the 'Delta x' value of 97, containing the text: "Detect possible problems in alignment between bands".



The image shows a screenshot of the Marlin Visualizador de Imagens software interface. The main window has a menu bar with options: Arquivo, Editar, Exibir, Geometria, Radiometria, Janela, and Ajuda. Below the menu is a toolbar with icons for file operations and display management. A settings panel is visible in the foreground, containing the following fields:

- Fixa: [dropdown]
- Passo: 5
- Fator de Zoom: 1
- Deslocamento Horizontal: 10
- Deslocamento Vertical: 10

Buttons at the bottom of the settings panel are Ajuda, Reset, OK, and Cancela.

Overlaid on the right is the 'Autocorrelação da banda' dialog box. It features a dropdown menu set to 'Horizontal'. The main area displays a graph titled 'Coeficiente de Correlação' with a bell-shaped curve. The y-axis is labeled 'Coeficiente de Correlação' and has a peak at 1 and a tick at 0.5. The x-axis is labeled 'Deslo' and ranges from -10 to 10 with tick marks every 2 units. A callout bubble points to the curve with the text: 'When used in a test site, a too smoothed curve may indicate the actual pixel size is larger than expected.'

Buttons at the bottom of the dialog box are Ajuda and Fechar.

Marlin Visualizador de Imagens

Arquivo Editar Exibir Geometria Radiometria Janela Ajuda

Zoom 2:1 Brilho zerar Contraste zerar

Pontos de Controle							
	Trabalho E	Trabalho N	Referência E	Referência N	Nome Referên	Controle	Verificação
1	698559.3481	7477209.8037	698842.3125	7477209.6251	Display 1	<input checked="" type="checkbox"/>	<input type="checkbox"/>
2	619092.5000	7490795.0000	619407.8750	7490811.2501	Display 1	<input checked="" type="checkbox"/>	<input type="checkbox"/>
3	639345.0000	7485940.0000	639610.1875	7485938.6251	Display 1	<input type="checkbox"/>	<input checked="" type="checkbox"/>
4	718770.7465	7569498.5968	719063.5625	7569503.5001	Display 1	<input checked="" type="checkbox"/>	<input type="checkbox"/>
5	651793.0514	7535938.9991	652069.4889	7535945.1241	Display 1	<input checked="" type="checkbox"/>	<input type="checkbox"/>
6	679877.5000	7475400.0000	680149.2834	7475340.7			
7	678222.5000	7505050.0000	678510.5334	7505066.2			
8	670275.0000	7489336.6667	670539.6667	7489377.6			
9	686010.0000	7552660.0001	686236.2708	7552629.5			

Fontes de pontos de controle

Display de Trabalho: Display 0

Imagem de Referência: Display 1

Ajuda Muda Referência Adm

OK Cancela

Display 1 #Bloqueado (Referê

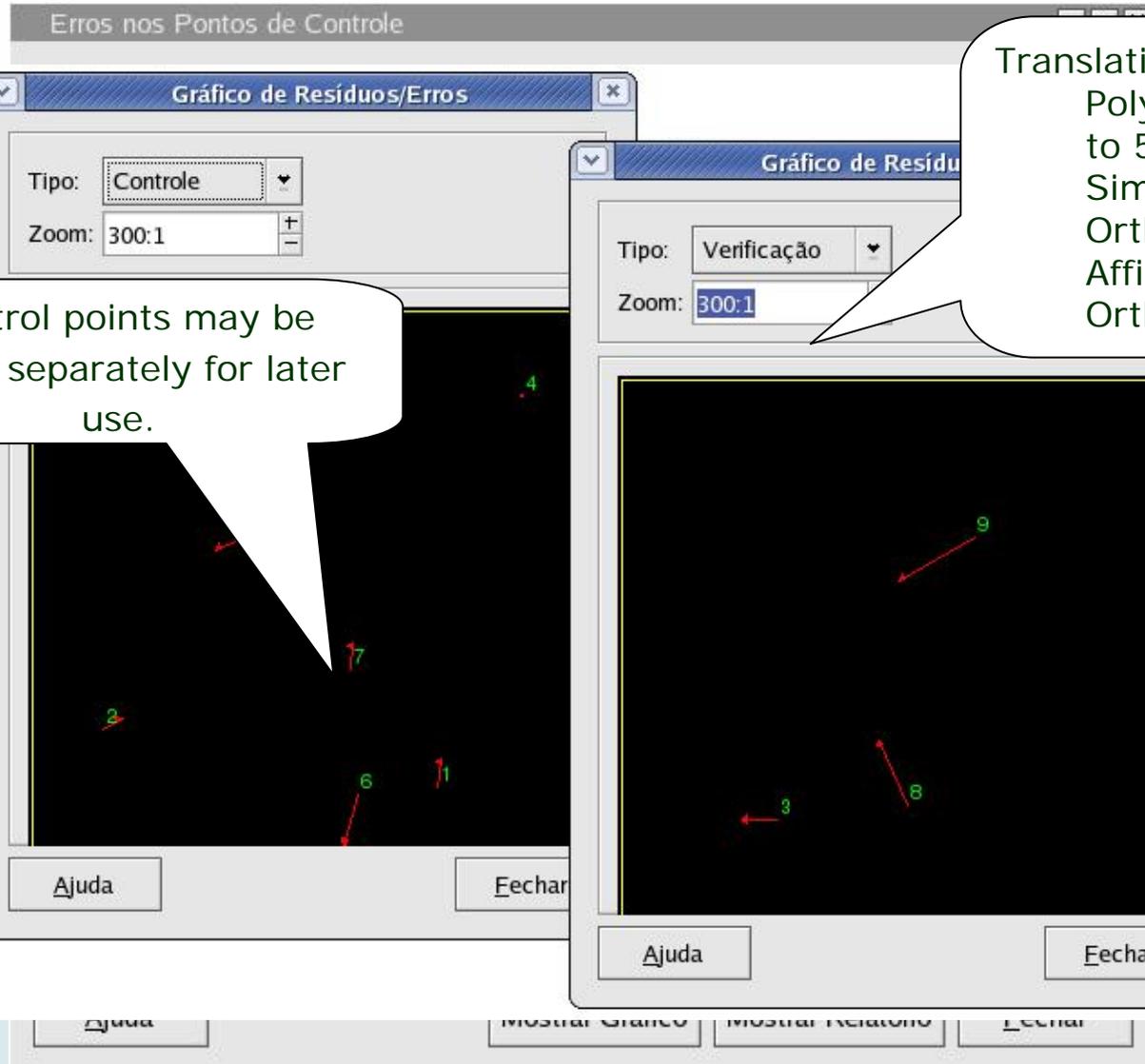
4180.58, y:1885.00 long: -43.19442

714.61 lo

Control points may be obtained directly from displays, and classified as Control and/or Validation.

Reference system may be changed from Projection to Satellite. Make it easier to interpret the error source:

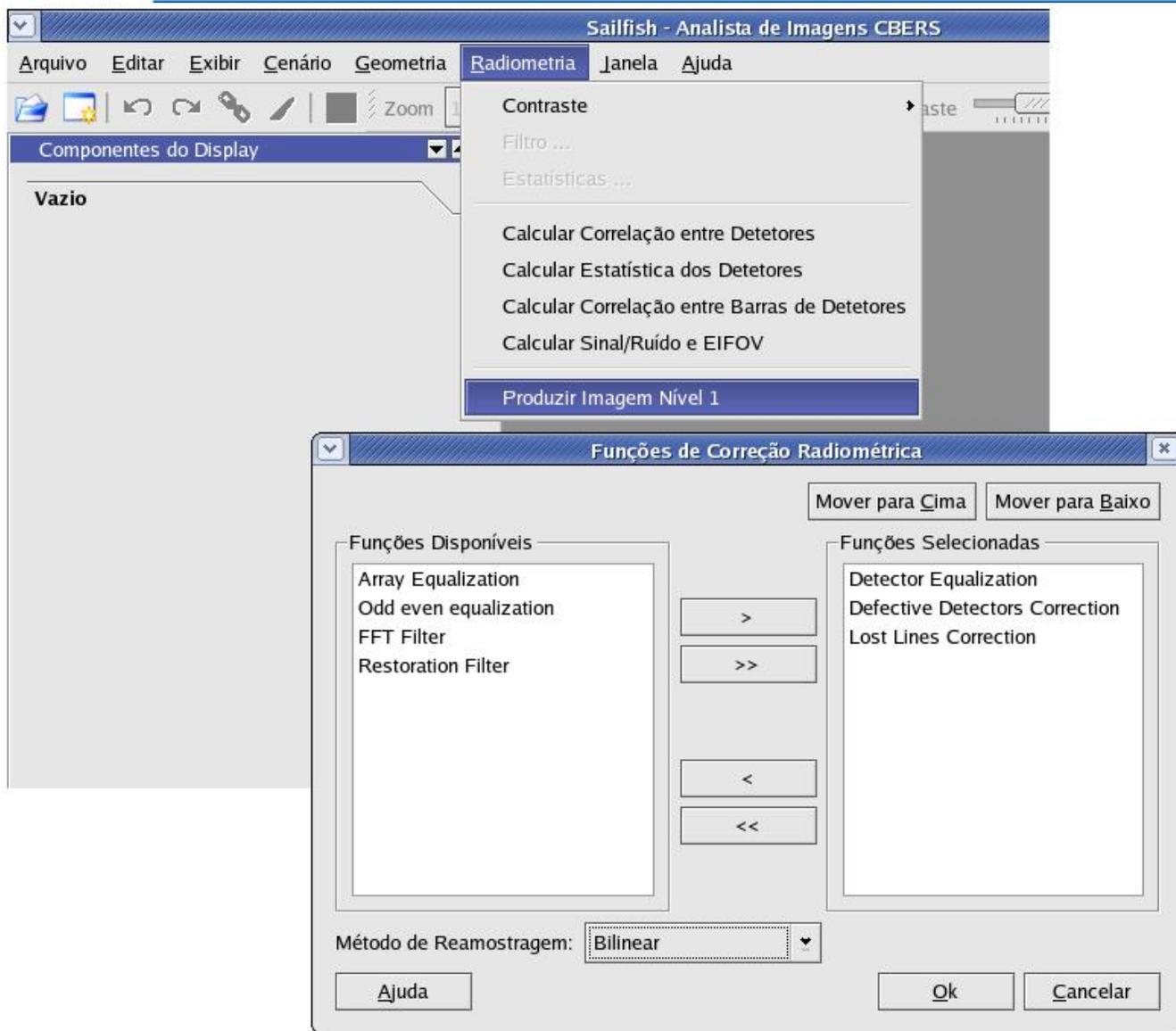
- Along track, time or pitch
- Cross track, yaw



Control points may be saved separately for later use.

Translation, Affine, Polynomial (up to 5th order), Similarity, Orthogonal, Affine Orthogonal

- Requirements by INPE, developed by Gisplan
- Advanced analysis for CBERS 1,2
 - CCD, IRMSS and WFI
- Extends Marlin functionality
 - Scenario: possible modification of radiometric and geometric parameters used during scene generation
- Integrated with the ground station processing system
 - Basic data is level 0 image
 - Up to level 4 images (ortho) may be generated with the adjusted parameters
 - Linux only





Correlação entre Barras de Detetores (CCD)

Banda 4

Barra	Início	Fim
1	1943	1983
2	57	97

Correlação 0.9715

Banda 2

Barra	Início	Fim
2	1943	1983
3	57	97

Correlação 0.9881

Componentes do Display

Display 2

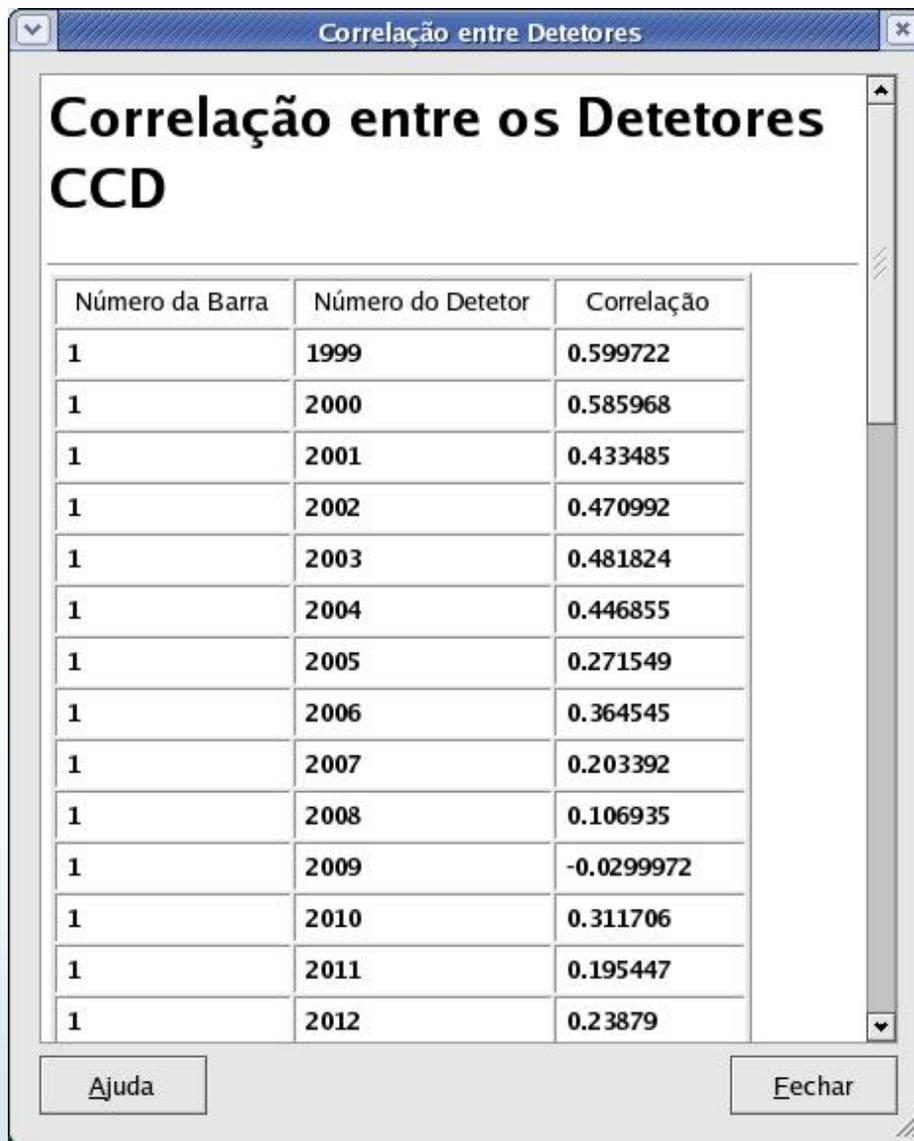
R	G	B	Nome da B
<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	...40710_15
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	...40710_15
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	...40710_15
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	...
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	...
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	...

Barra1-Barra2: A1 1943 1983 A2 57 97

Barra2-Barra3: A2 1943 1983 A3 57 97

Banda: 4

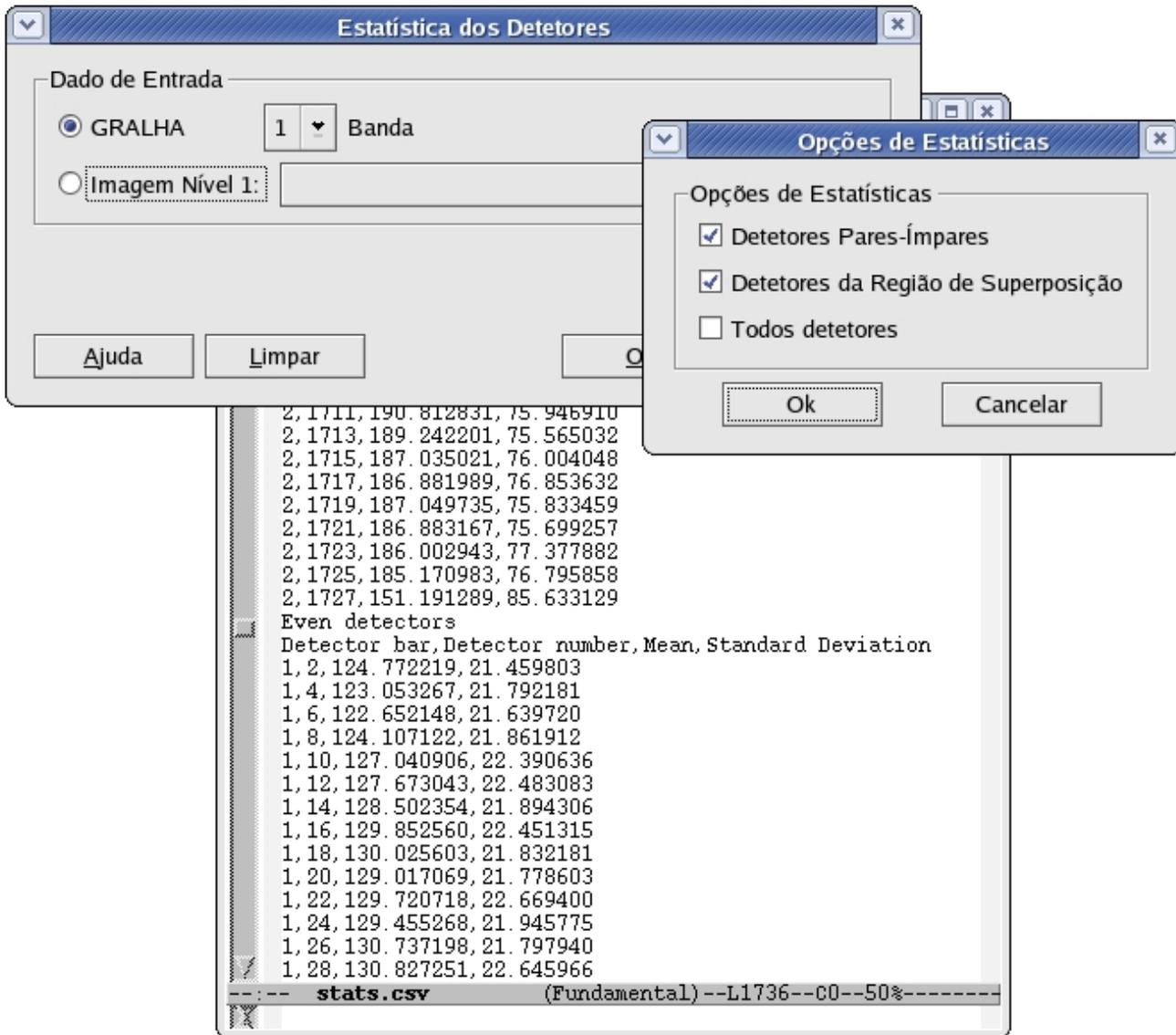
Ajuda **Reiniciar** **Ok** **Cancelar**



**Correlação entre os Detetores
CCD**

Número da Barra	Número do Detetor	Correlação
1	1999	0.599722
1	2000	0.585968
1	2001	0.433485
1	2002	0.470992
1	2003	0.481824
1	2004	0.446855
1	2005	0.271549
1	2006	0.364545
1	2007	0.203392
1	2008	0.106935
1	2009	-0.0299972
1	2010	0.311706
1	2011	0.195447
1	2012	0.23879

Ajuda Fechar



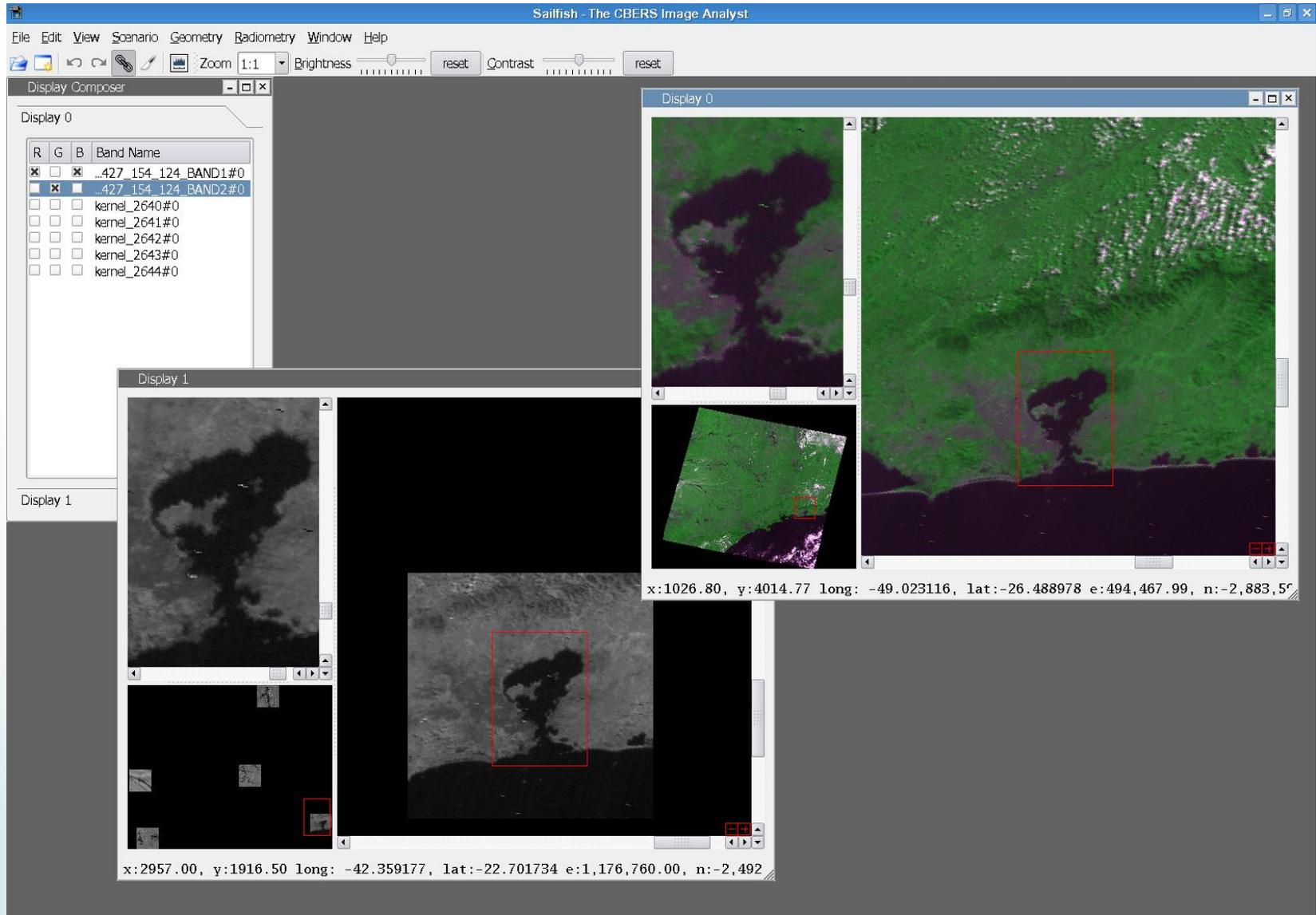
The screenshot shows two overlapping dialog boxes from the Sailfish software. The background dialog, titled "Estadística dos Detetores", has a "Dado de Entrada" section with two radio buttons: "GRALHA" (selected) and "Imagem Nível 1:". The "GRALHA" option has a dropdown menu showing "1" and the label "Banda". Below this are "Ajuda" and "Limpar" buttons. The foreground dialog, titled "Opções de Estatísticas", contains three checkboxes: "Detetores Pares-Ímpares" (checked), "Detetores da Região de Superposição" (checked), and "Todos detetores" (unchecked). It has "Ok" and "Cancelar" buttons at the bottom.

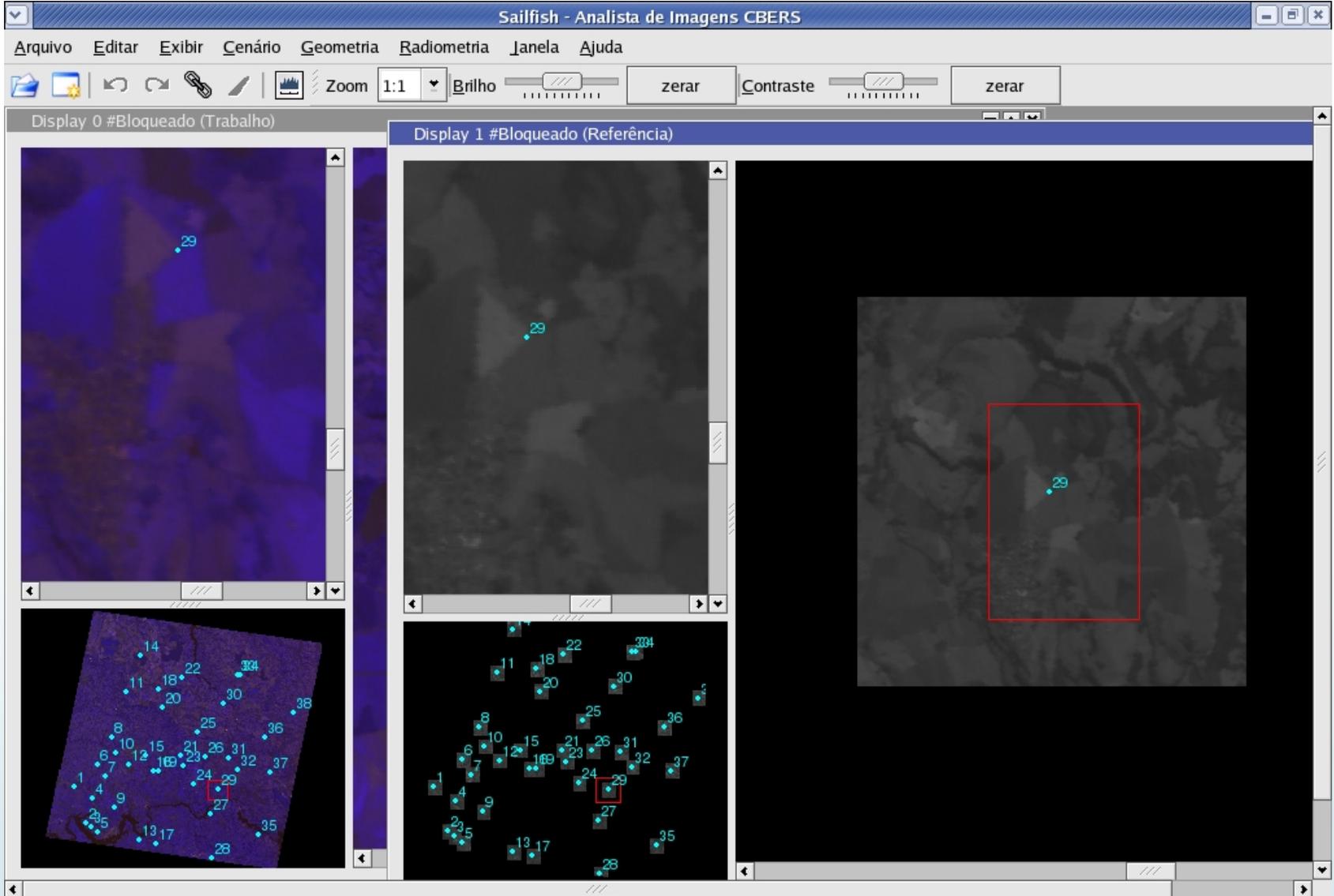
The main window displays a list of detector coordinates and statistics:

```

2, 1711, 190. 812831, 75. 946910
2, 1713, 189. 242201, 75. 565032
2, 1715, 187. 035021, 76. 004048
2, 1717, 186. 881989, 76. 853632
2, 1719, 187. 049735, 75. 833459
2, 1721, 186. 883167, 75. 699257
2, 1723, 186. 002943, 77. 377882
2, 1725, 185. 170983, 76. 795858
2, 1727, 151. 191289, 85. 633129
Even detectors
Detector bar, Detector number, Mean, Standard Deviation
1, 2, 124. 772219, 21. 459803
1, 4, 123. 053267, 21. 792181
1, 6, 122. 652148, 21. 639720
1, 8, 124. 107122, 21. 861912
1, 10, 127. 040906, 22. 390636
1, 12, 127. 673043, 22. 483083
1, 14, 128. 502354, 21. 894306
1, 16, 129. 852560, 22. 451315
1, 18, 130. 025603, 21. 832181
1, 20, 129. 017069, 21. 778603
1, 22, 129. 720718, 22. 669400
1, 24, 129. 455268, 21. 945775
1, 26, 130. 737198, 21. 797940
1, 28, 130. 827251, 22. 645966
  
```

At the bottom of the window, a status bar shows: `stats.csv (Fundamental) --L1736--C0--50%-----`





- Extension to support CBERS 2B
 - High Resolution Camera, HRC
- GRDB extensions
 - statistics on which kernels were used more often, and the error during the matching
- Marlin demonstration available

