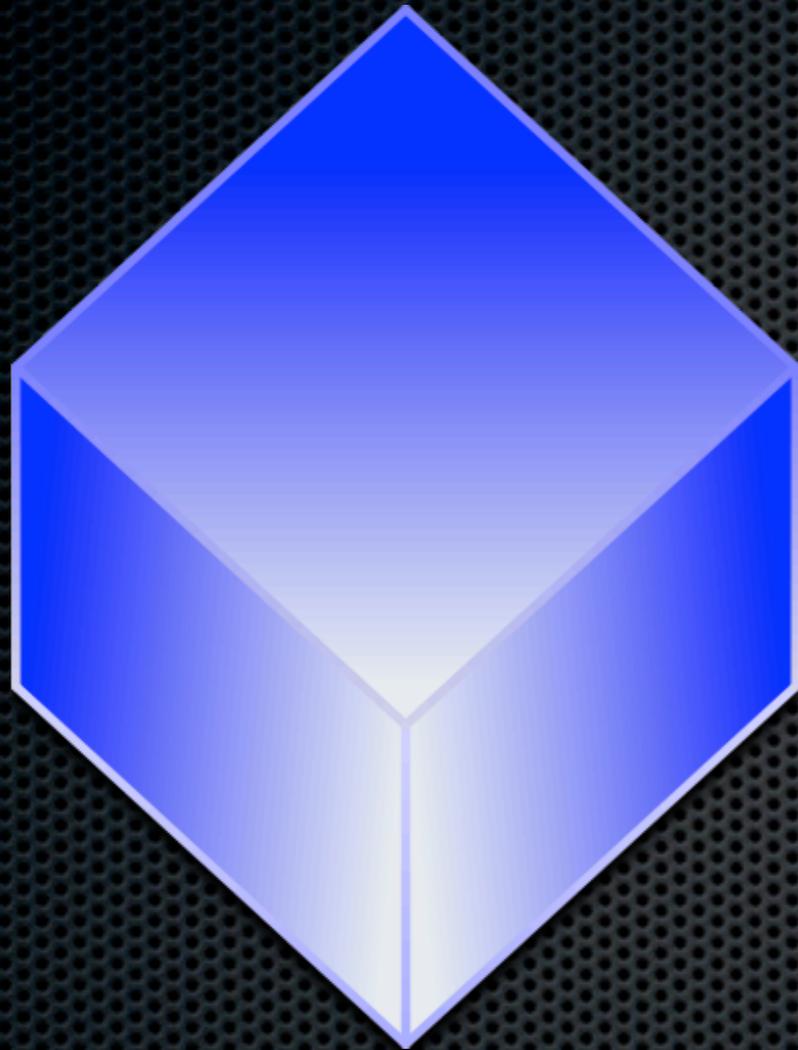


les rencontres du ciel et de l'espace

1-2-3 Novembre 2012



PixInsight

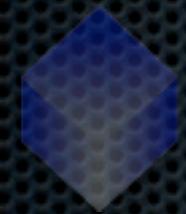
Philippe Bernhard

PixInsight : Qu'es aquò ?

Réponse rapide :

un logiciel de traitement d'images du ciel profond (et aussi planétaire)

Mais ce n'est pas que ça !



Historique

- Créé par Juan Conejero (Espagne), programmeur professionnel et astrophotographe.
- Prédécesseur: SGBNR (réduction de bruit) en 2001.
- Le projet PixInsight a démarré en 2003.
- PixInsight LE (freeware limited edition) a été réalisé en 2004/2005.
- PixInsight Standard (Edition commerciale, architecture modulaire) a démarré en 2008 et toujours en évolution constante.

Pourquoi PixInsight ?

- Logiciel de traitement puissant
- Algorithmes mathématiques innovants et optimisés
- Contrôle total de tous les processus
- Environnement graphique évolué
- Plateforme de traitement d'image réalisé par des astrophotographes pour des astrophotographes

Inside PixInsight ?

- Architecture modulaire et ouverte
- Développement : PixInsight Class Library
- Portabilité multi OS
- Données 8, 16, 32, 64 bits
- Interface graphique avec visu temps réel
- Gestion multi-processeur et RAM
- Gestion des profils de couleur ICC
- Scripts (Javascript), command line, PCL C++

Portabilité multi OS

- Microsoft Windows XP/Vista/7 : 32 et 64 bits
- Mac OS X 10.6/10.7/10.8 : 32 et 64 bits
- Linux 32 et 64 bits
- Core application based on PCL and Trolltech's Qt framework
- PCL : librairie indépendante de l'OS et du hardware
- Parallel processing : gestion avancée des processeurs multi-coeurs et hyperthreading

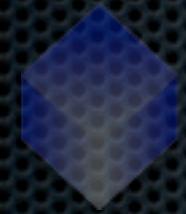
Dynamique réelle de 64 bits

- Unsigned Integers : 8-bit, 16-bit, 32-bit
- IEEE 754 Floating Point : 32-bit et 64-bit
- PCL support for complex-valued floating-point images
- Tous les processus peuvent travailler avec tous les types de données sans aucune distinction

12bit =	4 196
14bit =	16 384
16bit =	65 536
32bit =	4 294 967 296
64bit =	18 446 744 073 709 551 616

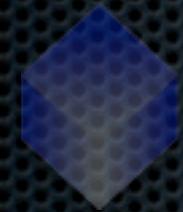
Formats d'images supportés

- FITS : 8, 16, 32, 64 bits
- TIF : 8, 16, 32, 64 bits
- APN (RAW : librairie DC-RAW)
- formats graphiques 8 bits (BMP, JPEG, PNG, GIF,...)



Principe mathématique

- **Traitement multi-échelle (multi-résolution)**
 - Décomposition du signal de départ en séparant à chaque niveau de résolution les basses fréquences (approximation) et les hautes fréquences (détails) du signal.
- **Traitement par ondelettes (algorithme à trous)**
- **Transformée de Fourier**
- **Déconvolution**
- **Masques**
- **Opérations linéaires (mathématiques)**



Principe mathématique

- Alignement stellaire précis (jusqu'à 20% meilleur que les autres logiciels dédiés)
- Empilement optimisé selon différents algorithmes
- Algorithmes évolués de composition de mosaïques
- Fonction magique : HDR Multiscale Transform

Principe mathématique

- Outils paramétrables (répétables pour plusieurs images)
- Outils dynamiques (uniques à l'image sélectionnée)

Gestion des couleurs

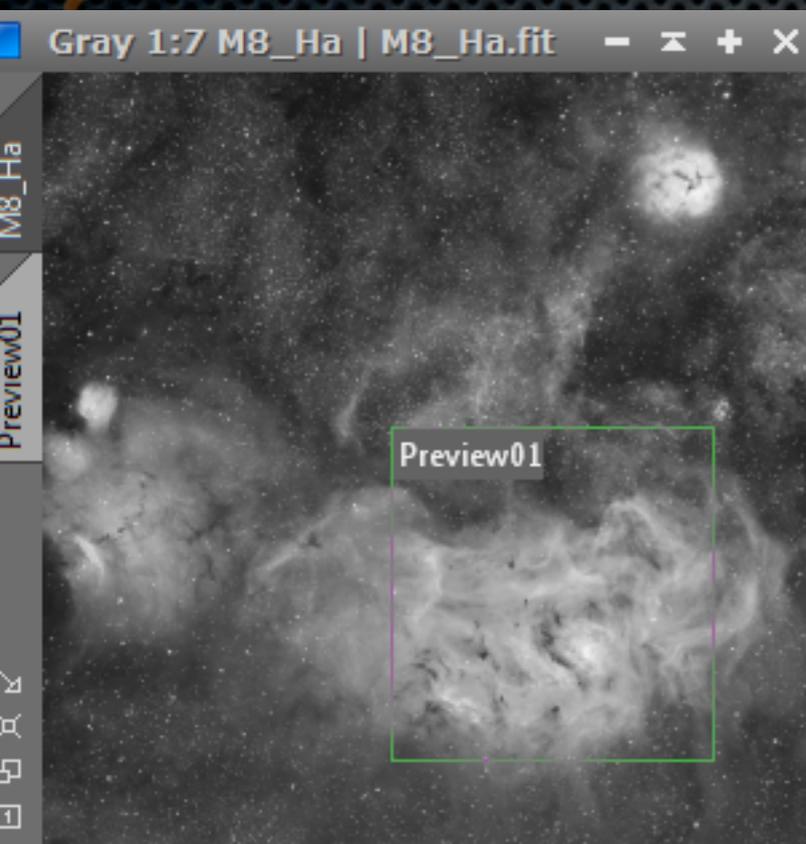
● Affichage

● Profils colorimétriques

	RGB
	Red
	Green
	Blue
	Lightness (CIE L*)
	CIE a*=R b*=G
	CIE L*=0.5
	CIE a*
	CIE b*
	CIE c*
	CIE h*
	CIE X
	Luminance (CIE Y)
	CIE Z
	Hue
	HSV Saturation
	HSI Saturation
	HSV Value
	HSI Intensity

Sauvegarde des Process

- Process Icons
- Historique d'un traitement : icône
- Projets (incluant historique de chaque image)

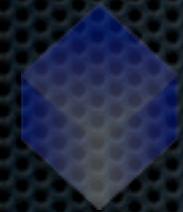


	#	Proc Id	Mask
✓	0	<Root>	
✓	1	HistogramTransformation	
✓	2	HDRMultiscaleTransform	
✓	3	CurvesTransformation	
✓	4	MultiscaleMedianTransform	M8_Ha_clone
✓	5	ProcessContainer	
✓	5.1	HistogramTransformation	Mask <*broke
✓	6	CurvesTransformation	M8_Ha_clone
✓	7	ACDNR	~M8_Ha_clor
✓	8	CurvesTransformation	

```
/*  
 * Start time: 2012/09/21 06:32:56  
 * Execution time: 66.519 s  
 */  
var P = new HDRMultiscaleTransform;  
P.numberOfLayers = 8;  
P.numberOfIterations = 2;  
P.invertedIterations = false;  
P.overdrive = 0.000;  
P.medianTransform = true;  
P.scalingFunctionData = [  
  0.003906,0.015625,0.023438,0.015  
  0.015625,0.0625,0.09375,0.0625,0  
  0.023438,0.09375,0.140625,0.0937  
  0.015625,0.0625,0.00375,0.0625,0
```

Ce qu'on n'y trouvera pas

- Fonctions artistiques
- Outils «clone» évolués
- Retouches locales
- Et plusieurs petites choses pourtant bien utiles...



L'interface

L'interface...

Process

The screenshot shows the PixInsight interface. On the left is the 'Process Explorer' with a list of processing tools. The 'HistogramTransformation' tool is selected. The main window displays the 'HistogramTransformation' reference documentation, including a table of contents and an introduction.

Process Explorer

- ATrousWaveletTransform
- BackgroundNeutralization
- ColorCalibration
- CurvesTransformation
- Deconvolution
- DynamicBackgroundExtraction
- DynamicCrop
- FastRotation
- HDRMultiscaleTransform
- HistogramTransformation**
- MorphologicalTransformation
- MultiscaleMedianTransform
- PixelMath
- ProcessContainer
- RGBWorkingSpace
- Resample
- SampleFormatConversion
- ScreenTransferFunction
- StarMask
- Statistics

Process 10 of 20

Reference Documentation: HistogramTransformation

Implements pixel intensity transformations defined by histogram clipping and expansion points. [\[more\]](#)

Categories: IntensityTransformations

Keywords: histogram, histogram transformation, intensity transform

Contents

- Introduction
 - Histogram Generation
 - Histogram Transformations
 - Identity Histogram Transformations
- Description
- Usage
 - Input and Output Histograms
 - Understanding Independence on Selected Views
 - Histogram Editing Modes
 - Information Panel
 - Display Options
 - View Selection List
 - Channel Selection
 - Histogram Transformation Parameters
 - Clipped Pixel Counts
 - AutoClip Functions
 - Histogram Readout Modes
 - Interoperability with ScreenTransferFunction
 - Working with the Real-Time Preview Virtual View
- References
- Related Tools

Introduction

A **histogram** is a discrete representation of the distribution of values in the whole set of data points into a number of intervals and counts the Histograms are discrete functions usually represented in the form of

Applied to digital images, histograms are generated by remapping all range of discrete values, for example 256 values in an 8-bit histogram counter initialized to zero. Then for each pixel in the image, its value corresponding counter is incremented by one unit. The result of this is a list of integers representing the total number of existing pixels for

A histogram provides a wealth of information about an image and how available numeric range. Histograms are powerful tools for statistical image analysis, and the basis for many essential

Console

The screenshot shows the 'Process Console' window with execution logs for the HistogramTransformation process. It details the reading of FITS files, MRS noise evaluation, scale factors, zero offsets, noise estimates, and weight. It also shows the integration of 11 images, pixel rejection counts, and Gaussian noise estimates.

Process Console

```
/Volumes/HD2/AIP/concours 4559/Bias -35C bin 22 11 fichiers bruts/calib_Mar25-010bm.fit
Reading FITS: 16-bit integers, 1 channel(s), 2048x2048 pixels: 100%
MRS noise evaluation: done.
Scale factors : 0.99971
Zero offset : +3.051758e-05
Noise estimates : 3.238e-04
Weight : 1.00000
/Volumes/HD2/AIP/concours 4559/Bias -35C bin 22 11 fichiers bruts/calib_Mar25-011bm.fit
Reading FITS: 16-bit integers, 1 channel(s), 2048x2048 pixels: 100%
MRS noise evaluation: done.
Scale factors : 1.00140
Zero offset : +3.051758e-05
Noise estimates : 3.238e-04
Weight : 1.00000

Integration of 11 images:
Pixel combination ..... average
Output normalization ..... none
Pixel rejection ..... Winsorized sigma clipping
Rejection normalization ... none
Rejection clippings ..... low=yes high=yes
Rejection parameters ..... sigma_low=4.000 sigma_high=4.000

* Using 2048 concurrent pixel stack(s) = 544.00 MB
Integrating pixel rows: 0 -> 2047: 100%

Pixel rejection counts:
/Volumes/HD2/AIP/concours 4559/Bias -35C bin 22 11 fichiers bruts/calib_Mar25-001bm.fit
1 : 4482 0.107% ( 1476 + 3006 = 0.035% + 0.072%)
/Volumes/HD2/AIP/concours 4559/Bias -35C bin 22 11 fichiers bruts/calib_Mar25-002bm.fit
2 : 4541 0.108% ( 1659 + 2882 = 0.040% + 0.069%)
/Volumes/HD2/AIP/concours 4559/Bias -35C bin 22 11 fichiers bruts/calib_Mar25-003bm.fit
3 : 4479 0.107% ( 1663 + 2816 = 0.040% + 0.067%)
/Volumes/HD2/AIP/concours 4559/Bias -35C bin 22 11 fichiers bruts/calib_Mar25-004bm.fit
4 : 4308 0.103% ( 1720 + 2588 = 0.041% + 0.062%)
/Volumes/HD2/AIP/concours 4559/Bias -35C bin 22 11 fichiers bruts/calib_Mar25-005bm.fit
5 : 4201 0.100% ( 1697 + 2504 = 0.040% + 0.060%)
/Volumes/HD2/AIP/concours 4559/Bias -35C bin 22 11 fichiers bruts/calib_Mar25-006bm.fit
6 : 4158 0.099% ( 1715 + 2443 = 0.041% + 0.058%)
/Volumes/HD2/AIP/concours 4559/Bias -35C bin 22 11 fichiers bruts/calib_Mar25-007bm.fit
7 : 4389 0.105% ( 1831 + 2558 = 0.044% + 0.061%)
/Volumes/HD2/AIP/concours 4559/Bias -35C bin 22 11 fichiers bruts/calib_Mar25-008bm.fit
8 : 4279 0.102% ( 1824 + 2455 = 0.043% + 0.059%)
/Volumes/HD2/AIP/concours 4559/Bias -35C bin 22 11 fichiers bruts/calib_Mar25-009bm.fit
9 : 4274 0.102% ( 1776 + 2498 = 0.042% + 0.060%)
/Volumes/HD2/AIP/concours 4559/Bias -35C bin 22 11 fichiers bruts/calib_Mar25-010bm.fit
10 : 4367 0.104% ( 1876 + 2491 = 0.045% + 0.059%)
/Volumes/HD2/AIP/concours 4559/Bias -35C bin 22 11 fichiers bruts/calib_Mar25-011bm.fit
11 : 4313 0.103% ( 1879 + 2434 = 0.045% + 0.058%)

Total : 47791 0.104% ( 19116 + 28675 = 0.041% + 0.062%)

MRS noise evaluation: done.
Computing noise scaling factors: done.

Gaussian noise estimates:
σs = 9.939e-05

Reference SNR increments:
Δσsθ = 1.6791

Average SNR increments:

Ready [Pause/Abort]
```

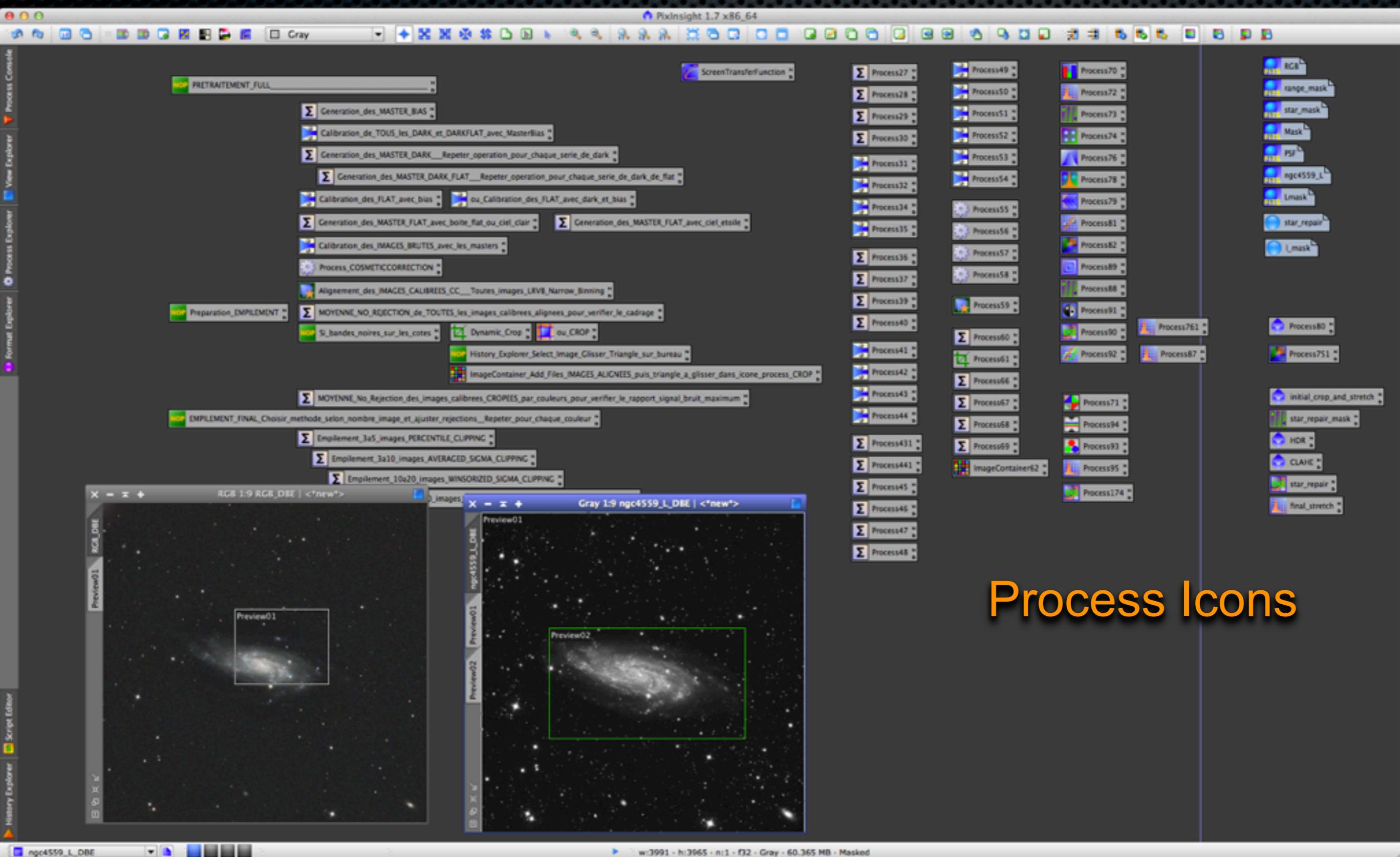
L'interface...

The screenshot displays the PixInsight 1.7 x86_64 interface with several panels and windows:

- Main Viewport:** Shows a large image of a nebula (IC 1848) in RGB 1:3 HAR_RHAVB_AIP format.
- Process Explorer:** Located on the right, it shows a workflow of processing steps:
 - star_mask
 - MIXSHO_AIP_DBE
 - MIXSHO_AIP
 - Process 0, 1, 2, 3, 4, 5, 6
 - dupliquer_pour_creeer_un_masque1
 - Histo_sur_mask1_si_petite_etoile_pas_top
 - StarMask
 - Apliquer_le_mask
 - Deconvolution
 - dupliquer_pour_creeer_un_masque2
 - Histo_sur_mask2
 - Apliquer_le_mask2_en_inverse
 - reduction_du_bruit
 - Reduction_Gradient_et_vignelage
 - Reduction_fine_des_gradients
 - On_Passe_en_Mode_Non_Lineaire
 - Histogramme
 - Star_mask3_et_le_mettre_en_inverse
 - Detail
 - Courbe
 - Detail_Fin
 - re_courbe
 - reduction_bruit_finale
 - Creation_image_SHO
 - SHO_V1
 - SHO_V2
 - Ha_en_Luminace
 - courbe
 - booster
- CurvesTransformation:** A window showing a graph with multiple curves (red, green, blue, magenta) on a grid, used for color calibration.
- ProcessContainer:** A window showing a table of processing steps and their parameters:

#	Proc Id	Mask
0	<Root>	
1	CurvesTransformation	
2	ACDNR	
3	Deconvolution	star_mask
4	BackgroundNeutralization	
5	MultiscaleMedianTransform	~MASK
6	ICCPProfileTransformation	
- ScreenTransferFunction:** A window showing the color calibration curves for the R, G, B, and L channels.

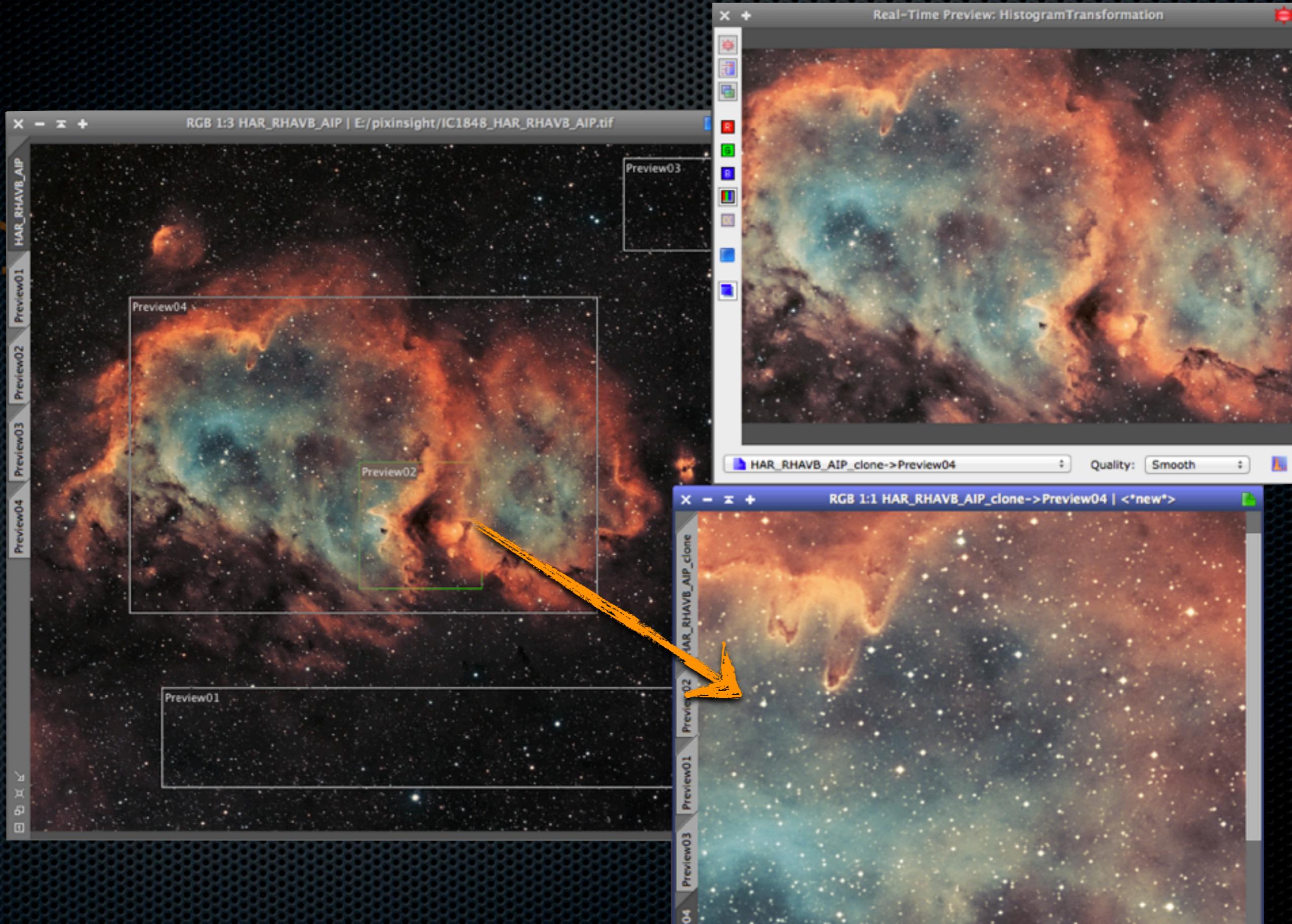
L'interface...



Process Icons

Preview, Real-Time Preview

PixInsight



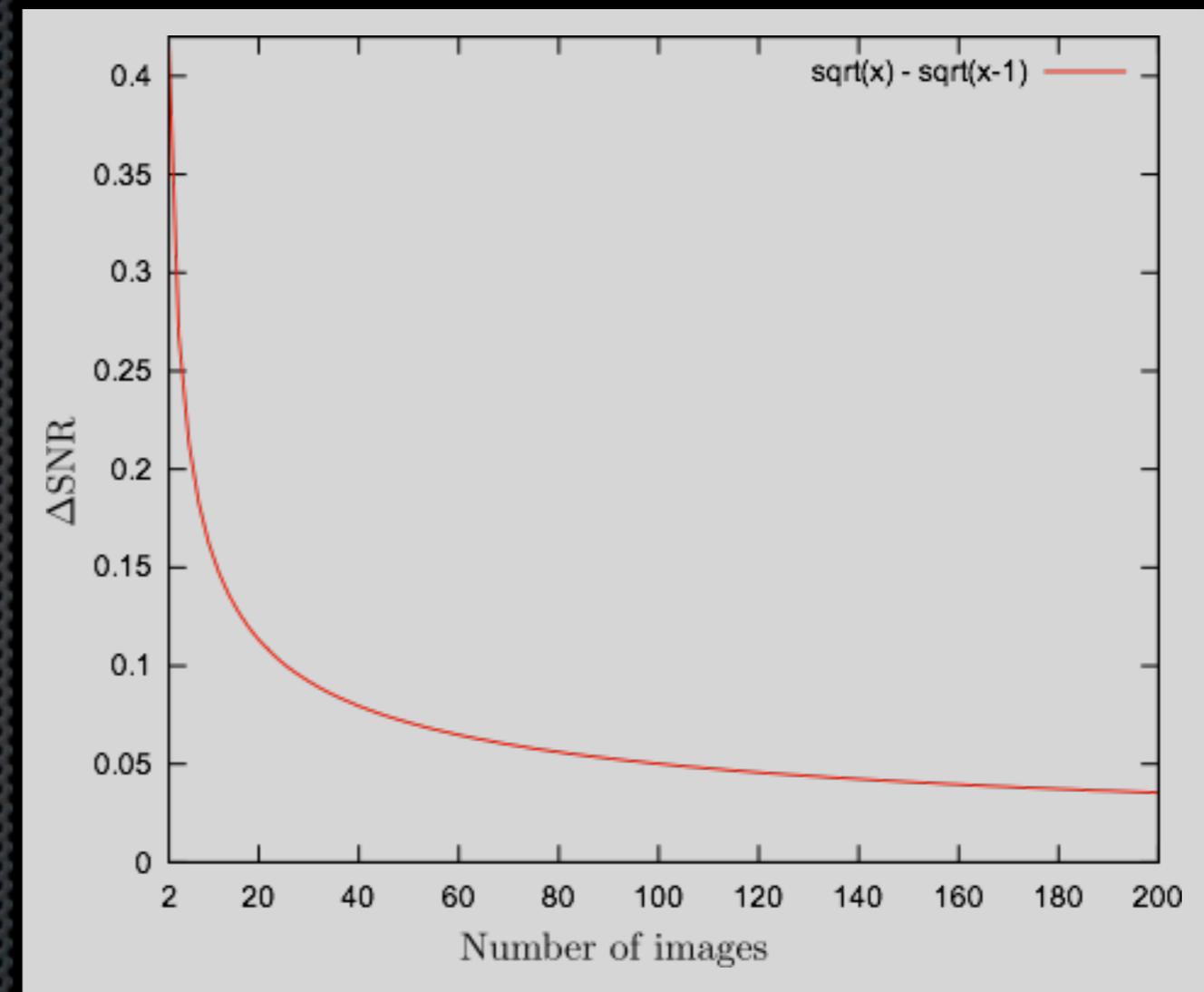
Le prétraitement

Optimisation prétraitement

Combien d'images ?

Bias, dark, flat :

- 10 images ?
- 25 images ?
- 50 images ?
- 100 images ?
- 200 images ?



$$\Delta\text{SNR}(N) = \sqrt{N} - \sqrt{N-1}$$

Process icons :

Création d'un Prétraitement CCD complet

- Suite d'icônes représentant des fonctions préprogrammées (*création perso*)
- Adapté aux images CCD monochromes L, R, V, B, Ha, OIII, SII, NII..., objets du ciel profond
- Adaptable facilement aux CCD couleurs ou APN (matrice de Bayer)
- Optimisation des paramètres à chaque étape par analyse des cartes de réjection
- Sauvegarde de chaque MASTER ou images en 32bits

Process icons : prétraitement «full»

Pixinsight

NOP PRETRAITEMENT_FULL _____ ^N_D

NOP PRETRAITEMENT_MASTER_BiasDarkFlat _____ ^N_D

 Generation_des_MASTER_BIAS ^N_D

MasterBIAS optimisé(s)

 Calibration_de_TOUS_les_DARK_et_DARKFLAT_avec_MasterBias ^N_D

Calibration des DARK

 Generation_des_MASTER_DARK__Repetier_operation_pour_chaque_serie_de_dark ^N_D

MasterDARK optimisé(s)

 Generation_des_MASTER_DARK_FLAT__Repetier_operation_pour_chaque_serie_de_dark_de_flat ^N_D

 Calibration_des_FLAT_avec_bias ^N_D

 ou_Calibration_des_FLAT_avec_dark_et_bias ^N_D

Calibration des FLATS

 Generation_des_MASTER_FLAT_avec_boite_flat_ou_ciel_clair ^N_D

MasterFLAT optimisé(s)

NOP PRETRAITEMENT_FULL _____ ^N_D

 Calibration_des_IMAGES_BRUTES_avec_les_masters ^N_D

Calibration des IMAGES avec les MASTERS

 Process_COSMETICCORRECTION ^N_D

Elimination des défauts cosmétiques résiduels

 Alignement_des_IMAGES_CALIBREES_CC__Toutes_images_LRVB_Narrow_Binning ^N_D

Alignement de toutes les IMAGES

NOP Preparation_EMPILEMENT _____ ^N_D

 MOYENNE_NO_REJECTION_de_TOUTES_les_images_calibrees_alignees_pour_verifier_le_cadrage ^N_D

Retrait des bandes noires pour optimisation du calcul du S/B

NOP Si_bandes_noires_sur_les_cotes ^N_D

 Dynamic_Crop ^N_D

NOP History_Explorer_Select_Image_Glisser_Triangle_sur_bureau ^N_D

 ImageContainer_Add_Files_IMAGES_ALIGNEES_puis_triangle_a_glisser_dans_icone_process_CROP ^N_D

NOP EMPILEMENT_FINAL_Choisir_methode_selon_nombre_image_et_ajuster_rejections__Repetier_pour_chaque_couleur ^N_D

NOP VERIF_S_B ^N_D

 MOYENNE_No_Rejection_des_images_calibrees_CROPEES_par_couleurs_pour_verifier_le_rapport_signal_bruit ^N_D

calcul du S/B max

 Empilement_3a5_images_PERCENTILE_CLIPPING ^N_D

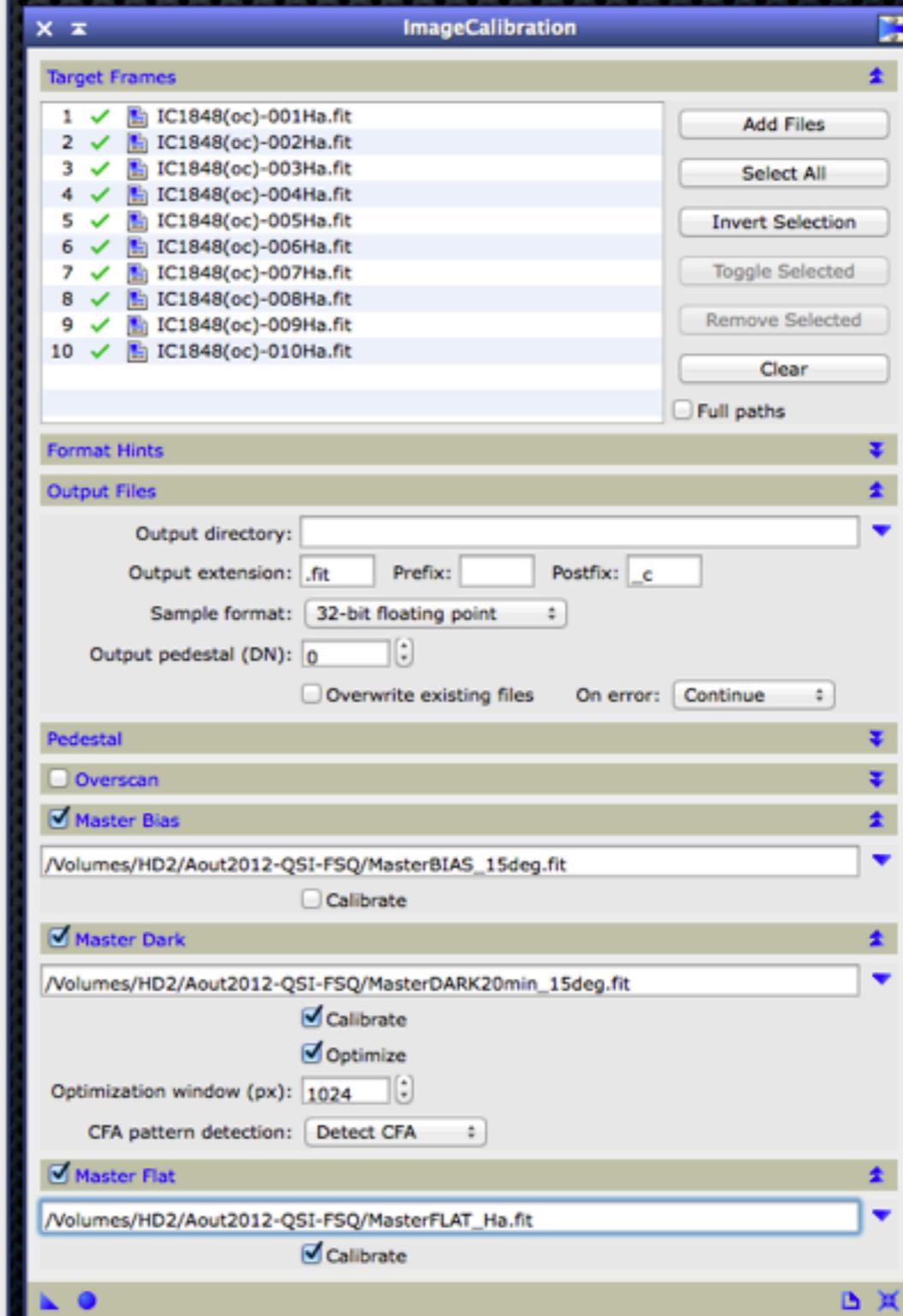
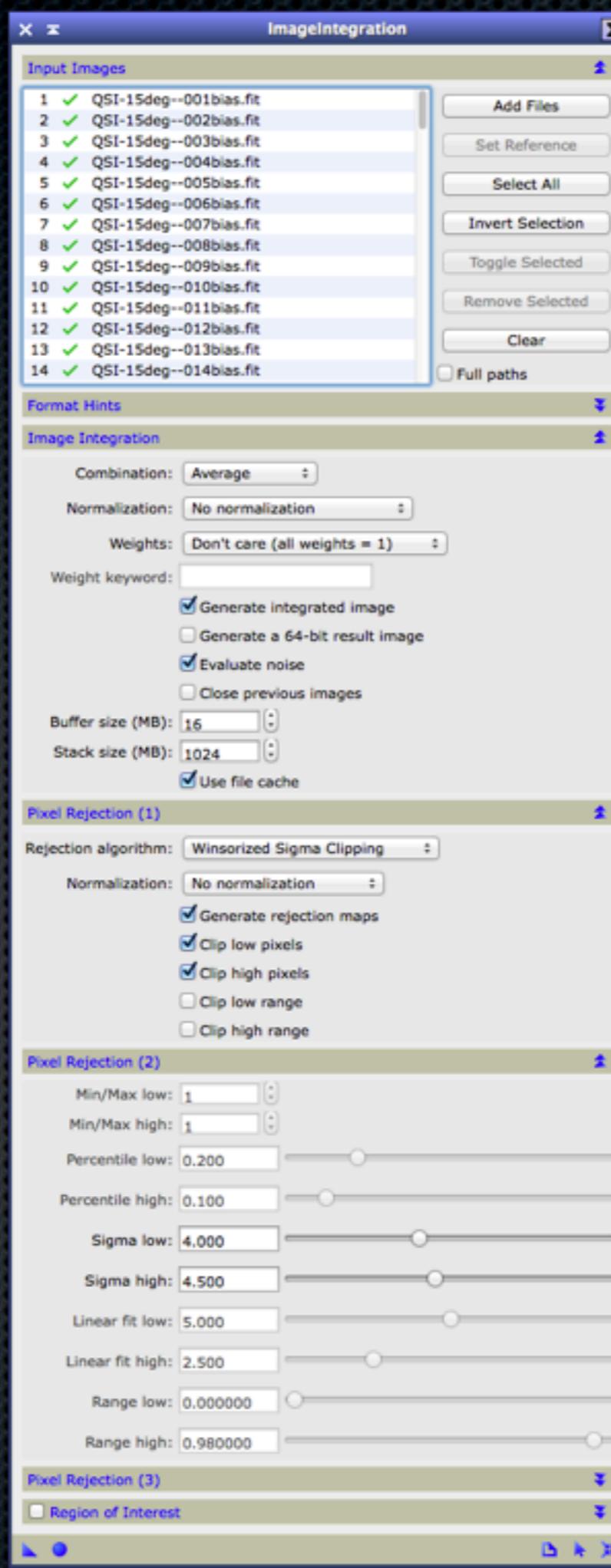
Empilement(s) optimisé(s) des différentes images ou couches couleur

 Empilement_3a10_images_AVERAGED_SIGMA_CLIPPING ^N_D

 Empilement_10a20_images_WINSORIZED_SIGMA_CLIPPING ^N_D

 Empilement_20_et_plus__images_avec_gradients_pollution_LINEAR_FIT_CLIPPING ^N_D

intégration, calibration



cosmetique, alignement...

PixInsight

CosmeticCorrection

Target Frames

1	✓	NGC6888-001Ha_c.fit
2	✓	68cyg-001Ha_c.fit
3	✓	68cyg-002Ha_c.fit
4	✓	68cyg-003Ha_c.fit
5	✓	68cyg-004Ha_c.fit
6	✓	68cyg-005Ha_c.fit
7	✓	68cyg-006Ha_c.fit
8	✓	68cyg-007Ha_c.fit
9	✓	68cyg-008Ha_c.fit
10	✓	68cyg-009Ha_c.fit
11	✓	68cyg-010Ha_c.fit
12	✓	68cyg-011Ha_c.fit

Output

Amount: 1.00

Use Master Dark

Master Dark: James/HD2/Aout2012-QSI-FSQ/MasterDARK20min_15deg.fit

Hot Pixels Threshold

Enable

Level: 0.1233997121

Sigma: 34.3740

Qty: 385

Real: Qty: 385, Level: 0.1233997121, Sigma: 34.373997

Cold Pixels Threshold

Enable

Level: 0.0000152590

Sigma: 0.02260

Qty: 38

Real: Qty: 9293, Level: 0.0000152590, Sigma: 0.022597

Use Auto detect

Hot Sigma: 3.0

Cold Sigma: 3.0

Use Defect List

Real Time Preview

	Hot	Cold
Dark	0	0
Auto	0	0

Show map Snapshot

StarAlignment

Reference image: 68_Cyg_002Ha_c_cc

Working mode: Register/Match Images

Generate masks

Frame adaptation

Target Images

1	✓	68cyg-001Ha_c_cc.fit
2	✓	68cyg-002Ha_c_cc.fit
3	✓	68cyg-003Ha_c_cc.fit
4	✓	68cyg-004Ha_c_cc.fit
5	✓	68cyg-005Ha_c_cc.fit
6	✓	68cyg-006Ha_c_cc.fit
7	✓	68cyg-007Ha_c_cc.fit
8	✓	68cyg-008Ha_c_cc.fit
9	✓	68cyg-009Ha_c_cc.fit
10	✓	68cyg-010Ha_c_cc.fit
11	✓	68cyg-011Ha_c_cc.fit
12	✓	68cyg-012Ha_c_cc.fit
13	✓	68_Cyg-001Ha_c_cc.fit
14	✓	68_Cyg-002Ha_c_cc.fit

Format Hints

Output Images

Star Detection

Detection scales: 4

Noise scales: 1

Hot pixel removal: 1

Log(sensitivity): -1.00

Peak response: 0.80

Maximum distortion: 0.500

Inverted image

Star Matching

RANSAC tolerance: 2.00

RANSAC iterations: 2000

Maximize inliers: 1.00

Maximize overlapping: 1.00

Maximize regularity: 1.00

Minimize RMS error: 1.00

Maximum stars: <Auto>

Triangles per star: 40

Compute intersections: Mosaic modes only

Restrict to previews

Use brightness relations

Use scale differences

Scale tolerance: 0.010

Interpolation

Registration model: Projective Transformation

Pixel interpolation: Auto

Clamping threshold: 0.30

Optimisation de l'intégration : réjection

Integration of 11 images:
Pixel combination average
Output normalization additive
Pixel rejection none
Integrating pixel rows: 0 -> 2047: 100%

MRS noise evaluation: done.

Gaussian noise estimates:
 $\sigma_z = 5.728e-05$

Reference SNR increments:
 $\Delta\sigma_{z0} = 4.6897$

Average SNR increments:
 $\Delta\sigma_z = 3.3180$

5.574 s

Moyenne simple

moyenne avec réjection

Total : 345387 0.749% (45 + 345342 = 0.000% + 0.749%)

MRS noise evaluation: done.

Gaussian noise estimates:
 $\sigma_z = 5.813e-05$

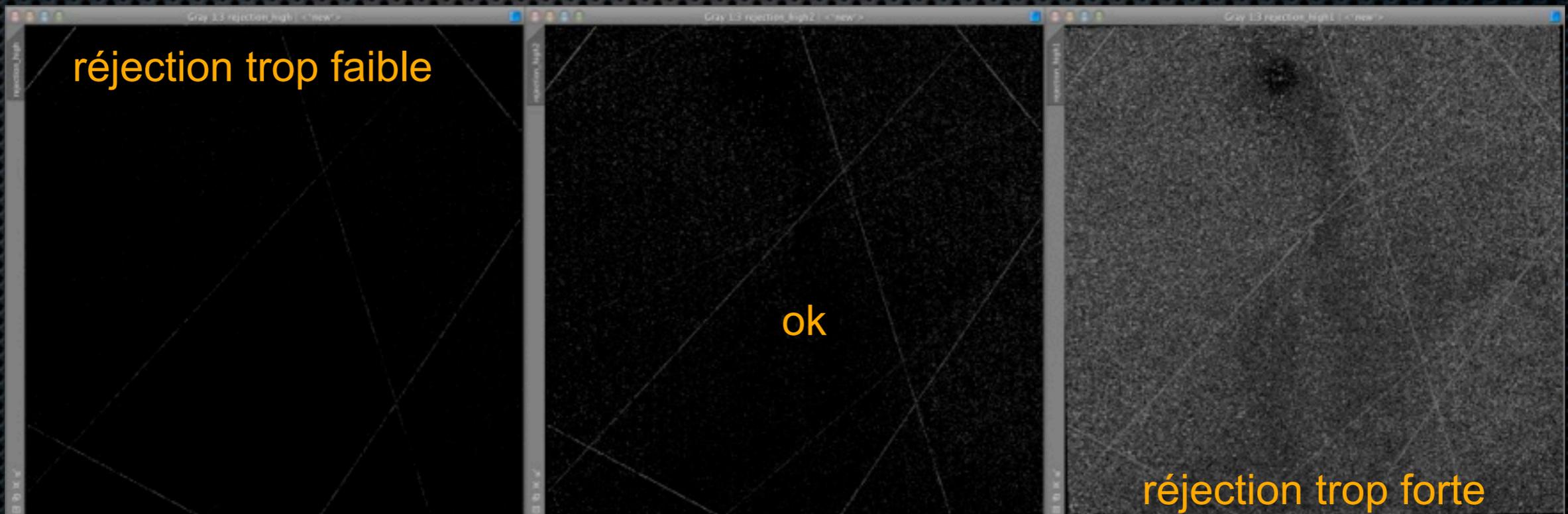
Reference SNR increments:
 $\Delta\sigma_{z0} = 4.6185$

Average SNR increments:
 $\Delta\sigma_z = 3.2676$

réjection trop faible

ok

réjection trop forte



Process icons : prétraitement «simplifié»

Pixinsight

NOP PRETRAITEMENT_SIMPLIFIE N
 D

NOP PRETRAITEMENT_MASTER_BiasDarkFlat N
 D

Σ Generation_des_MASTER_BIAS N
 D

MasterBIAS optimisé(s)

Σ Generation_des_MASTER_DARK__Repetier_operation_pour_chaque_serie_de_dark N
 D

MasterDARK optimisé(s)

Σ Generation_des_MASTER_DARK_FLAT__Repetier_operation_pour_chaque_serie_de_dark_de_flat N
 D

 Calibration_des_FLAT_avec_bias N
 D

 ou_Calibration_des_FLAT_avec_dark_et_bias N
 D

Calibration des FLATS

Σ Generation_des_MASTER_FLAT_avec_boite_flat_ou_ciel_clair N
 D

MasterFLAT optimisé(s)

NOP PRETRAITEMENT N
 D

 Calibration_des_IMAGES_BRUTES_avec_les_masters N
 D

Calibration des IMAGES

 Process_COSMETICCORRECTION N
 D

 Alignement_des_IMAGES_CALIBREES_CC__Toutes_images_LRVB_Narrow_Binning N
 D

NOP Preparation_EMPILEMENT N
 D

Σ MOYENNE_NO_REJECTION_de_TOUTES_les_images_calibrees_alignees_pour_verifier_le_cadrage N
 D

NOP Si_bandes_noires_sur_les_cotes N
 D

 Dynamic_Crop N
 D

NOP History_Explorer_Select_Image_Glisser_Triangle_sur_bureau N
 D

 ImageContainer_Add_Files_IMAGES_ALIGNEES_puis_triangle_a_glisser_dans_icone_process_CROP N
 D

NOP EMPILEMENT_FINAL_Choisir_methode_selon_nombre_image_et_ajuster_rejections__Repetier_pour_chaque_couleur N
 D

NOP VERIF_S_B N
 D

Σ MOYENNE_No_Rejection_des_images_calibrees_CROPEES_par_couleurs_pour_verifier_le_rapport_signal_bruit_maximum N
 D

Σ Empilement_3a5_images_PERCENTILE_CLIPPING N
 D

Σ Empilement_3a10_images_AVERAGED_SIGMA_CLIPPING N
 D

Σ Empilement_10a20_images_WINSORIZED_SIGMA_CLIPPING N
 D

Σ Empilement_20_et_plus__images_avec_gradients_pollution_LINEAR_FIT_CLIPPING N
 D

Process icons : prétraitement «minimum»

Pixinsight

NOP PRETRAITEMENT_MINIMUM N
 D

NOP PRETRAITEMENT_MASTER_BiasDarkFlat N
 D

Σ Generation_des_MASTER_BIAS N **MasterBIAS optimisé(s)**
 D

Σ Generation_des_MASTER_DARK__Repetier_operation_pour_chaque_serie_de_dark N **MasterDARK optimisé(s)**
 D

Σ Generation_des_MASTER_DARK_FLAT__Repetier_operation_pour_chaque_serie_de_dark_de_flat N
 D

Σ Generation_des_MASTER_FLAT_avec_boite_flat_ou_ciel_clair N **MasterFLAT optimisé(s)**
 D

NOP PRETRAITEMENT_SIMPLE N
 D

 Calibration_des_IMAGES_BRUTES_avec_TOUS_les_masters N **Calibration des IMAGES**
 D

 Process_COSMETICCORRECTION N
 D

 Alignement_des_IMAGES_CALIBREES_CC__Toutes_images_LRVB_Narrow_Binning N
 D

NOP EMPILEMENT_FINAL_Choisir_methode_selon_nombre_image_et_ajuster_rejections__Repetier_pour_chaque_couleur N
 D

Σ Empilement_3a5_images_PERCENTILE_CLIPPING N
 D

Σ Empilement_3a10_images_AVERAGED_SIGMA_CLIPPING N
 D

Σ Empilement_10a20_images_WINSORIZED_SIGMA_CLIPPING N
 D

Σ Empilement_20_et_plus__images_avec_gradients_pollution_LINEAR_FIT_CLIPPING N
 D

NOP Si_bandes_noires_sur_les_cotes N
 D

 Dynamic_Crop N
 D

BATCH

pixinsight

Batch Preprocessing Script v1.22

Bias | **Darks** | **Flats** | **Lights**

- ▲ Binning 1
 - ▲ 900.00s
 - Dark-900s-20deg-01...
 - Dark-900s-20deg-02...
 - Dark-900s-20deg-03...
 - Dark-900s-20deg-04...
 - Dark-900s-20deg-05...
 - Dark-900s-20deg-06...
 - Dark-900s-20deg-07...
 - Dark-900s-20deg-08...
 - Dark-900s-20deg-09...
 - ▲ Binning 2
 - ▲ 300.00s
 - Dark2x2-300s-20deg...
 - Dark2x2-300s-20deg...

Exposure tolerance: 10

Image Integration

Combination: Average

Rejection algorithm: Winsorized Sigma Clipping

Min/Max low: 1

Min/Max high: 1

Percentile low: 0.20

Percentile high: 0.10

Sigma low: 4.00

Sigma high: 3.50

Linear fit low: 5.00

Linear fit high: 3.50

Clear Remove Selected Invert Selection

+ Add Files + Add Bias + Add Darks + Add Flats + Add Lights + Add Custom Reset

Diagnostics Run Exit

A script for calibration and alignment of light frames
Copyright (c) 2012 Kai Wiechen.
Copyright (c) 2012 Pleiades Astrophoto.

Options

- CFA images
- Optimize dark frames
- Generate rejection maps
- Export calibration files
- Up-bottom FITS
- Use master bias
- Use master dark
- Use master flat

Registration Reference Image

Output Directory

Batch Preprocessing Script v1.22

Bias | **Darks** | **Flats** | **Lights**

- ▲ Binning 1
 - ▲ Luminance
 - ▲ 900.00s
 - Trio-L-02.fit
 - Trio-L-03.fit
 - Trio-L-04.fit
 - Trio-L-05.fit
 - Trio-L-06.fit
 - Trio-L-07.fit
 - Trio-L-08.fit
 - Trio-L-11.fit
 - Trio-L-12.fit
 - ▲ Binning 2
 - ▲ Bleu
 - ▲ 300.00s
 - Trio-B-01.fit
 - Trio-B-02.fit
 - Trio-B-03.fit
 - Trio-B-04.fit
 - Trio-B-05.fit
 - ▲ Binning 2
 - ▲ Rouge
 - Trio-R-01.fit
 - Trio-R-02.fit
 - Trio-R-03.fit
 - Trio-R-04.fit
 - Trio-R-05.fit

Calibrate only

Cosmetic Correction

Apply

Template icon: <none>

DeBayer

Bayer/mosaic pattern: RGGB

DeBayer method: VNG

Image Registration

Pixel interpolation: Auto

Clamping threshold: 0.30

Image Integration

Apply

Integration parameters...

+ Add Files + Add Bias + Add Darks + Add Flats + Add Lights + Add Custom Reset

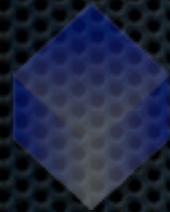
Diagnostics Run Exit

Le traitement

Traitement

Avant tout traitement, il faut s'assurer que l'on a utilisé toutes les techniques possibles afin d'optimiser l'image brute d'empilement :

- Utilisation de toutes les techniques permettant d'augmenter le rapport signal sur bruit lors de l'acquisition
- Calibration précise des images brutes
- Intégration optimale des images



Traitement

Le traitement est avant tout une perception personnelle (artistique ou mathématique) de l'image finale tout en essayant de préserver les structures qui la composent. Il faut avoir à l'esprit que :

- Le traitement n'est pas une chose triviale (cela demande des essais et donc du temps)
- Chaque image est unique : pas de formules universelles (ou de «workflow»)
- Et... une bonne dose de subjectivité

Traitement

PIXINSIGHT offre une panoplie de fonctions pour traiter toute sorte d'images. Beaucoup de fonctions sont inédites et uniques au logiciel. Il ne faut pas hésiter à les utiliser pour optimiser chaque étape du traitement
Citons par exemple :

- Pas moins de 6 fonctions de réduction de bruit.
- Outil mathématique très puissant (PIXELMATH)
- Gestion des masques très précise. Bon nombre de traitements plus ou moins complexes nécessitent un masque optimisé

Images linéaires
Images non-linéaires
Screen Transfer Function

Image linéaire

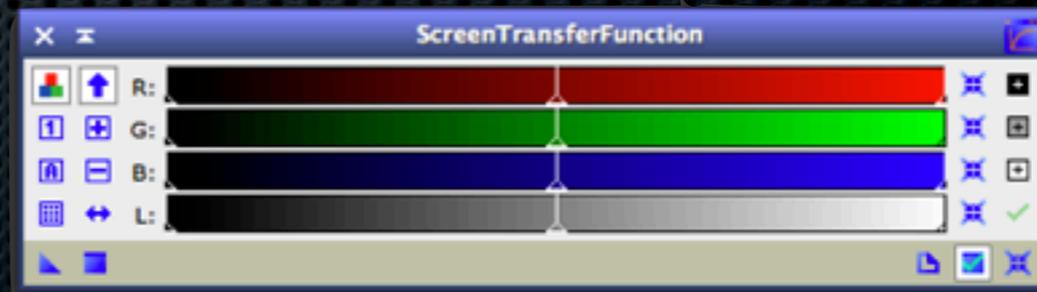
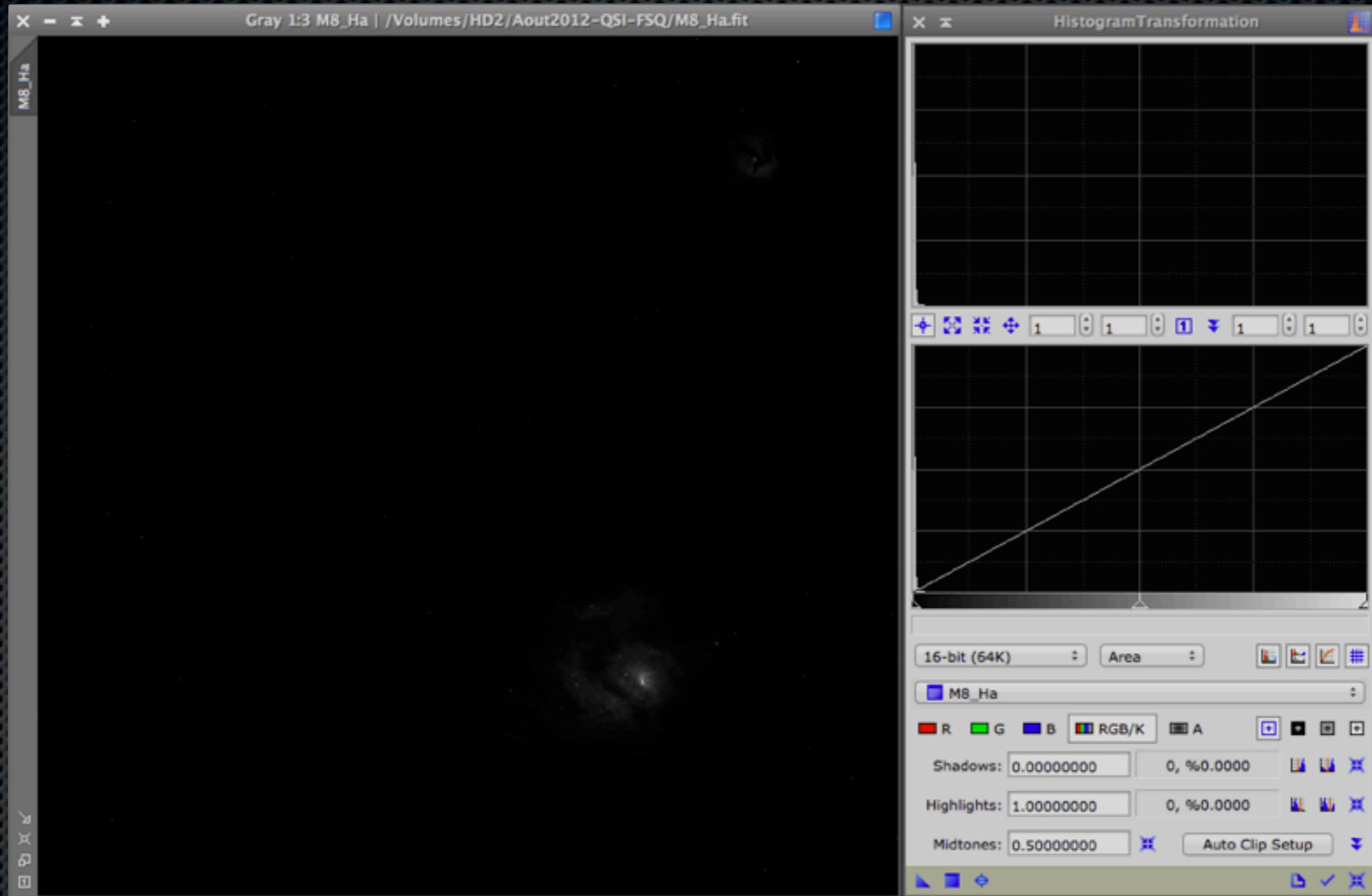


Image linéaire : STF

PixInsight

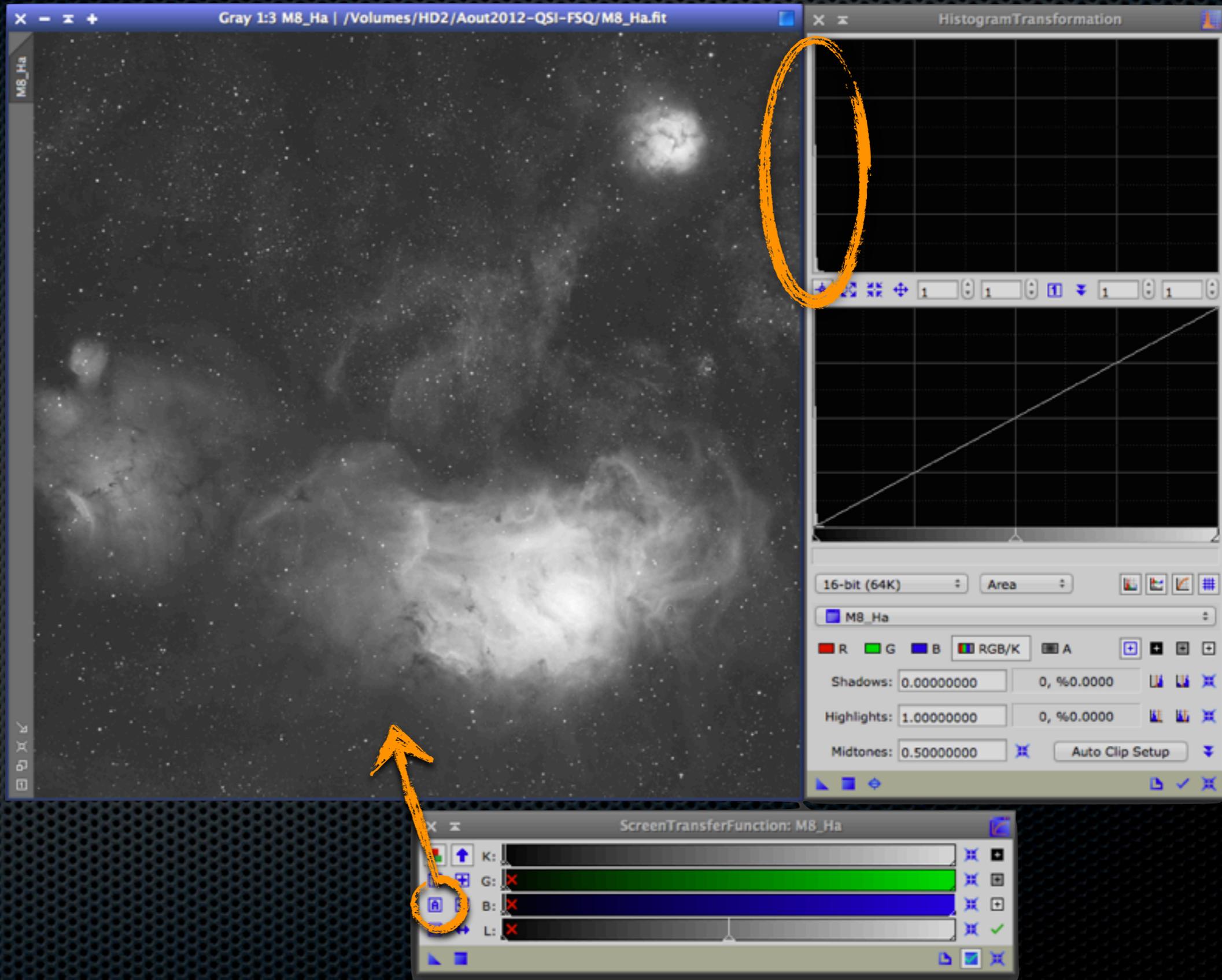


Image linéaire --> non linéaire

PixInsight

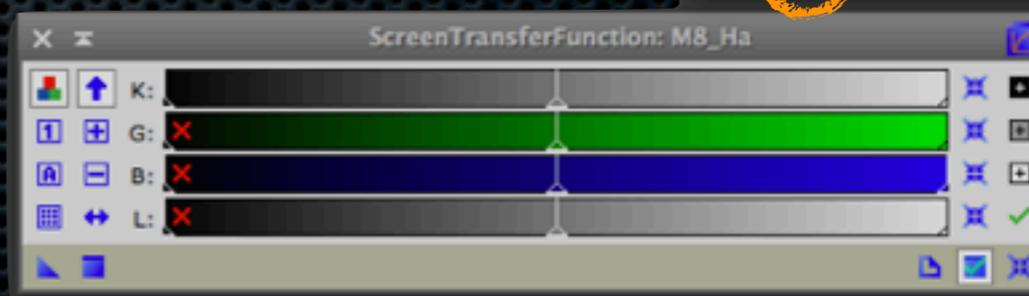
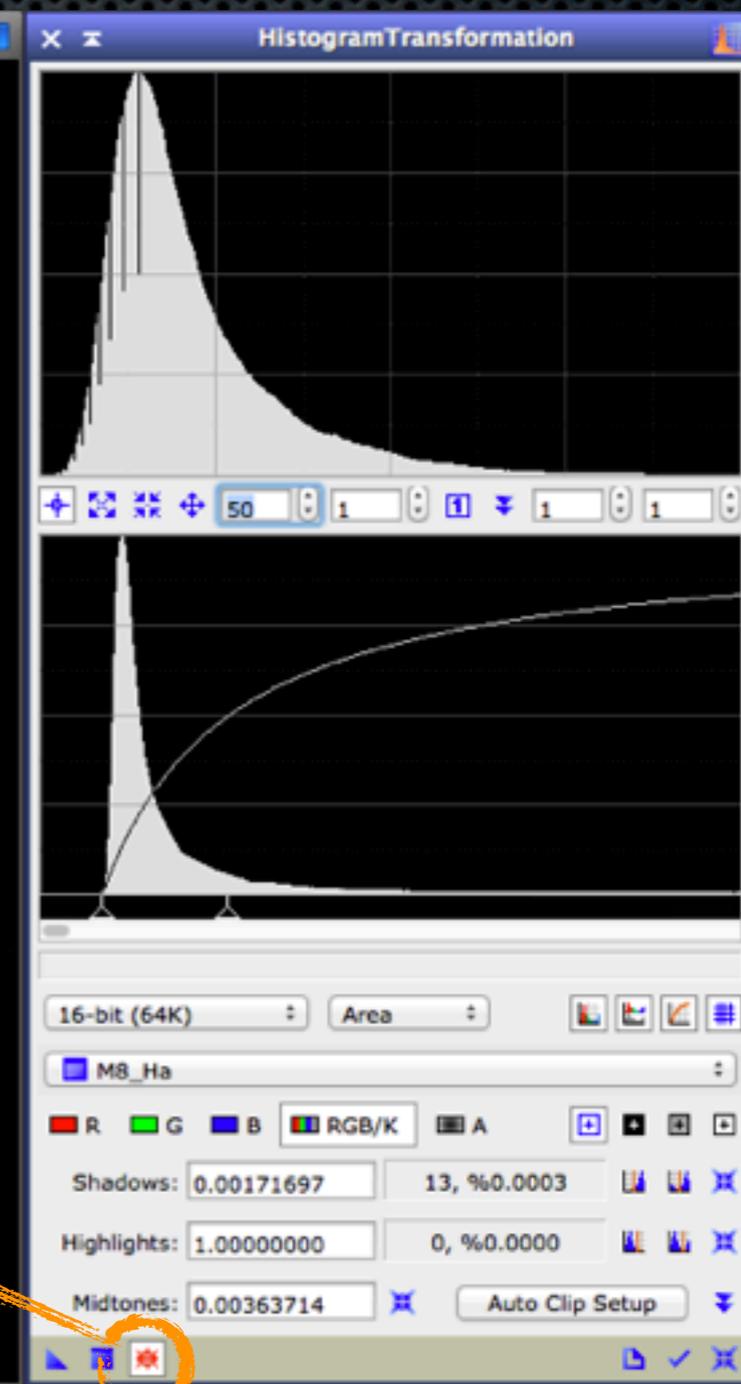
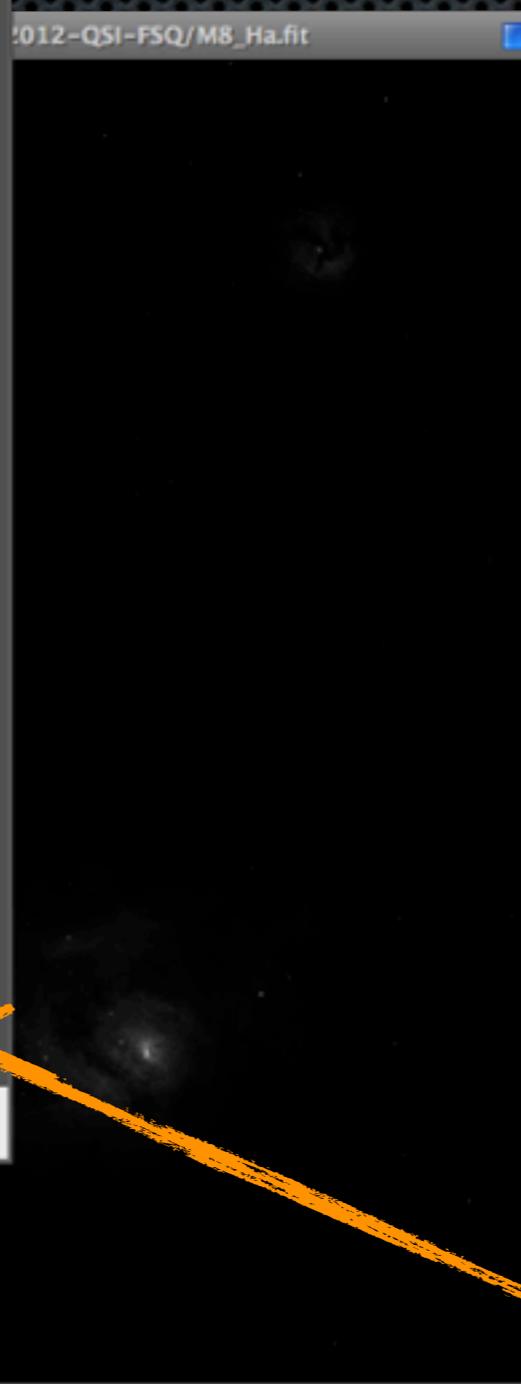
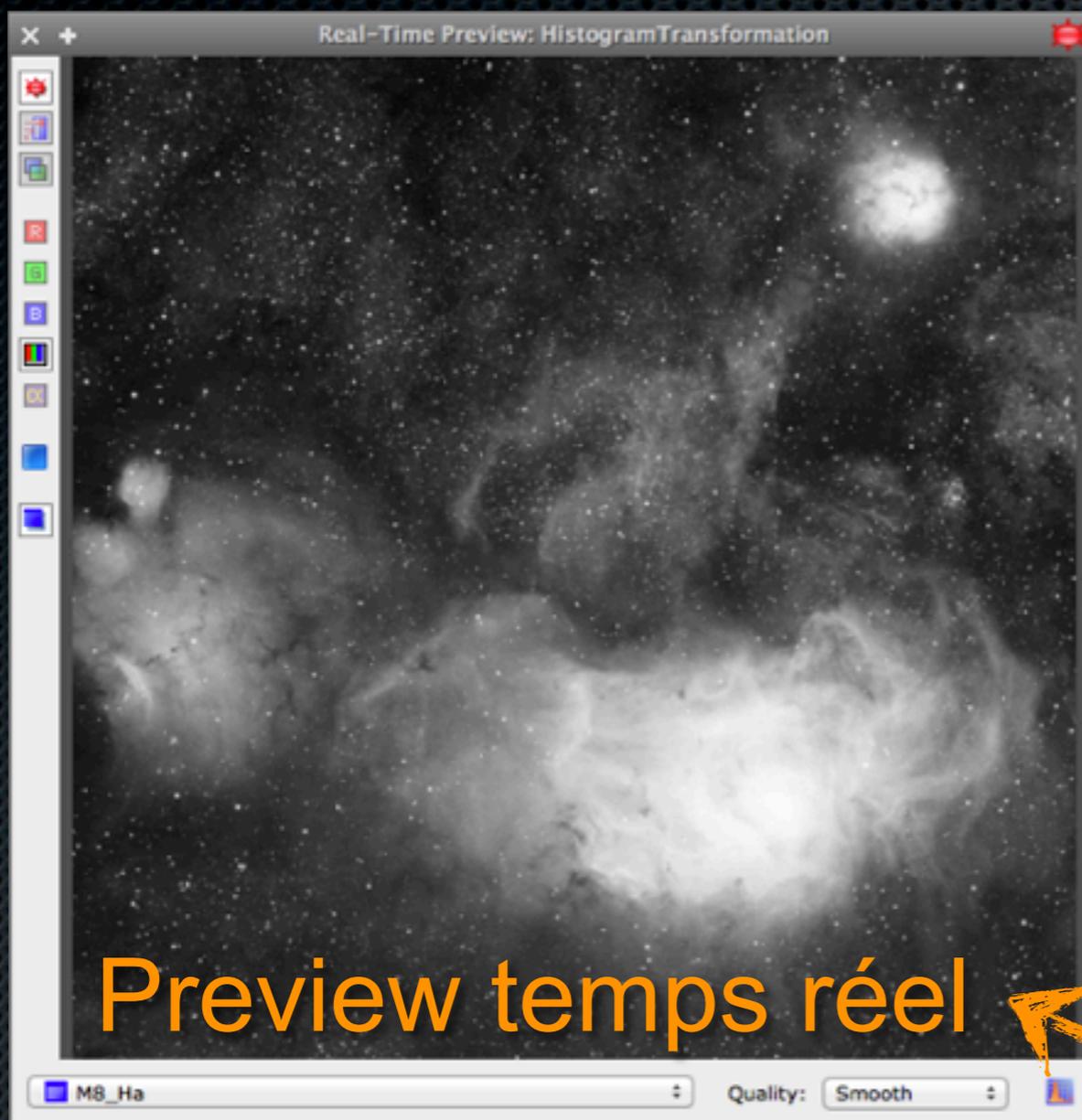
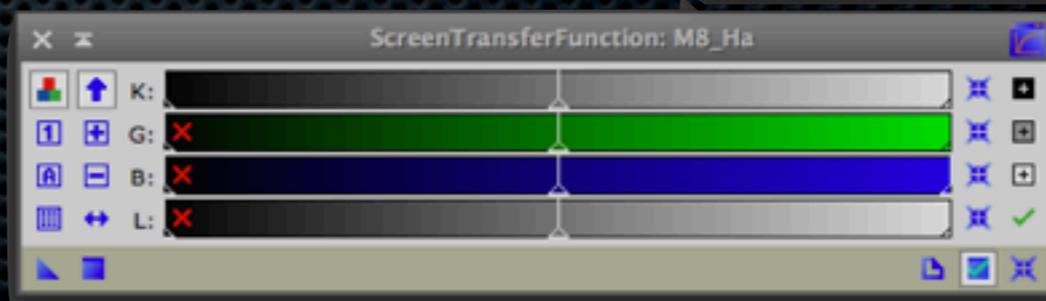
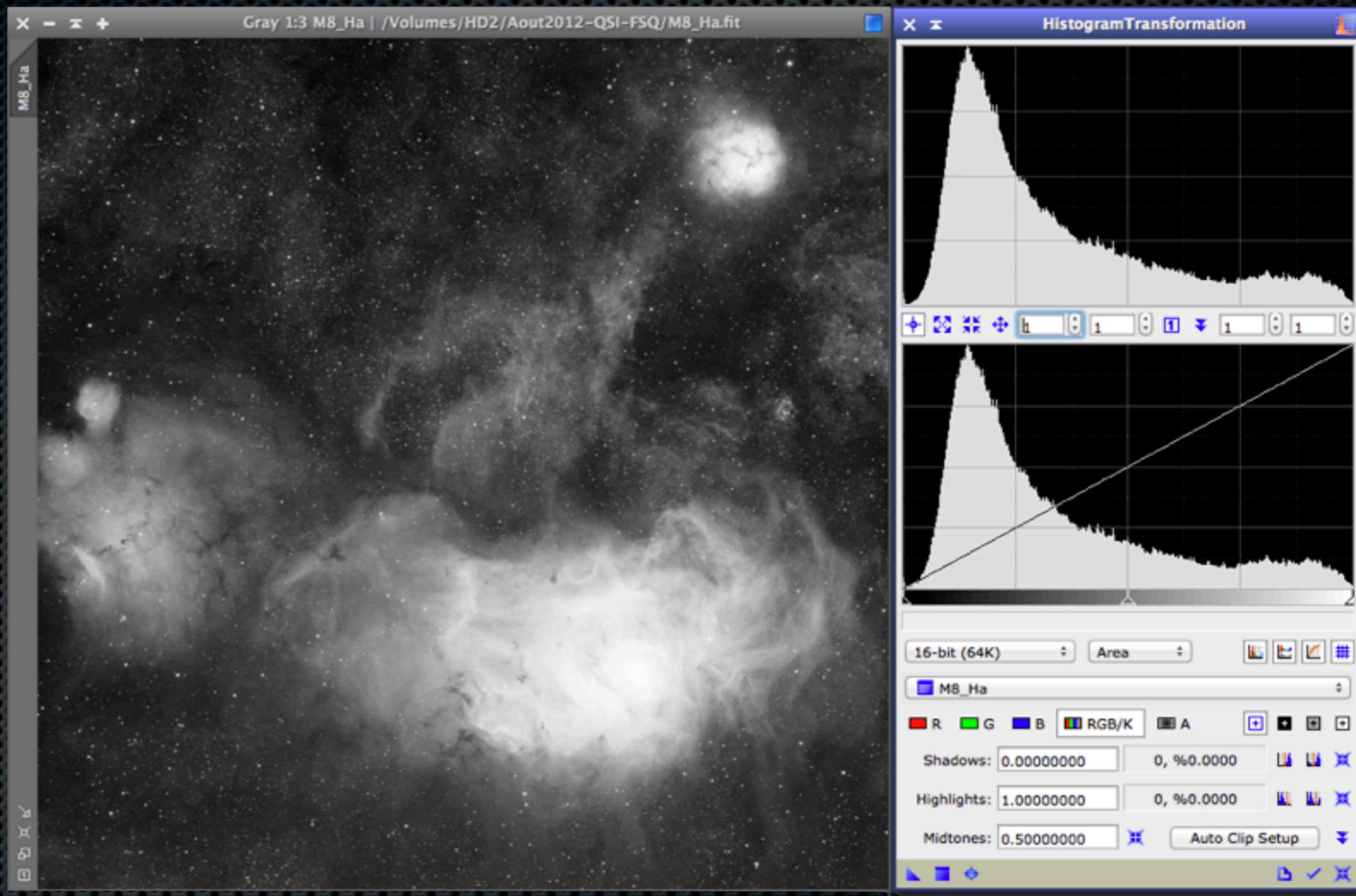


Image non linéaire

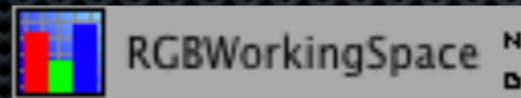


Des exemples de processus de traitement

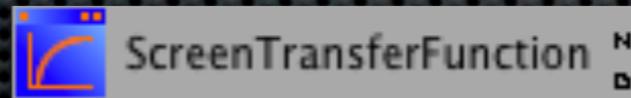
Traitement : image monochrome

image
linéaire

image
non linéaire



RGBWorkingSpace ^N_D



ScreenTransferFunction ^N_D



Masque de protection des hautes lumières



ATrousWevletTransform ^N_D

Réduction du bruit

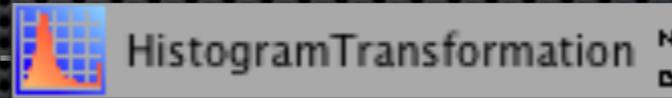


DynamicBackgroundExtraction ^N_D

Retrait des gradients

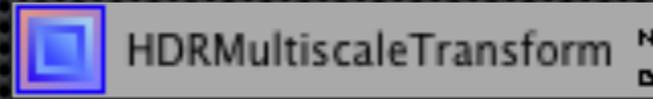


AutomaticBackgroundExtractor ^N_D



HistogramTransformation ^N_D

Compression de la dynamique



HDRMultiscaleTransform ^N_D

un peu de magie !



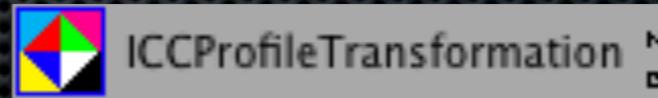
CurvesTransformation ^N_D

Rehaussement des niveaux



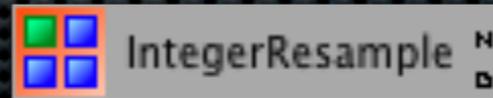
ACDNR ^N_D

2nde réduction du bruit (éventuellement)



ICCProfileTransformation ^N_D

Profil de couleurs (sRGB ou AdobeRGB ou GREY)



IntegerResample ^N_D

Réduction format (éventuellement)

Traitement : image monochrome

image
linéaire

image
non linéaire



Déconvolution

Traitement LRVB

PixInsight

images
linéaires

images
non linéaires

Luminance

ScreenTransferFunction_Luminance

DynamicPSF

StarMask

Deconvolution

ATrousWevletTransform

DynamicBackgroundExtraction

AutomaticBackgroundExtractor

HistogramTransformation

HDRMultiscaleTransform

CurvesTransformation

ACDNR

RGBWorkingSpace

Rouge

Vert

Bleu

SII

ou Ha

OIII

ChannelCombination_images_R_V_B

STF_RVB

DynamicBackground_RVB

AutomaticBackground_RVB

BackgroundNeutralization

ColorCalibration

HistogramTransformation_RVB

SNR

ACDNR_LRGB

StarMaskL

MorphologicalTransformation

CurvesTransform_RVB_Sat

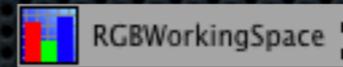
LRGBCombination

CurvesTransform_Final

ICCProfileTransformation

IntegerResample

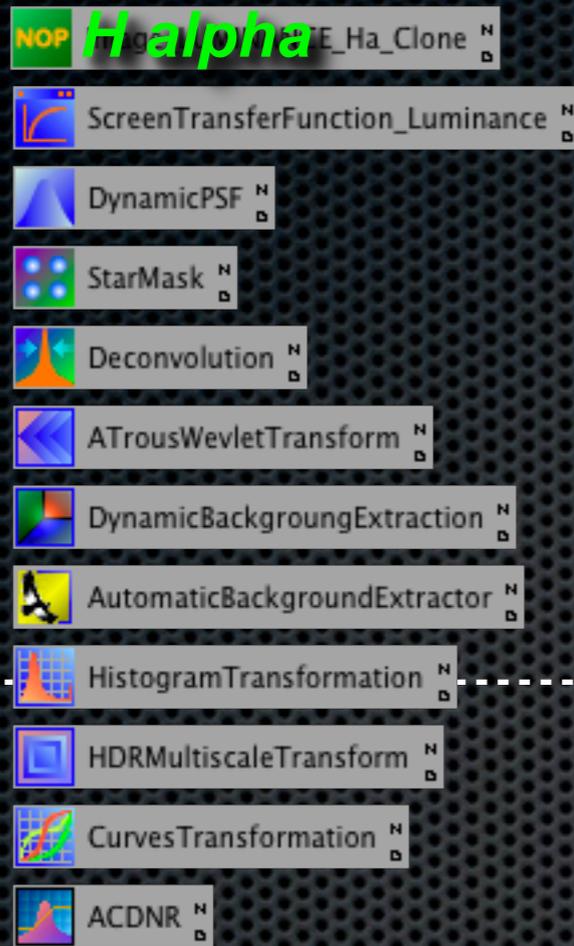
Traitement canaux mixés



PixInsight

images linéaires

images non linéaires



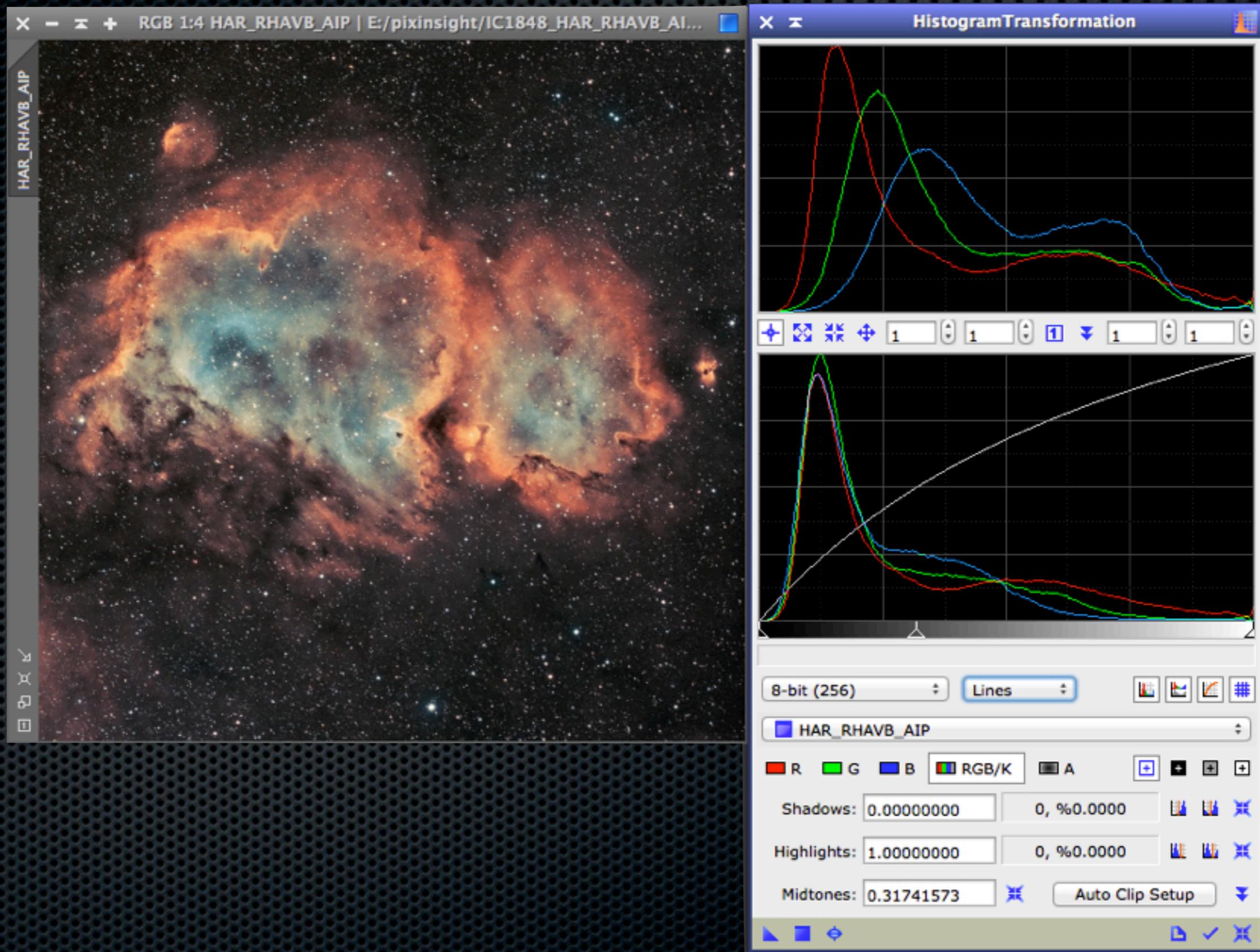
images linéaires

images non linéaires

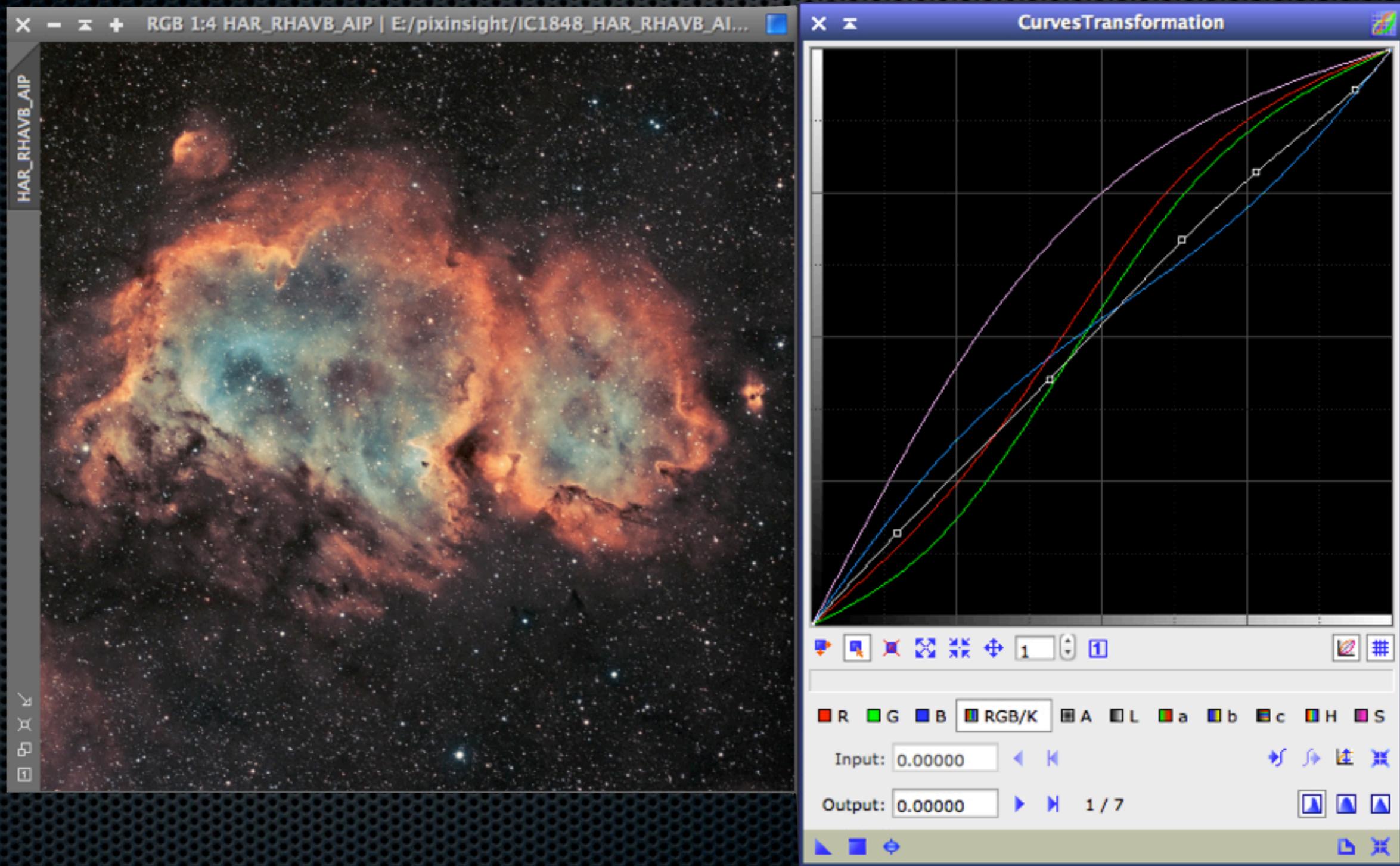


Des fonctions clés !

Histogram Transformation



Curves Transformation

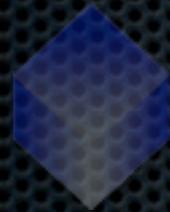


Les masques

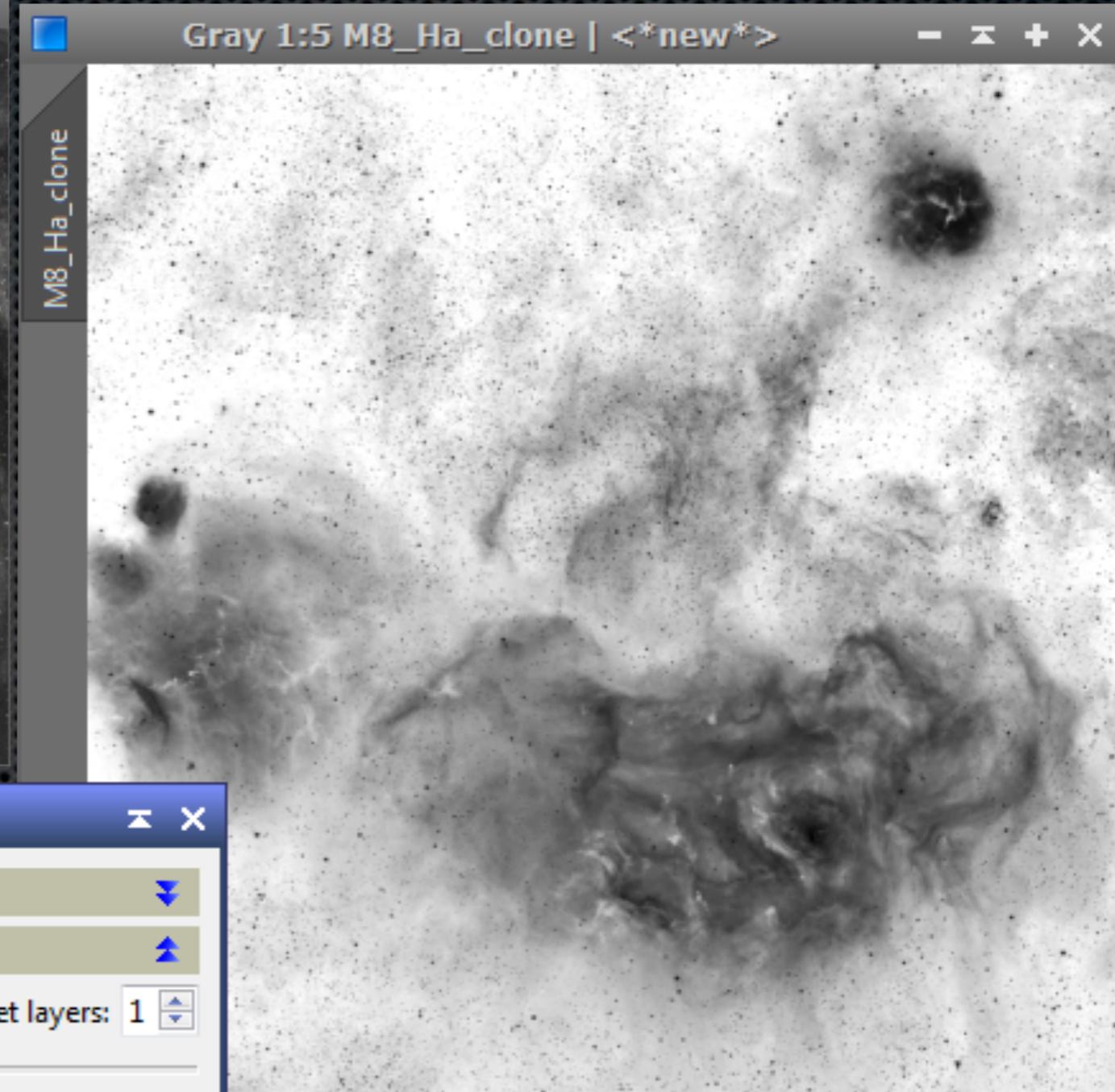
Indispensables à une majorité de fonctions

Les processus de traitement utilisent des masques d'intensité pour limiter leur effets sur certaines zones de l'image. Leur choix et leur utilisation est primordiale dans la réussite d'un traitement spécifique

Plusieurs fonctions permettent de créer facilement ces masques.



Les masques



ACDNR

ACDNR Filters

Lightness Mask

Preview

Removed wavelet layers: 1

Midtones: 0.41000

Shadows: 0.18000

Highlights: 0.98000

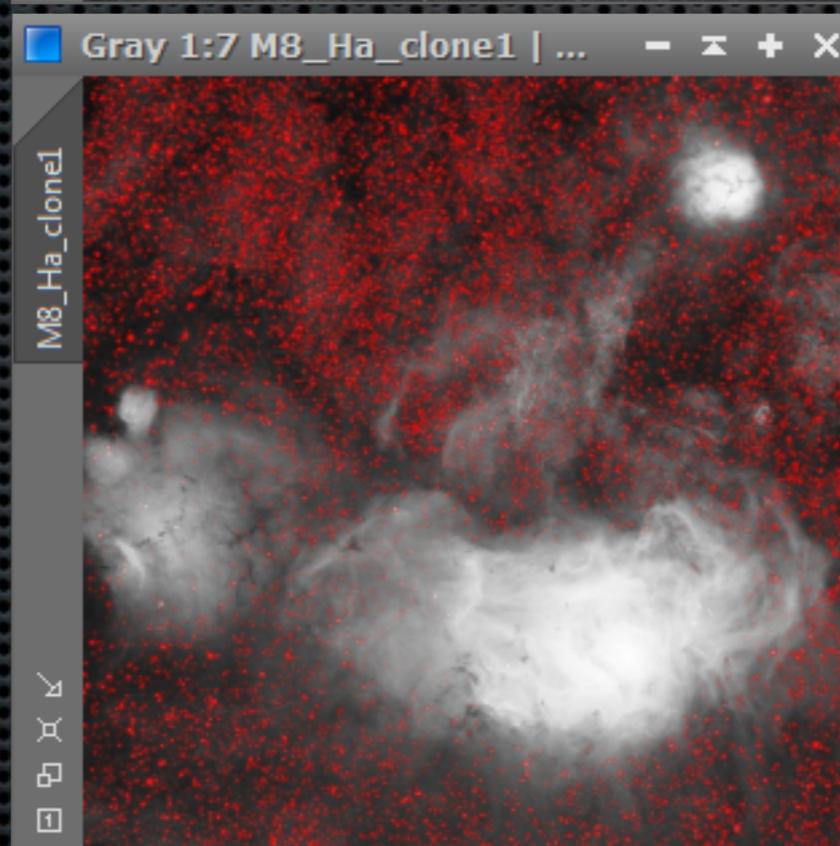
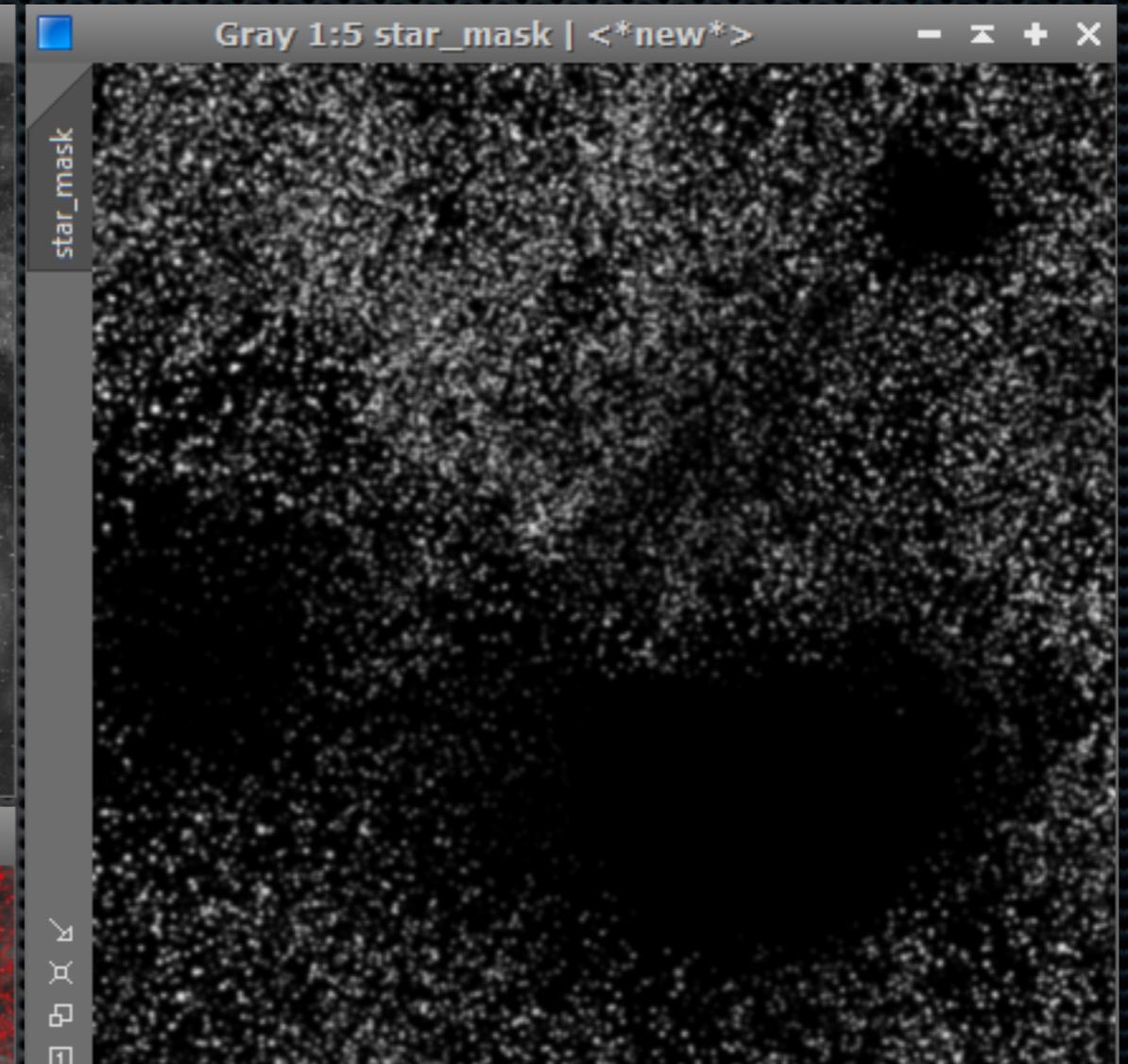
This panel shows the ACDNR (Advanced Color Deconvolution and Noise Reduction) settings for the "Lightness Mask" filter. The "Preview" checkbox is checked. The "Removed wavelet layers" is set to 1. The sliders for Midtones, Shadows, and Highlights are positioned at 0.41000, 0.18000, and 0.98000 respectively.

Les masques

The image displays a software interface for image processing, showing the creation of a mask from an astronomical image. The interface consists of several windows and a control panel:

- Top-left window:** "Gray 1:7 M8_Ha | M8_Ha.fit" showing the original grayscale image of the M8 nebula.
- Top-right window:** "Gray 1:5 range_mask | < *new*" showing the resulting grayscale mask, where the nebula is white and the background is black.
- Bottom-left window:** "Gray 1:7 M8_Ha_clone1 | ..." showing the original image with a red overlay, likely representing the mask applied to the image.
- Bottom-right window:** "M8_Ha_clone2" showing the original image with a solid red background, indicating that the mask has been inverted or applied to the background.
- RangeSelection control panel:** A dialog box with the following settings:
 - Lower limit: 0.340000
 - Upper limit: 0.830000
 - Link range limits
 - Fuzziness: 0.10
 - Smoothness: 23.0
 - Screening
 - Lightness
 - Invert

Les masques



StarMask

Threshold: 0.30000 Mode: Star Mask

Scale: 5 Growth: 2 Comp.: 2 Small: 1

Smoothness: 12 Aggregate Binarize Contours Invert

Shadows: 0.00000

Midtones: 0.50000

Highlights: 1.00000

Truncation: 1.00000

Limit: 1.00000

This panel shows the StarMask dialog box with various settings for generating the star mask. The settings include Threshold (0.30000), Mode (Star Mask), Scale (5), Growth (2), Comp. (2), Small (1), Smoothness (12), and several checkboxes for Aggregate, Binarize, Contours, and Invert. There are also sliders for Shadows, Midtones, Highlights, Truncation, and Limit.

HDRMultiscaleTransform



image Nicolas Outters

HDRMultiscaleTransform



HDRMultiscaleTransform

Number of layers: Number of iterations: Inverted

Overdrive:

Median transform

Scaling function:

To lightness Preserve hue

Lightness mask

Deringing

Midtones Balance

HDRMultiscaleTransform



Tout est possible !

Du plus soft au plus hard !

xinsight



Yeux de merlan...

PixInsight



Deconvolution

PSF

Algorithm

Deringing

Global dark: 0.1300

Global bright: 0.0000

Local deringing

Local support: star_mask

Local amount: 0.70

Wavelet Regularization

Dynamic Range Extension



DERINGING !

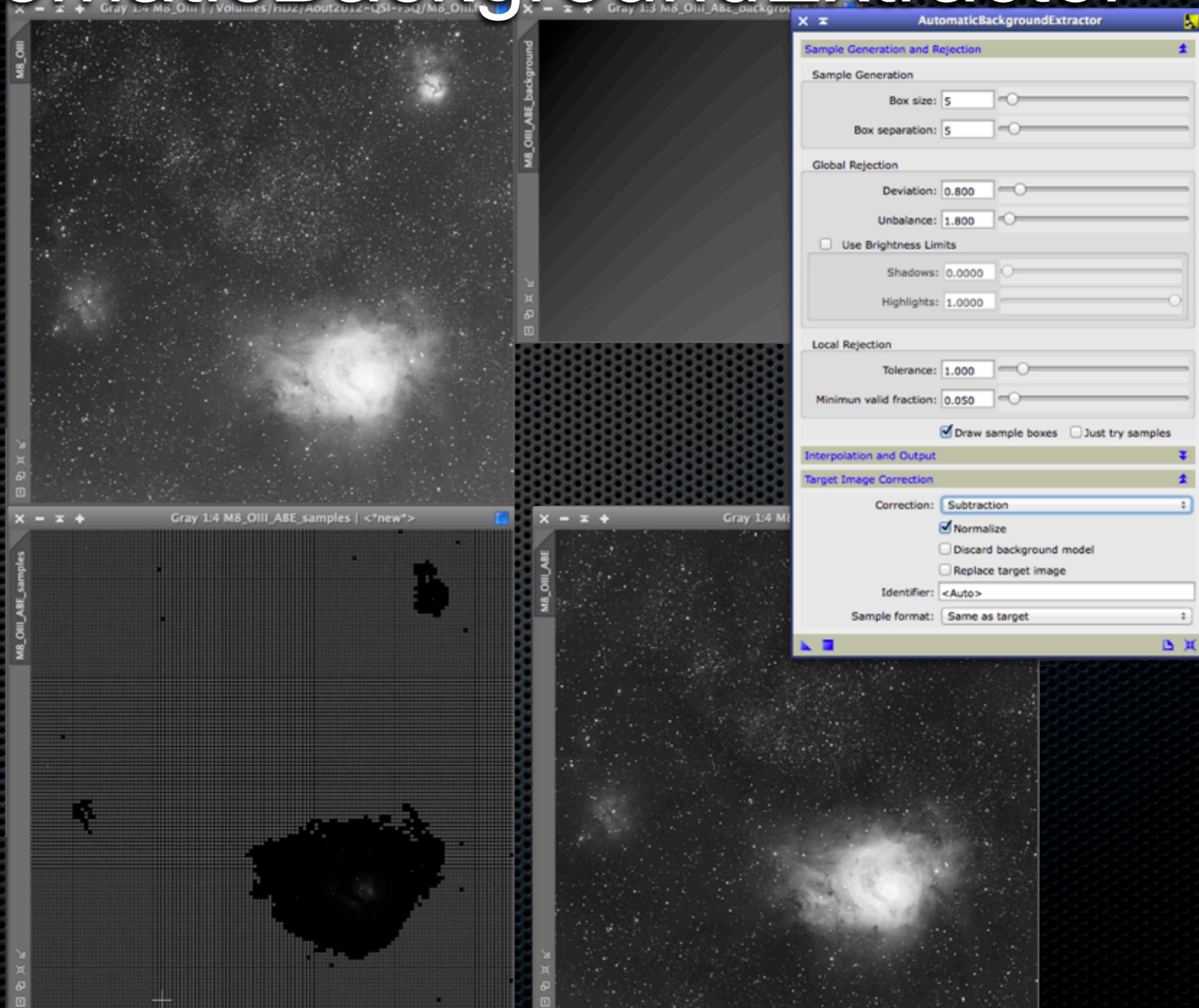
Présent sur de nombreuses fonctions

DynamicBackgroundExtraction

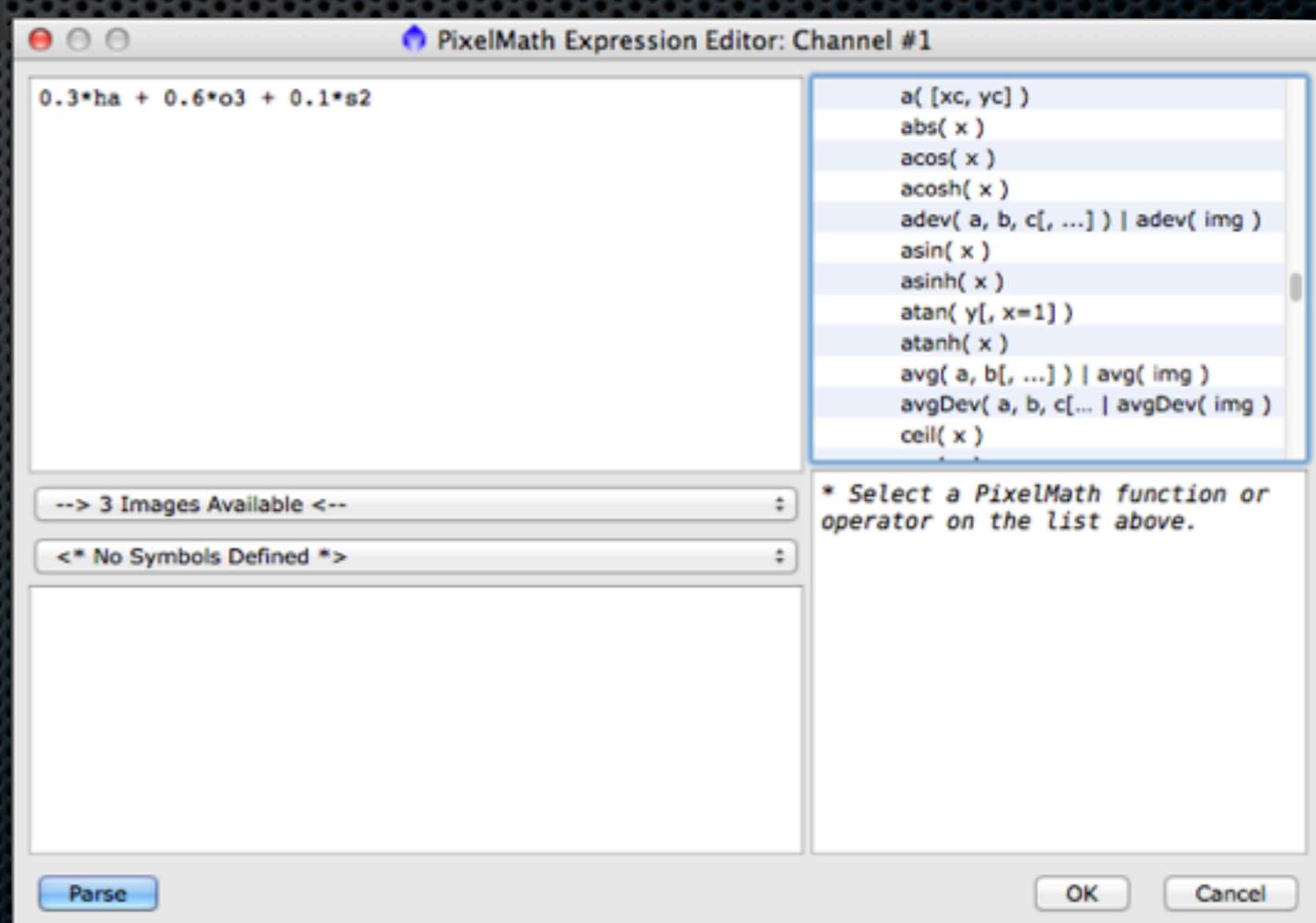
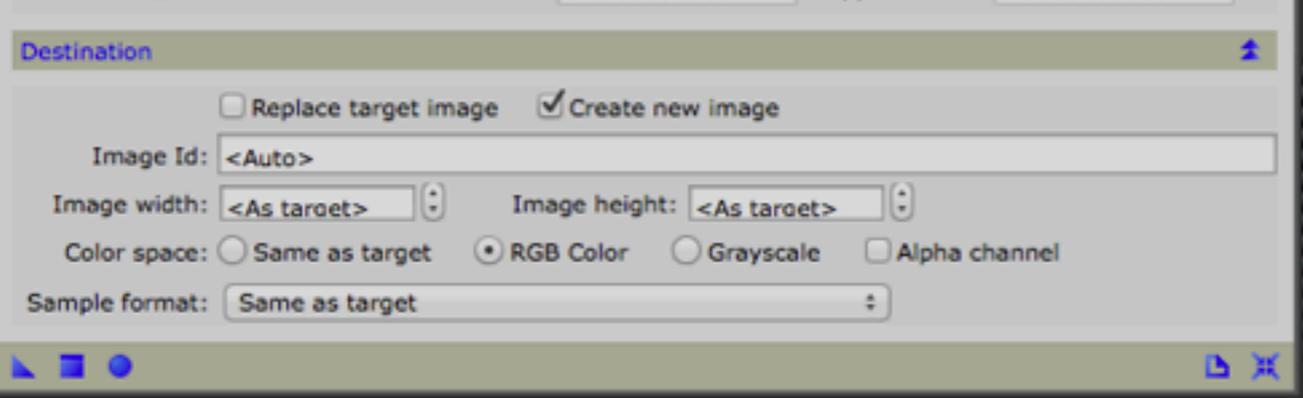
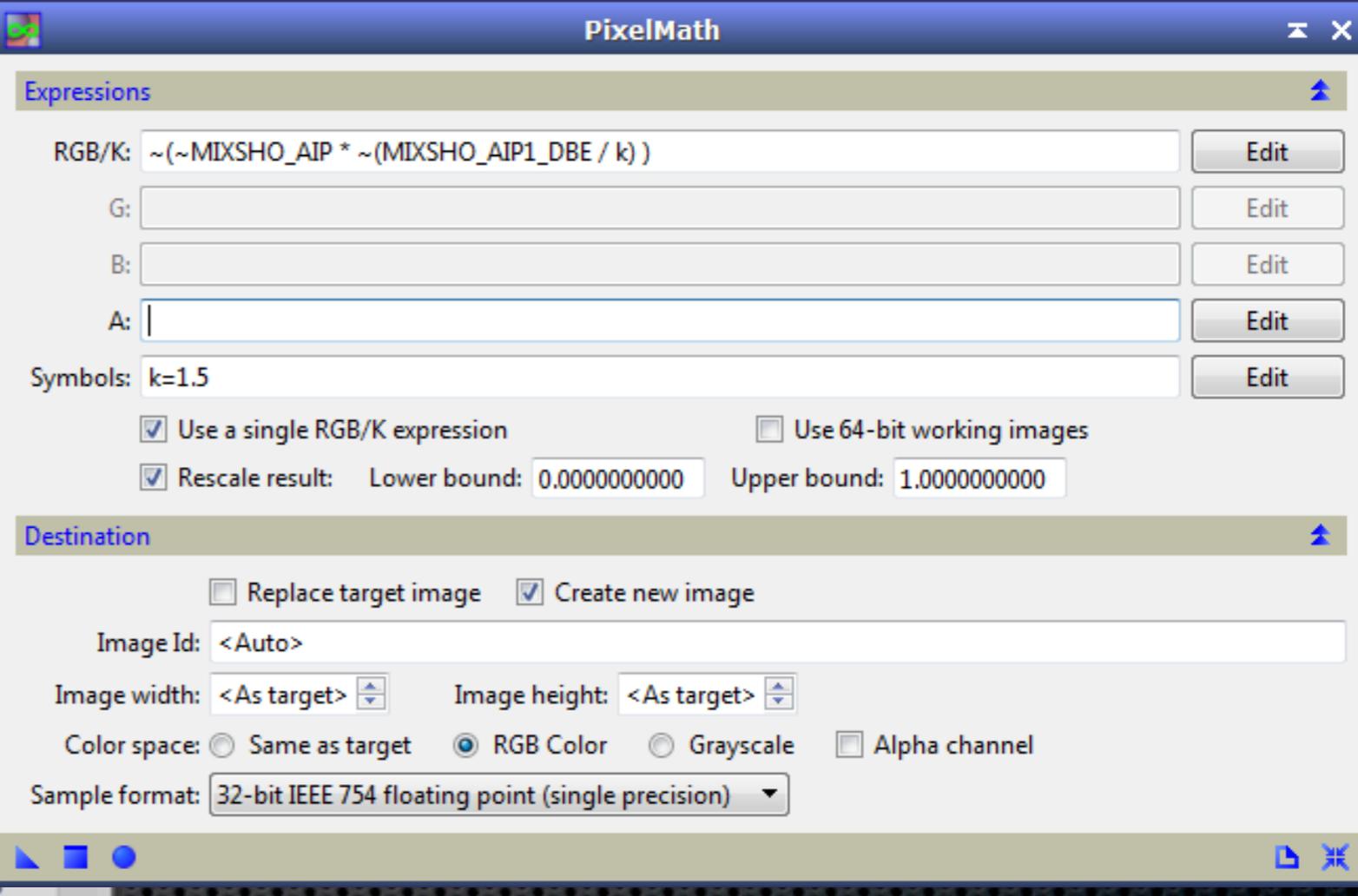
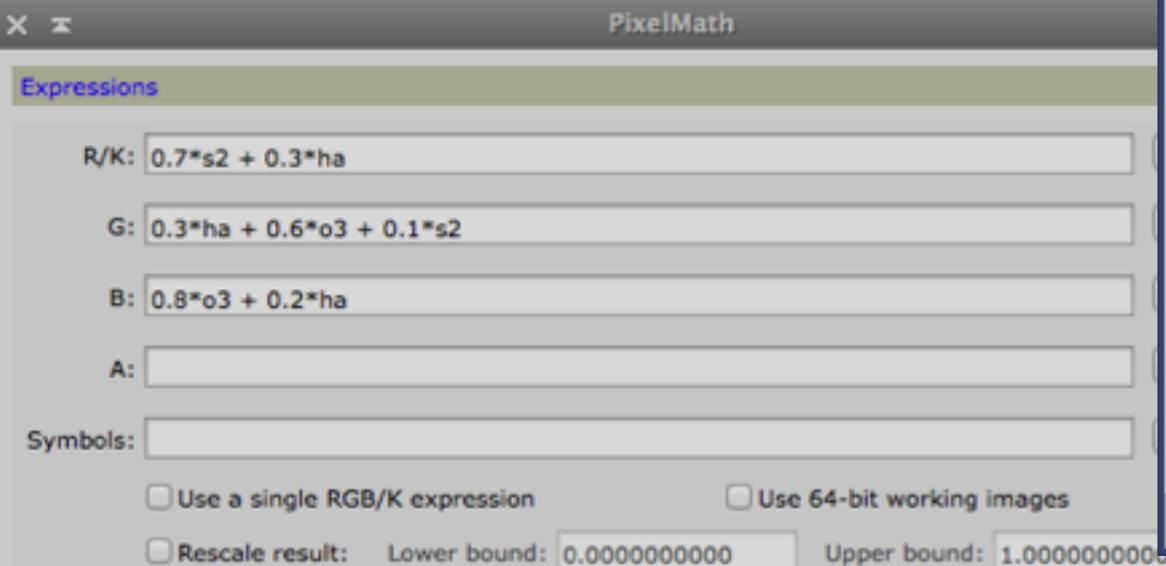
The screenshot displays the DynamicBackgroundExtraction software interface. It features two main image windows: 'Image05' on the left, which shows a galaxy image with a grid of small square markers overlaid, and 'Image05_DBE' on the right, which shows the same galaxy image with the background extracted, leaving only the stars and the galaxy structure. A 'ScreenTransferFunction: Image05' window is visible at the bottom left, showing color bars for Red (R), Green (G), Blue (B), and Luminance (L). On the right side, there is a 'DynamicBackgroundExtraction' control panel with various settings:

- Selected Sample:** 55 of 126
- Sample #:** 55
- Anchor X:** 1857
- Anchor Y:** 1197
- Radius:** 20
- R/K:** 0.002537
- G:** 0.003620
- B:** 0.003985
- Fixed:**
- Wr:** 0.969
- Wg:** 0.966
- Wb:** 0.959
- Model Parameters (1):**
 - Tolerance:** 1.000
 - Shadows relaxation:** 3.000
 - Smoothing factor:** 0.250 Unweighted
- Model Parameters (2):**
- Sample Generation:**
 - Default sample radius:** 20
 - Samples per row:** 10
 - Minimum sample weight:** 0.750
 - Sample color:** [Color Picker]
 - Selected sample color:** [Green]
 - Bad sample color:** [Red]
- Model Image:**
- Target Image Correction:**
 - Correction:** Subtraction
 - Normalize
 - Discard background model
 - Replace target image
 - Identifier:** <Auto>
 - Sample format:** Same as target

AutomaticBackgroundExtractor



PixelMath



INDISPENSABLE !

La déconvolution : la PSF

The screenshot displays the Pixinsight 1.7 x86 interface. The main window shows a grayscale image of a star field with green crosses marking detected stars. The 'DynamicPSF' panel on the right lists parameters for 63 stars, including Moffat model coefficients (B, A), centroid coordinates (cx, cy), and FWHM values. The 'Average Star Data' dialog box in the foreground provides a summary of the average Moffat PSF for the 63 stars, with the FWHMx and FWHMy values circled in orange.

Star ID	Ch	B	A	cx	cy	sx	sy	FWHMx	FWHMy	r	theta
1	0	0.013667	0.033037	792.40	438.50	2.18	2.01	1.91px	1.76px	0.920	171.79
2	0	0.013732	0.159002	701.96	527.80	2.10	2.01	1.92px	1.83px	0.954	162.46
3	0	0.013715	0.006480	595.36	1307.25	2.01	1.92	1.90px	1.81px	0.955	153.63
4	0	0.013745	0.030206	853.95	1191.43	2.32	2.19	1.92px	1.81px	0.945	170.81
5	0	0.013713	0.012010	1383.55	1182.55	2.41	2.26	1.95px	1.82px	0.935	165.99
6	0	0.013697	0.011685	1156.41	1864.49	2.04	1.93	1.91px	1.81px	0.945	4.12
7	0	0.013736	0.026384	859.51	1659.82	2.17	2.10	1.90px	1.84px	0.969	163.58
8	0	0.013721	0.015735	885.71	1696.92	2.45	2.32	1.92px	1.82px	0.945	165.49

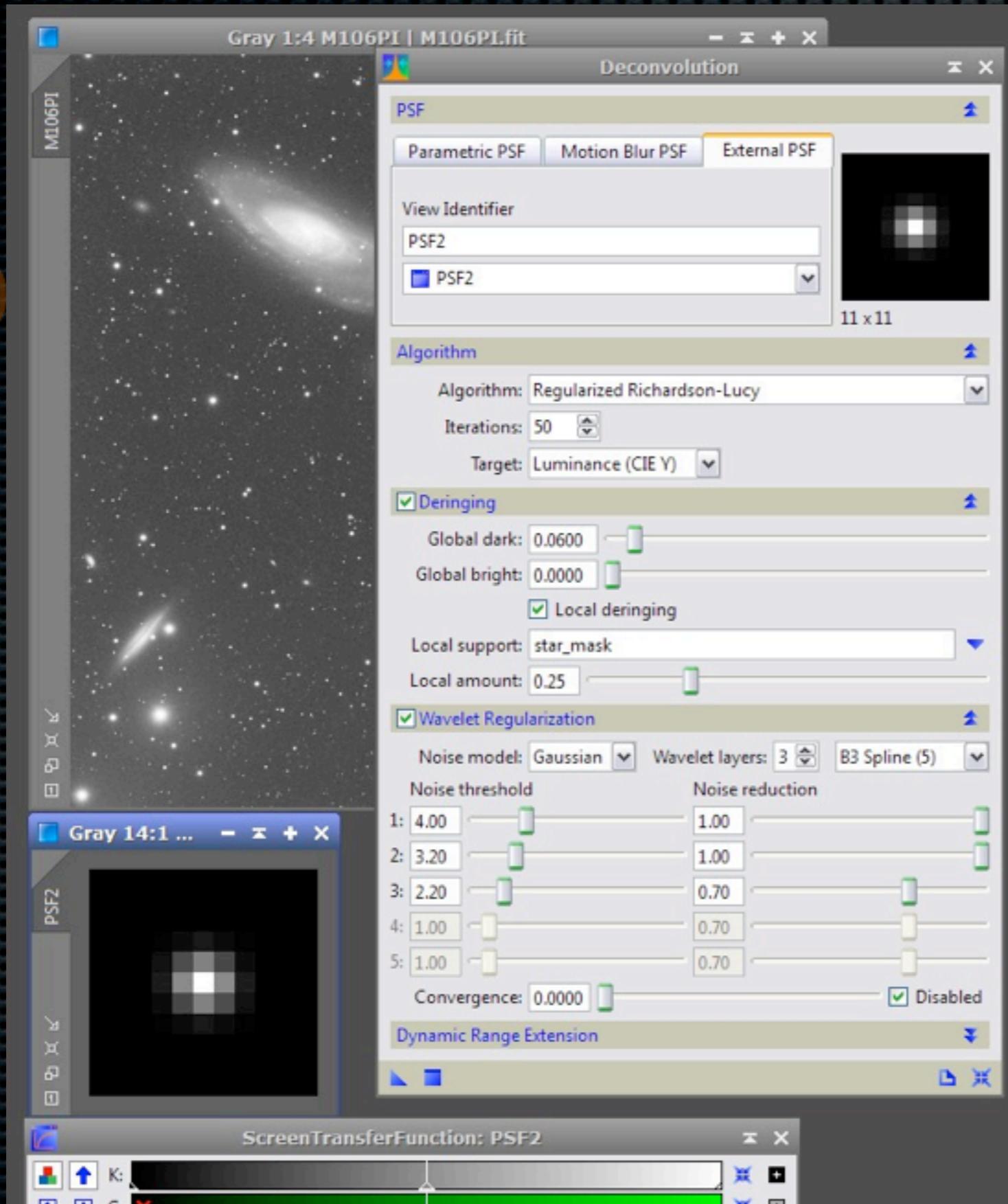
Average Star Data

Average Moffat PSF

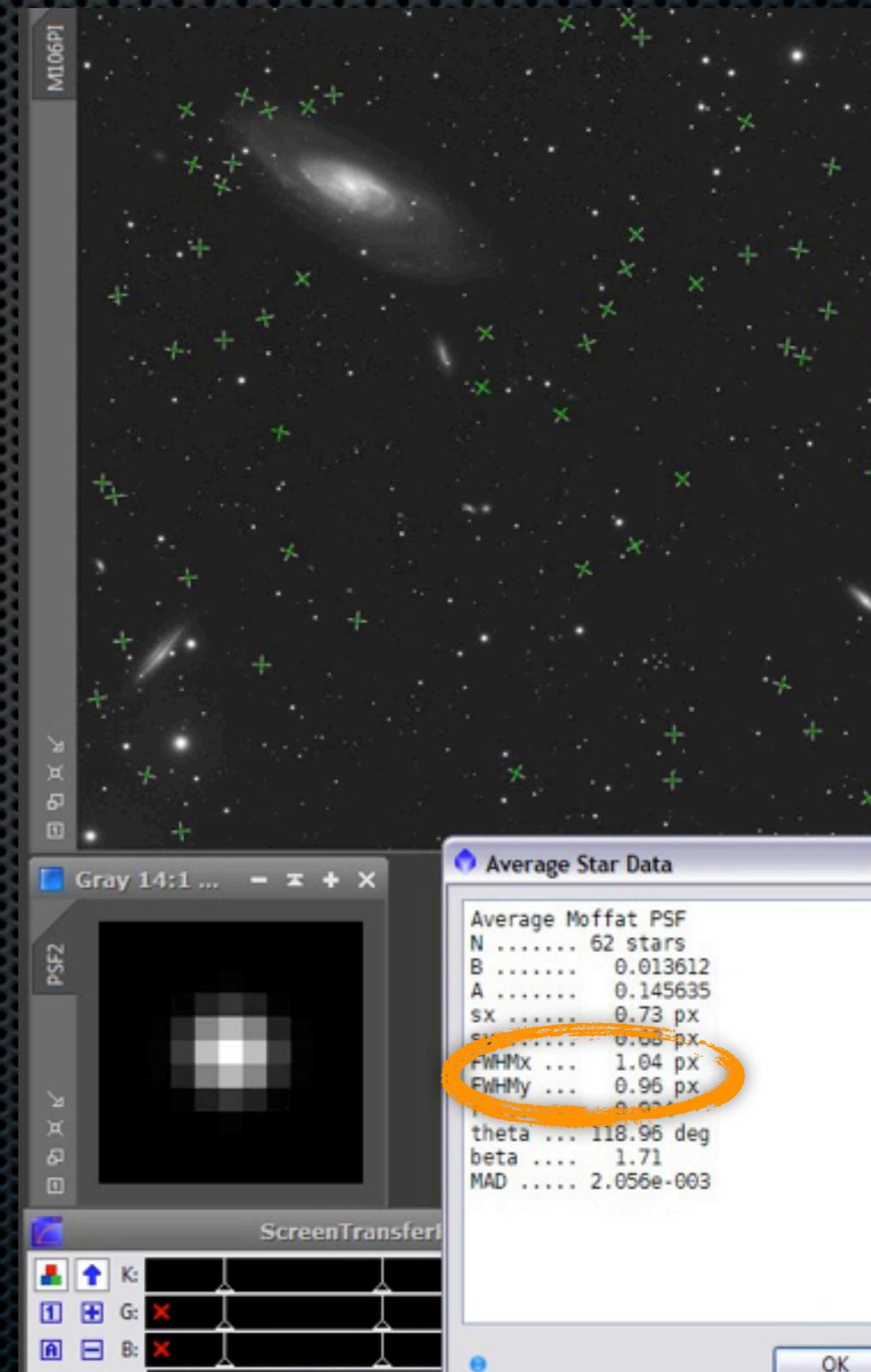
- N 63 stars
- B 0.013778
- A 0.044840
- sx 2.17 px
- sy 2.04 px
- FWHMx ... 1.92 px
- FWHMy ... 1.80 px
- r 0.938
- theta 154.53 deg
- beta 3.89
- MAD 5.226e-003

La déconvolution

PixInsight



The screenshot shows the 'Deconvolution' dialog box in PixInsight. The 'PSF' section is set to 'External PSF' with 'PSF2' selected. The 'Algorithm' is 'Regularized Richardson-Lucy' with 50 iterations and 'Luminance (CIE Y)' target. The 'Deringing' section is checked, with 'Global dark' at 0.0600, 'Global bright' at 0.0000, and 'Local deringing' checked. The 'Wavelet Regularization' section is checked, with 'Noise model' set to 'Gaussian', 'Wavelet layers' at 3, and 'B3 Spline (5)' selected. The 'Noise threshold' and 'Noise reduction' sliders are visible, with values ranging from 1.00 to 4.00. The 'Convergence' is set to 0.0000 and 'Dynamic Range Extension' is disabled.



The screenshot shows the 'Average Star Data' dialog box in PixInsight. The 'Average Moffat PSF' section is visible, with the following data:

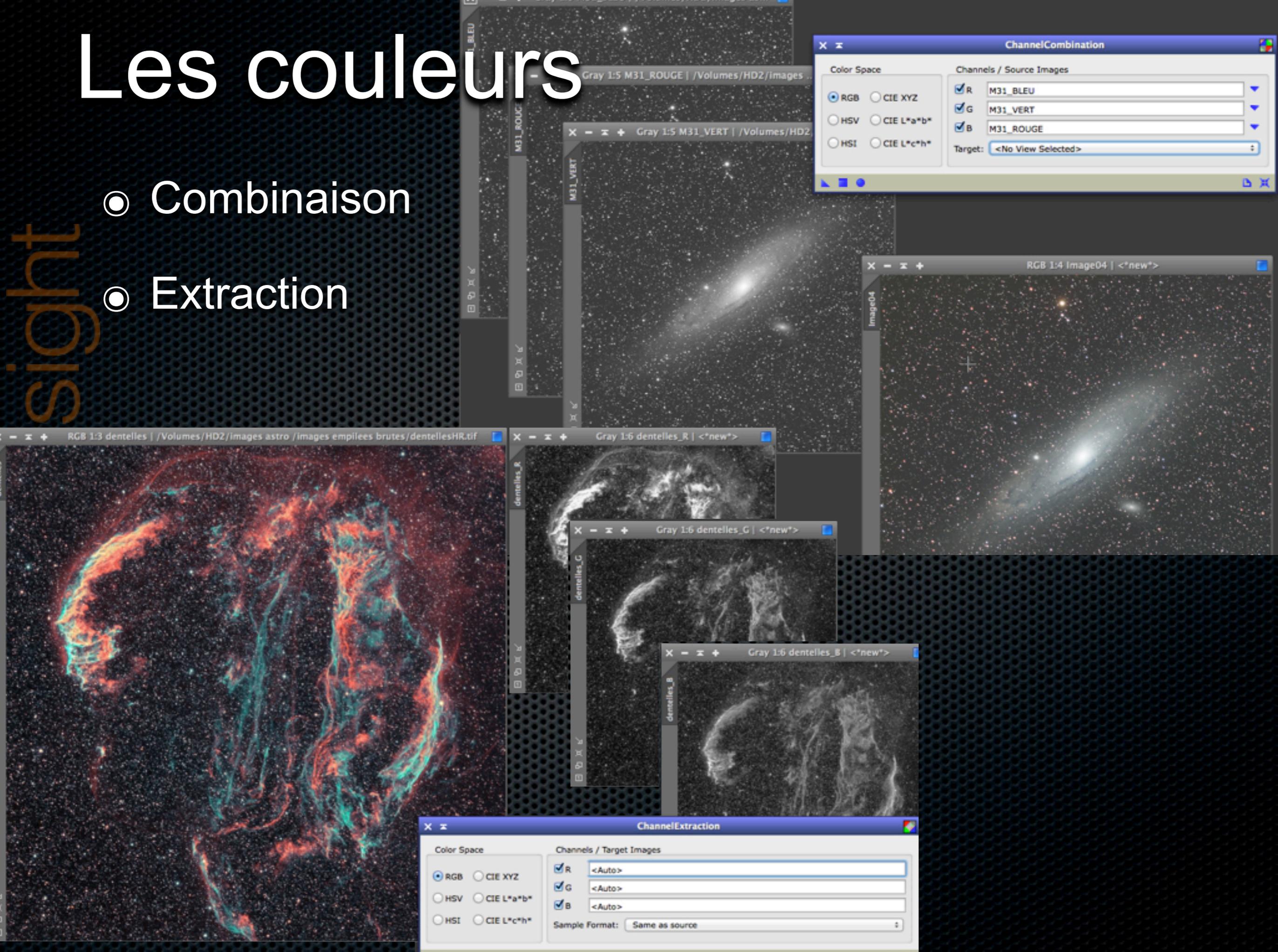
Parameter	Value
N	62 stars
B	0.013612
A	0.145635
sx	0.73 px
sy	0.68 px
FWHMx	1.04 px
FWHMy	0.96 px
theta	118.96 deg
beta	1.71
MAD	2.056e-003

The 'FWHMx' and 'FWHMy' values are circled in orange.

Les couleurs

- Combinaison
- Extraction

sight



La calibration des couleurs

PixInsight

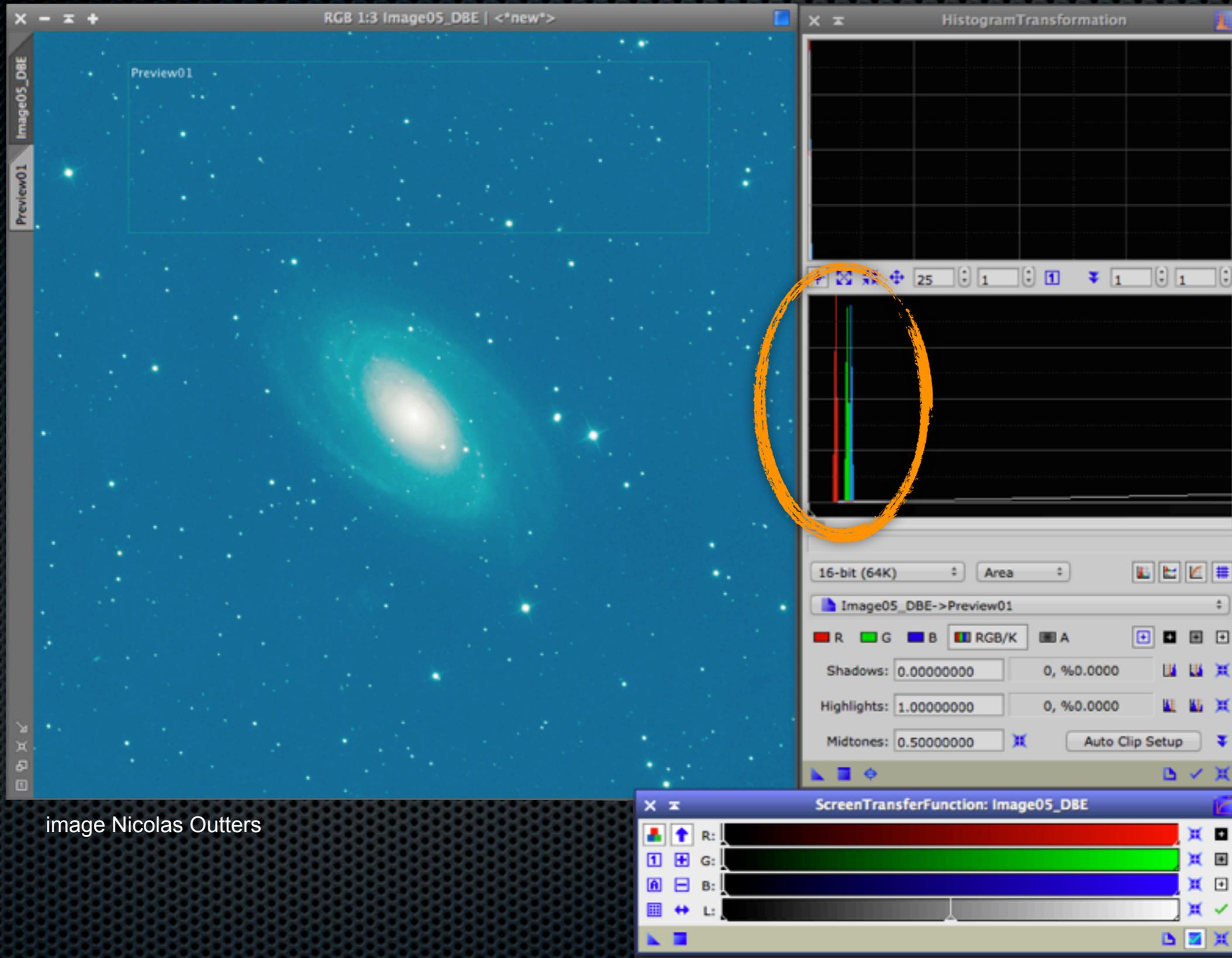
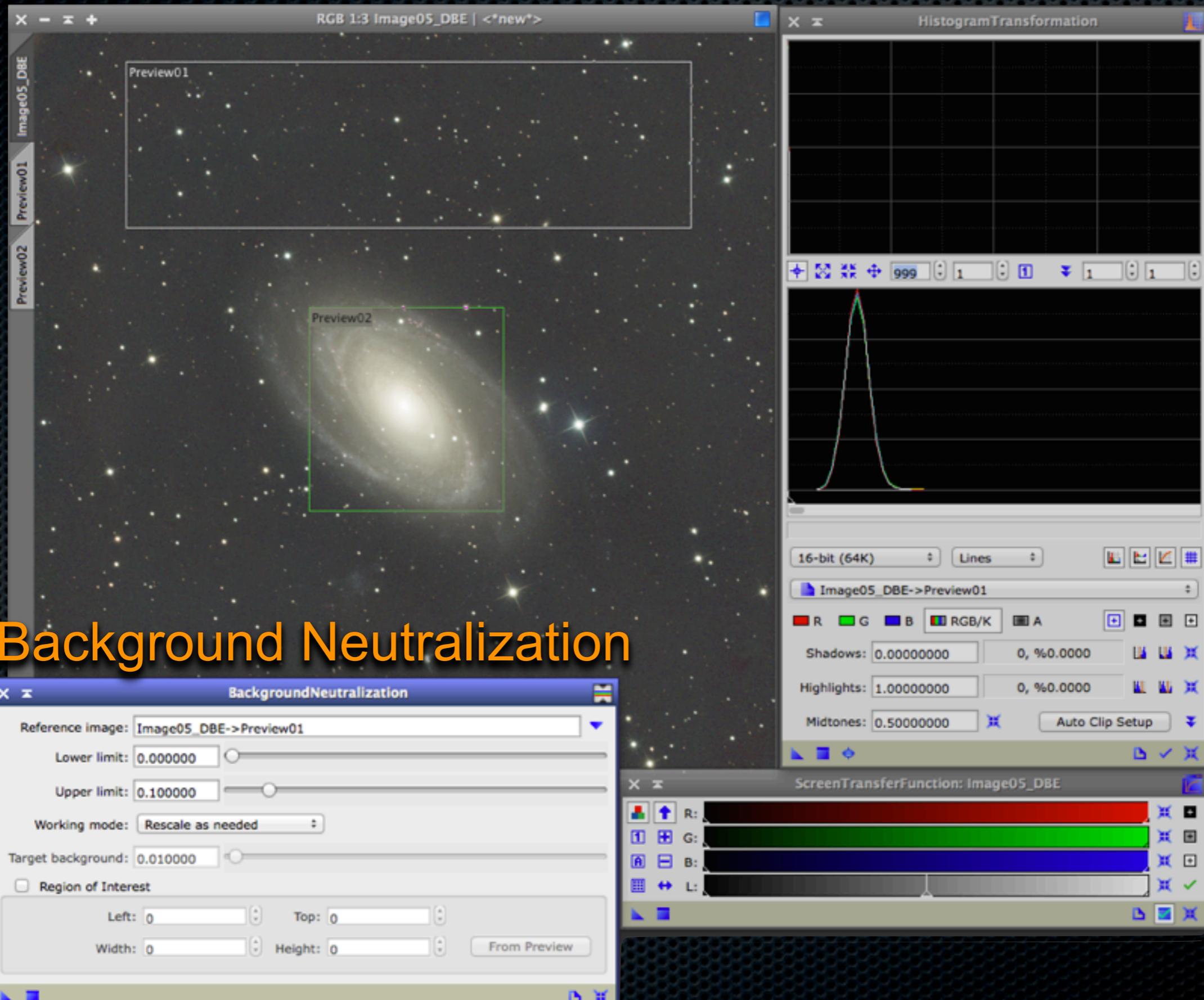


image Nicolas Outters

La calibration des couleurs

PixInsight



Background Neutralization

La calibration des couleurs

PixInsight

The screenshot displays the PixInsight interface with the 'Color Calibration' dialog box open. The main window shows a galaxy image with two preview windows: 'Preview01' (top left) and 'Preview02' (center). The 'Color Calibration' dialog has two sections: 'White Reference' and 'Background Reference'. The 'White Reference' section is active, with 'Reference image' set to 'Image05_DBE->Preview02', 'Lower limit' at 0.00000, and 'Upper limit' at 0.90000. The 'Background Reference' section has 'Reference image' set to 'Image05_DBE->Preview01', 'Lower limit' at 0.000000, and 'Upper limit' at 0.100000. A color calibration bar is visible at the bottom of the dialog, showing sliders for Red, Green, Blue, and Luminance.

Color Calibration

La calibration des couleurs

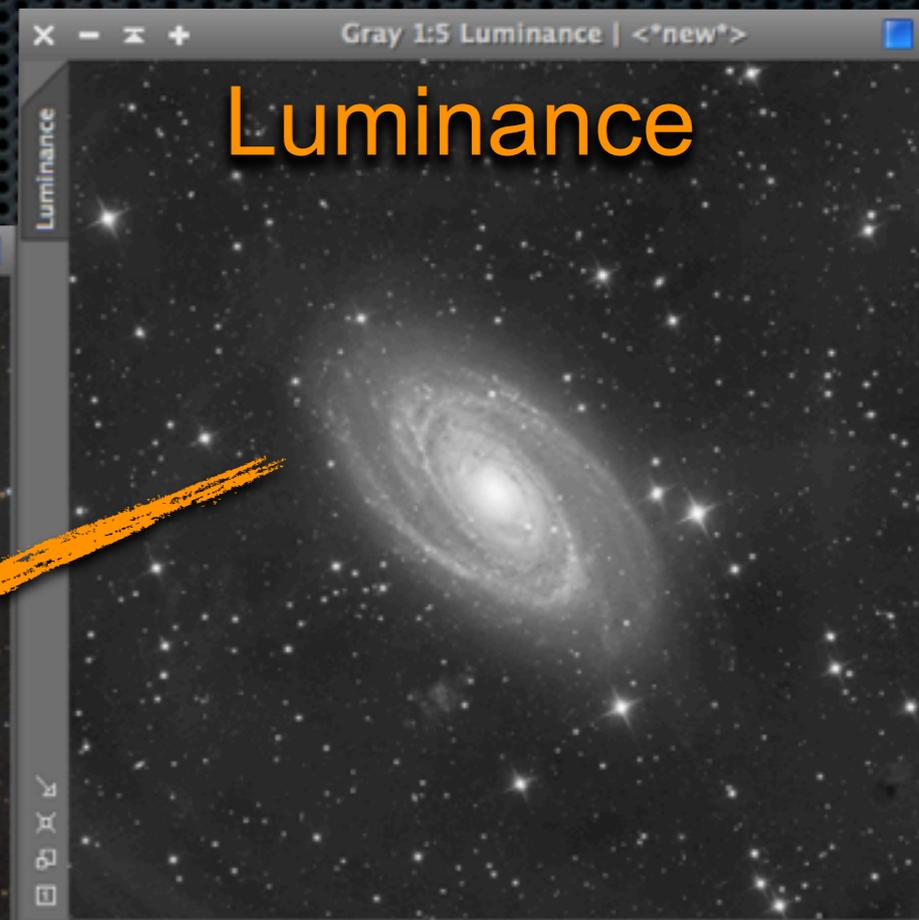
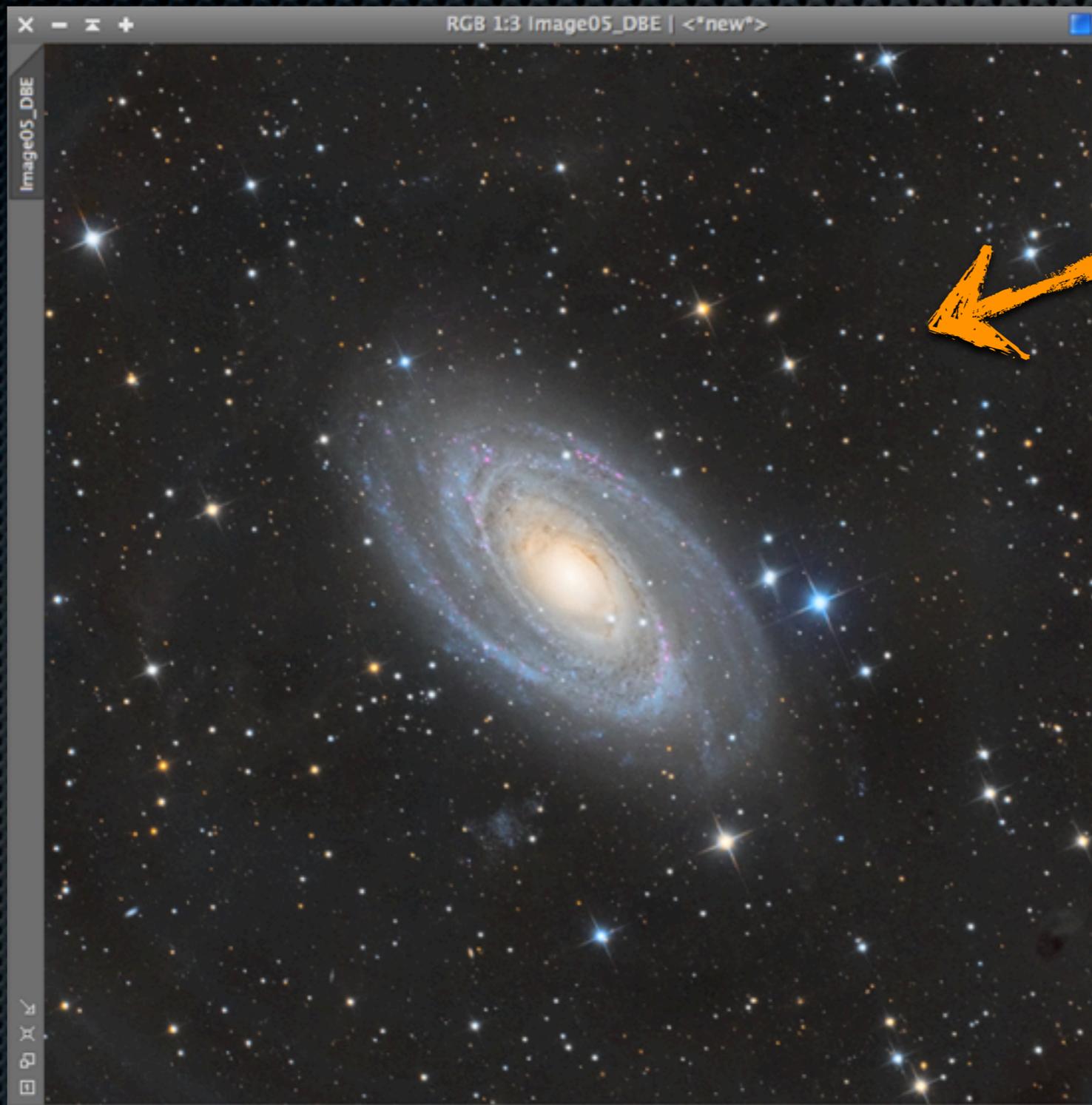
PixInsight

The screenshot displays the PixInsight interface with the following components:

- Main Window:** Shows the original image 'Image05_DBE' with two preview windows: 'Preview01' (top) and 'Preview02' (bottom). An orange arrow points from 'Preview01' to the top histogram window, and another points from 'Preview02' to the bottom histogram window.
- Top Histogram Window:** Titled 'HistogramTransformation', it shows a histogram for 'Image05_DBE->Preview01'. The histogram has a single sharp peak, indicating a narrow range of colors. The 'Shadows' and 'Highlights' sliders are both set to 1.0000000.
- Bottom Histogram Window:** Also titled 'HistogramTransformation', it shows a histogram for 'Image05_DBE->Preview02'. The histogram is much wider and more complex, showing multiple peaks and valleys, indicating a broader color range. The 'Shadows' slider is set to 0.0000000 and the 'Highlights' slider is set to 1.0000000. The 'Midtones' slider is set to 0.5000000. The 'Auto Clip Setup' button is visible.

LRGB

PixInsight



LRGBCombination

Channels / Source Images

- L Luminance
- R <Auto>
- G <Auto>
- B <Auto>

Target: <No View Selected>

Channel Weights

Transfer Functions

Lightness: 0.500

Saturation: 0.200

Chrominance Noise Reduction

Smoothed wavelet layers: 4

Protected wavelet layers: 2

This panel contains the settings for the LRGBCombination process. It includes checkboxes for the L, R, G, and B channels, a 'Target' dropdown, sliders for 'Lightness' (0.500) and 'Saturation' (0.200), a checked 'Chrominance Noise Reduction' option, and numerical inputs for 'Smoothed wavelet layers' (4) and 'Protected wavelet layers' (2).

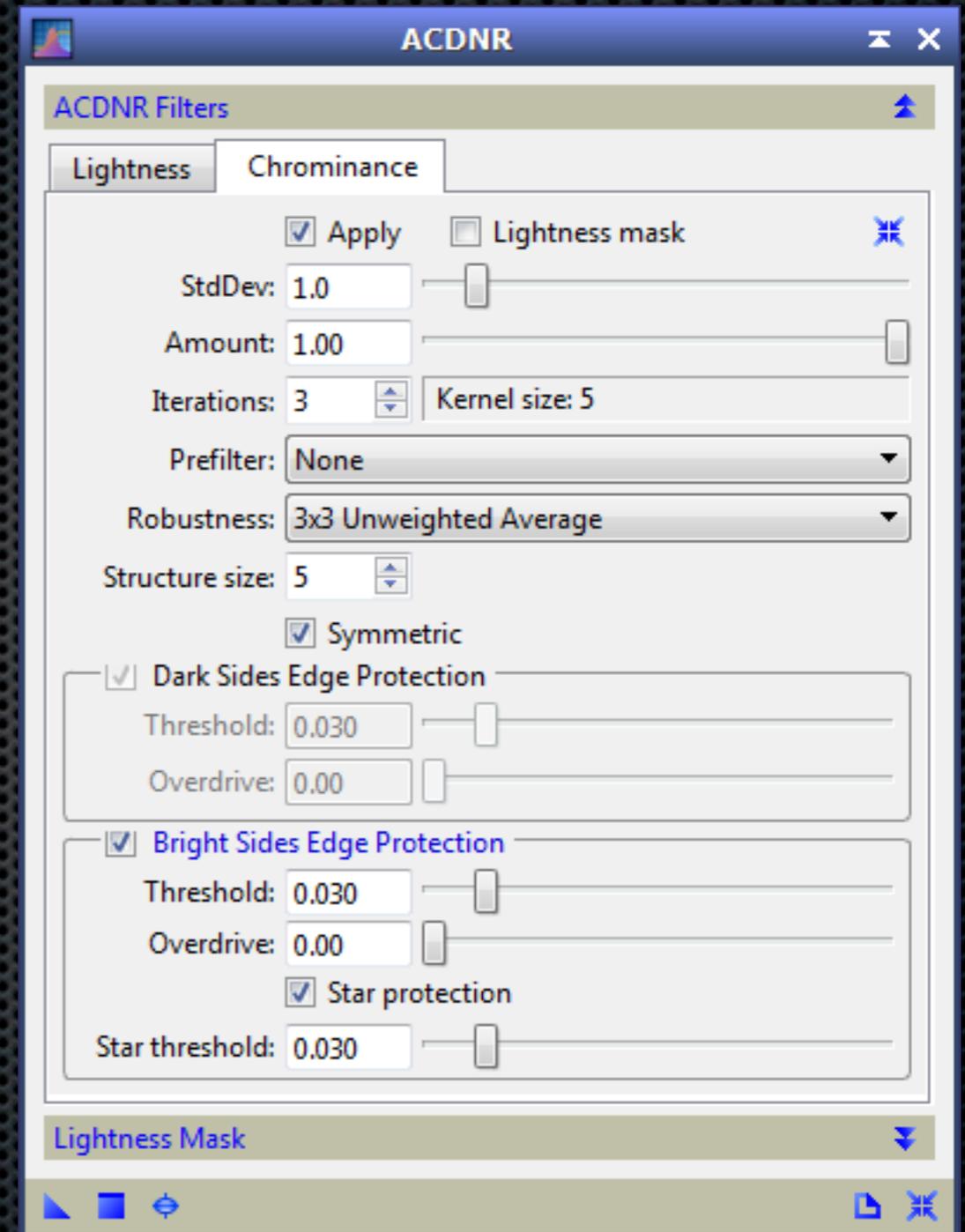
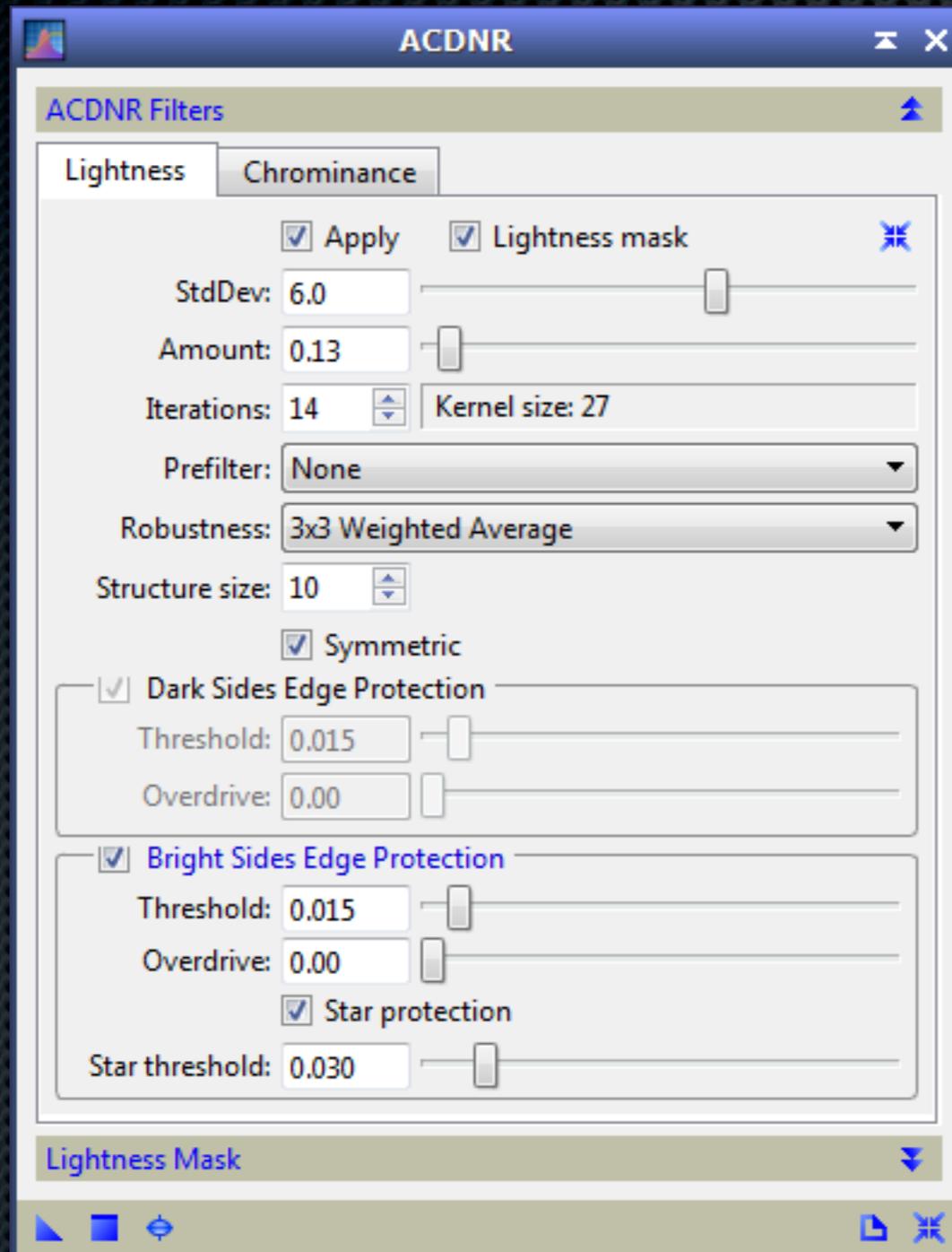
Le bruit... pas moins de 6 fonctions

La réduction du bruit est souvent une étape clé du traitement mais c'est aussi une décision puisqu'il y a toujours un risque que l'algorithme détruise des données essentielles en plus du bruit.

- **ACDNR** *Adaptive contrast-driven noise reduction* (Lum+Chroma / non-linéaire)
- **SCNR** *Subtractive Chromatic Noise Reduction* (Chroma / non-linéaire)
- **GREYCstoration** (Lum / non-linéaire)
- **ATrouWaveletTransform** (Lum+Chroma / linéaire, non-lin.)
- **MultiscaleMedianTransform** (Lum+Chr / lin., non-lin)
- **LRGB Combination** (Chroma / non-linéaire)

ACDNR

PixInsight



Luminance

Chroma

MultiscaleMedianTransform

ATrouWaveletTransform

PixInsight

Luminance
et/ou
Chroma

MultiscaleMedianTransform

Wavelet Layers

Dyadic Linear: 0 Layers: 8

Scaling Function: B3 Spline (5)

Layer	Scale	Parameters
✓ 1	1	S(t=1.0000, s=0.10, a=1.5000)
✓ 2	2	S(t=1.0000, s=0.10, a=1.0000)
✓ 3	4	S(t=1.0000, s=0.10, a=0.5000)
✓ 4	8	S(t=1.0000, s=0.10, a=0.3000)
✓ 5	16	S(t=1.0000, s=0.10, a=0.1000)
✓ 6	32	S(t=0.5000, s=0.10, a=0.0000)
✓ 7	64	S(t=0.3000, s=0.10, a=0.0000)
✓ 8	128	
✓ R	256	

Multiscale Layer 1/8

Bias: 0.000

Noise Reduction

Threshold: 1.0000

Amount: 0.10

Adaptive: 1.5000

Dynamic Range Extension

Target: RGB/K components Layer Preview: No layer preview

ATrouWaveletTransform

Wavelet Layers

Dyadic Linear: 0 Layers: 8

Scaling Function: B3 Spline (5)

Layer	Scale	Parameters
✓ 1	1	
✓ 2	2	
✓ 3	4	
✓ 4	8	
✓ 5	16	
✓ 6	32	
✓ 7	64	
✓ 8	128	
✓ R	256	

Detail Layer 1/8

Bias: 0.000

Noise Reduction

Threshold: 3.000

Amount: 1.00

Iterations: 1

k-Sigma Noise Thresholding

Threshold: 3.00

Amount: 0.50

Soft thresholding

Use multiresolution support

Deringing

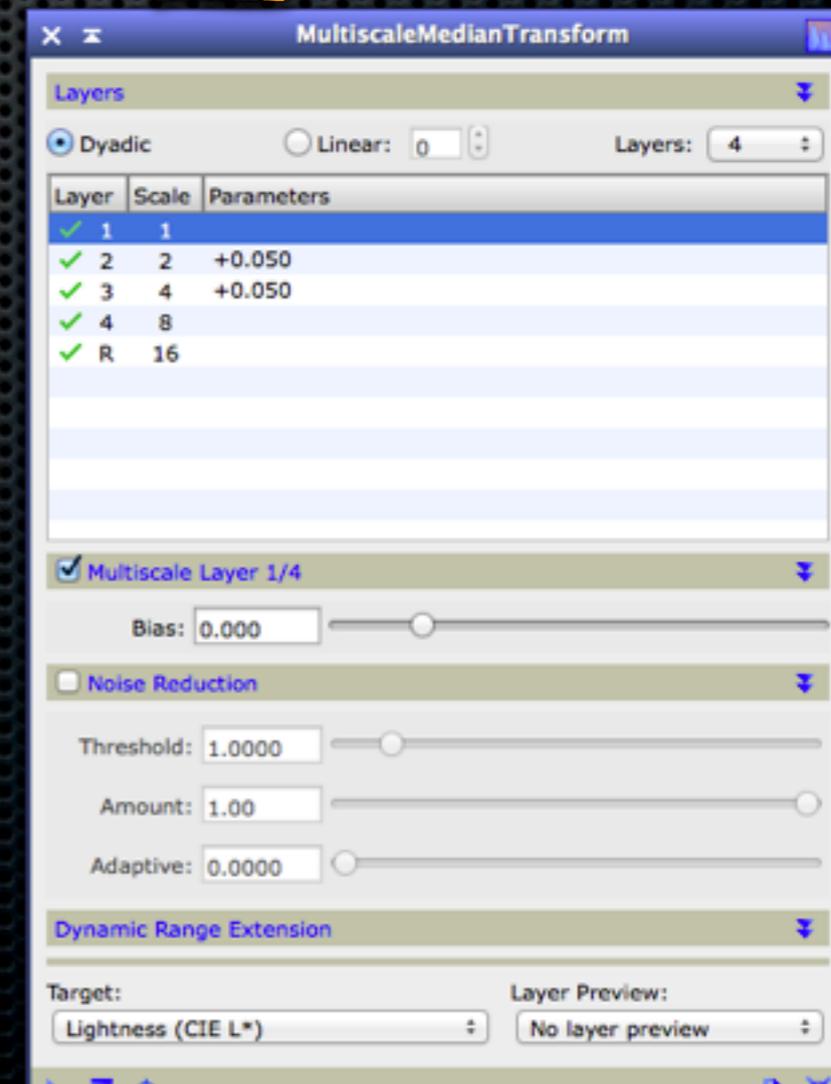
Large-Scale Transfer Function

Dynamic Range Extension

Target: RGB/K components Layer Preview: No layer preview

L'accentuation... 5 fonctions

- UnsharpMask
- MultiscaleMedianTransform 
- ATrouWaveletTransform
- RestorationFilter
- Deconvolution

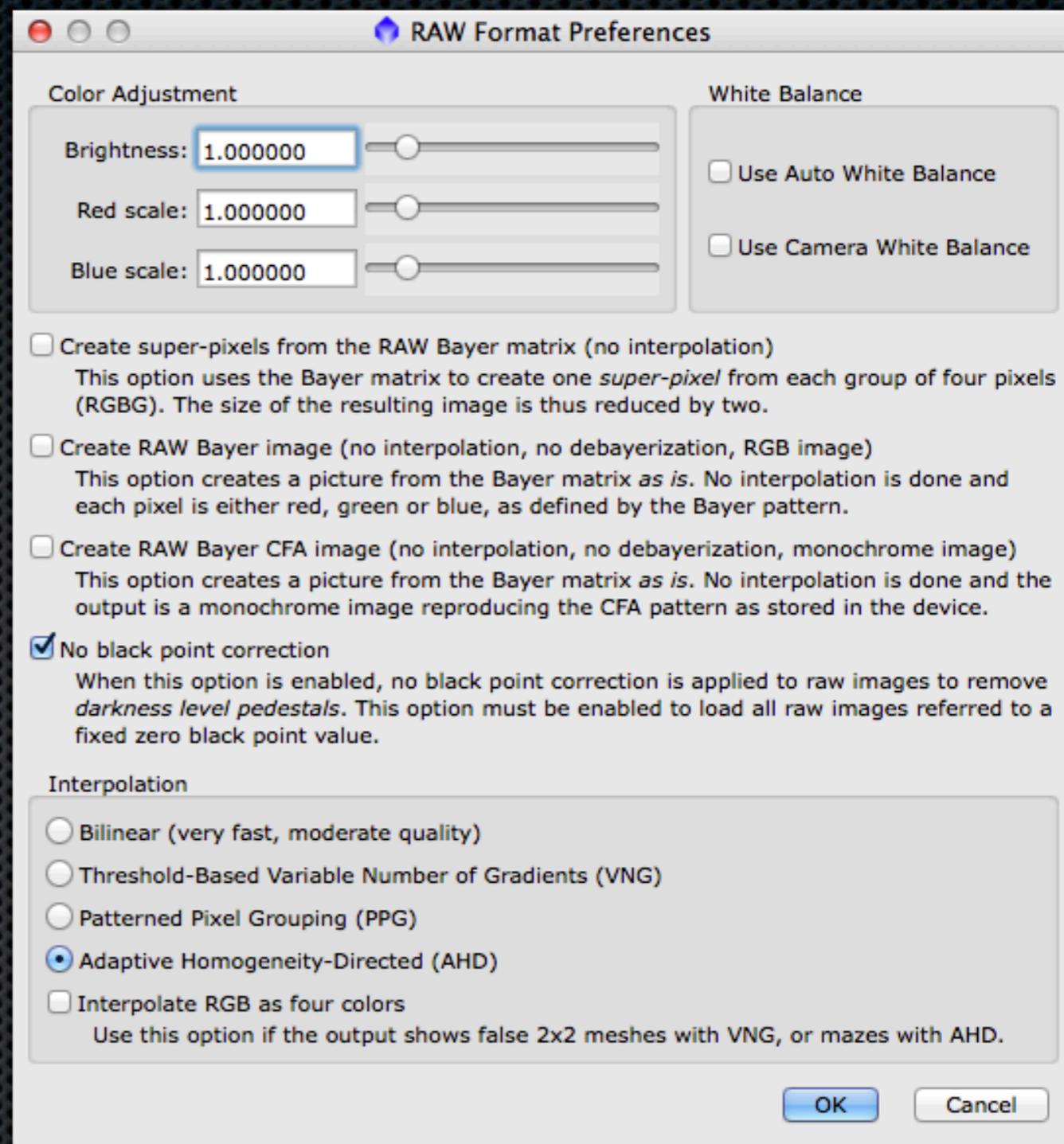
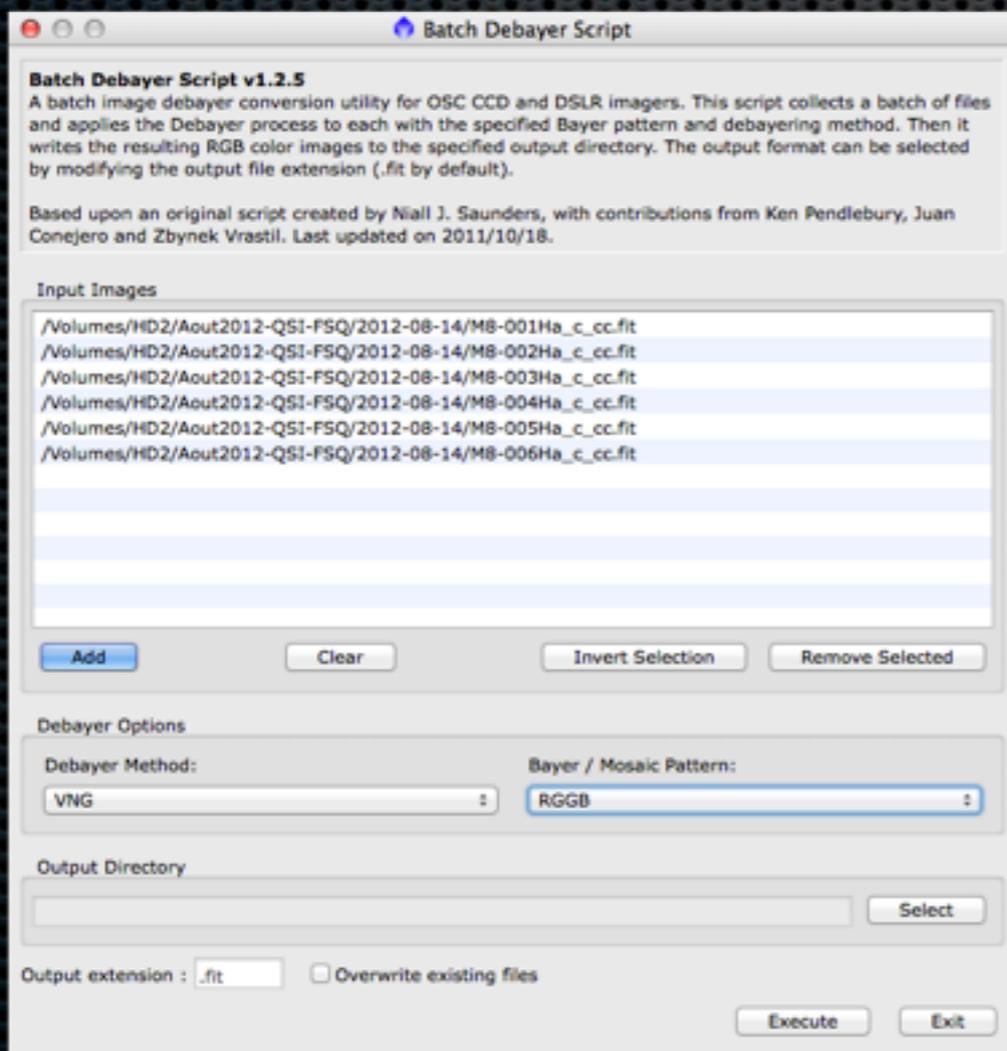


Les APN

● RAW

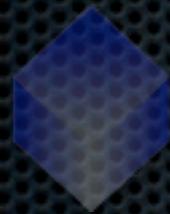
● Debayer

PixInsight

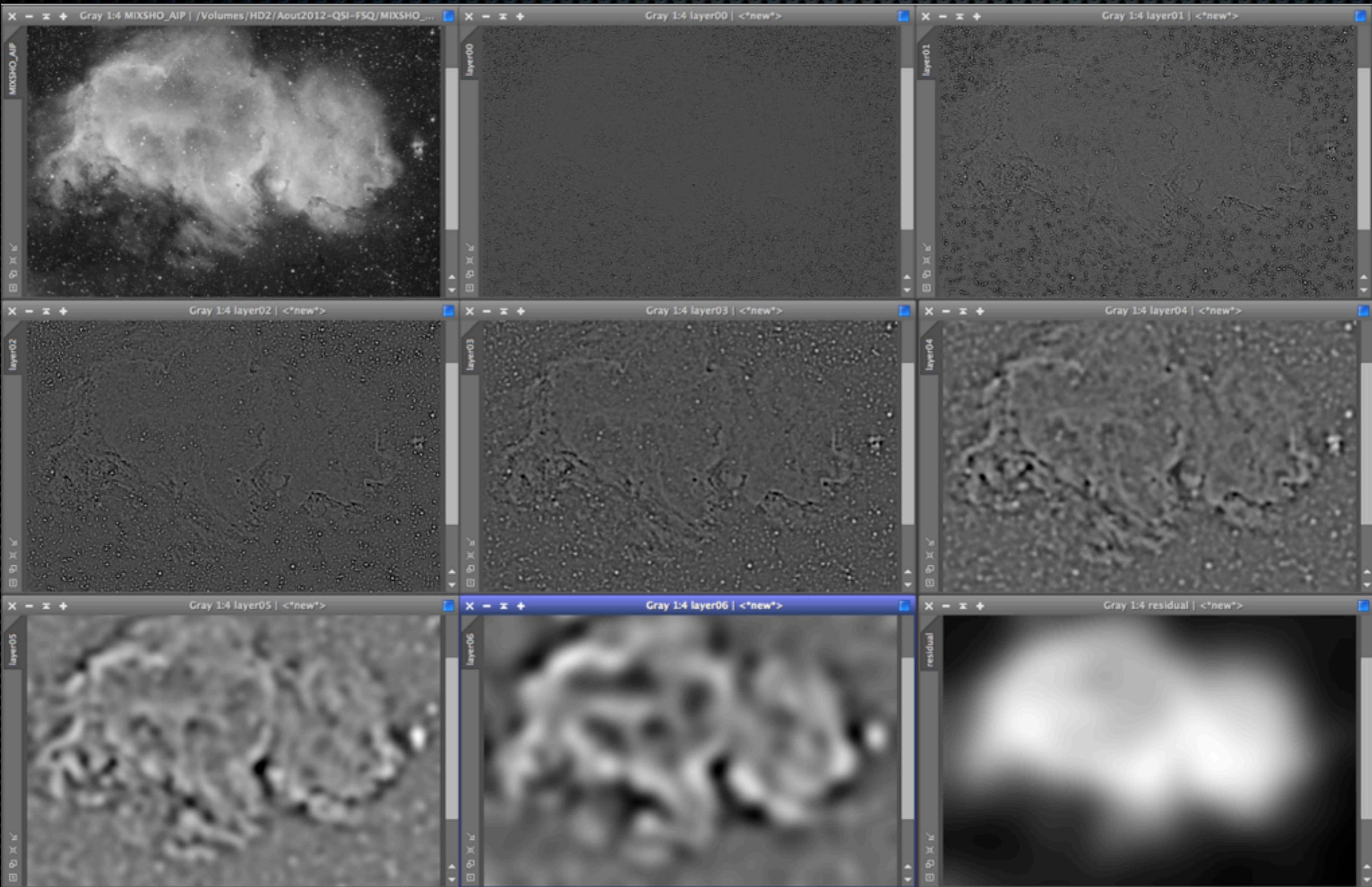


Et les autres...

- Fonctions géométriques
- Fonctions d'interpolation
- Couleurs
- Transformée de Fourier
- HDR sur plusieurs images
- Mosaïques
- *j'en oublie...*



Multiscale : analysez vos images



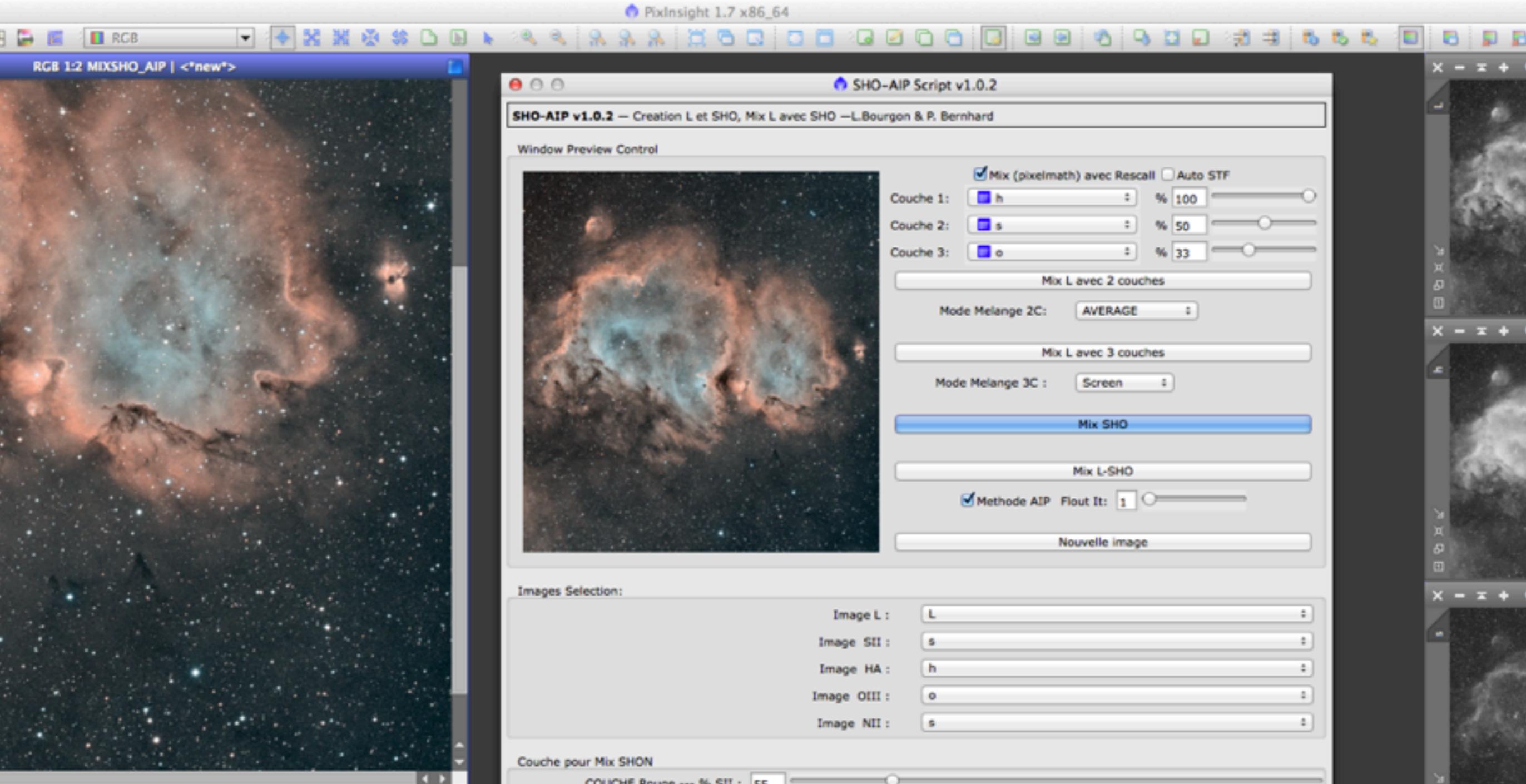
Les scripts

The screenshot displays the PixInsight Script Editor interface. On the left, a 'View Explorer' pane lists various 'External Objects' under 'Core JavaScript Objects', including ACDNR, ATrousWaveletTransf..., AdaptiveStretch, Annotation, AssignICCProfile, AssistedColorCalibra..., AutoHistogram, AutomaticBackgrou..., B3Estimator, BackgroundNeutraliz..., Binarize, Blink, ChannelCombination, ChannelExtraction, ChannelMatch, CloneStamp, ColorCalibration, ColorManagementSet..., ColorSaturation, ConvertToGrayscale, ConvertToRGBColor, Convolution, CosmeticCorrection, CreateAlphaChannels, Crop, CurvesTransformation, Debayer, Deconvolution, DefectMap, DigitalDevelopment, Divide, DynamicAlignment, DynamicBackgroundE..., and DynamicCrop.

The main editor window, titled 'SHO-AIP.js', contains the following JavaScript code:

```
334 }
335
336 var engine = new Inset;
337
338 function ii_dialog() {
339
340 this. base = Dialog;
341 this. base ();
342 var labelWidth1 = this.font.width( "-----" + 'T' );
343
344 this.ApplyAutoSTF = function( view, shadowsClipping, targetBackground)
345 {
346     var stf = new ScreenTransferFunction;
347
348     var n = view.image.isColor ? 3 : 1;
349
350     var A = [ // c0, c1, m, r0, r1
351             [0, 1, 0.5, 0, 1],
352             [0, 1, 0.5, 0, 1],
353             [0, 1, 0.5, 0, 1],
354             [0, 1, 0.5, 0, 1] ];
355
356     for ( var c = 0; c < n; ++c ) {
357         view.image.selectedChannel = c;
358         var median = view.image.median();
359         var avgDev = view.image.avgDev();
360
361         if ( median < 0.5 ) { // Noninverted channel
362             var c0 = Math.range( median + shadowsClipping*avgDev, 0.0, 1.0 );
363             var m = findMidtonesBalance( targetBackground, median - c0 );
364             A[c] = [c0, 1, m, 0, 1];
365         } else { // Inverted channel
366             var c1 = Math.range( median - shadowsClipping*avgDev, 0.0, 1.0 );
367             var m = 1 - findMidtonesBalance( targetBackground, c1 - median );
368             A[c] = [0, c1, m, 0, 1];
369         }
370     }
371
372     stf.STF = A;
373     view.image.resetSelections();
374     stf.executeOn( view );
375 }
376
377 this.Calculate_L = function(c)
378 {
379     if(Dejala==0)
380     {
381         Dejala=1;
382         this.cursor = new Cursor( StdCursor_ArrowWait);
383         console.show();
384         var scale L1 = opacityL1/100;
385         var scale L2 = opacityL2/100;
386         var FL1 = format("%.2f", scale_L1);
387         var FL2 = format("%.2f", scale_L2);
388
389         var FL = "";
390
391         if(c==3)
392         {
393             var scale L3 = opacityL3/100;
394             var FL3 = format("%.2f", scale_L3);
395
396
```

The status bar at the bottom shows the file path: /Volumes/HD2/scripts Pixinsight/SHO/SHO-AIP.js, the page number 128, and the version 1. The system tray on the right shows 'INS'.



Les scripts

```
putative star pair matches.
forming RANSAC ...
star pair matches in 130 RANSAC iterations.
ary of model properties:
ers : 0.762
lapping : 0.978
arity : 0.964
ity : 0.883
ean square error:
: 0.345 px
age RMS error deviation:
: 0.204 px
errors:
: 1.381 px
: 1.236 px
sformation matrix:
-0.9997 -0.8255 +2064.7347
+0.0257 -1.0081 +2012.4393
+0.0000 +0.0000 +1.0000
e : 0.999
tion : -181.45°
: +2064.73 px
: +2012.44 px
3 s
ation 2, delta = 0.197 arcsec (0.1 pixels)
e center ..... RA: 02 55 00.279 Dec: +60 31 01.72
lution ..... 3.93 arcsec/pix
e Plate Solver script version 1.51
entiation Matrix (Gnomonic projection = Matrix * Coords[x,y]):
+0.001091148462 -0.000027856936 -1.004035520758
+0.000020000633 +0.001090779784 -1.140105925929
+0.000000000000 +0.000000000000 +1.000000000000
lution ..... 3.929 arcsec/pix
tion ..... 178.543 deg
l ..... 388.51 mm
l size ..... 7.40 um
d of view ..... 2d 13' 30.7" x 2d 13' 26.8"
e center ..... RA: 02 55 00.279 Dec: +60 31 01.72
e bounds:
op-left ..... RA: 02 46 37.861 Dec: +59 21 35.76
op-right ..... RA: 03 04 06.317 Dec: +59 24 54.37
ottom-left .... RA: 02 45 33.064 Dec: +61 34 44.36
ottom-right ... RA: 03 04 15.897 Dec: +61 38 16.98
--execute-mode=auto
lications/PixInsight64.app/Contents/src/scripts/ImageSolver+AnnotateImage/ImageSolver.js"
essing script file:
lications/PixInsight64.app/Contents/src/scripts/ImageSolver+AnnotateImage/ImageSolver.js
Pause/Abort
```



Image Plate Solver Script
Image Plate Solver v1.51 — A script for plate-solving astronomical images. The values are initialized from existing WCS coordinates or the keywords OBJECTRA, OBJECTDEC, FOCALLEN, XPIXSZ and DATE_OBS if present.
Copyright © 2012 Andrés del Pozo

Image parameters

Right Ascension (hms): 2 : 55 : 7.747 Search

Declination (dms): 60 : 31 : 1.62 S

Epoch (ymd): 2012 : 8 : 20

Image scale: Focal distance (mm): 388.509 Resolution (arcsec/px): 3.92876

Pixel size (um): 7.4

Model Parameters

Local star catalog: /Users/Macbookpro/Documents/PPMXL.bin

VizieR star catalog: PPMXL CDS (vizier.u-strasbg.fr) Strasbourg, France

Limit magnitude: 12

Star sensitivity: -1.00 Show stars

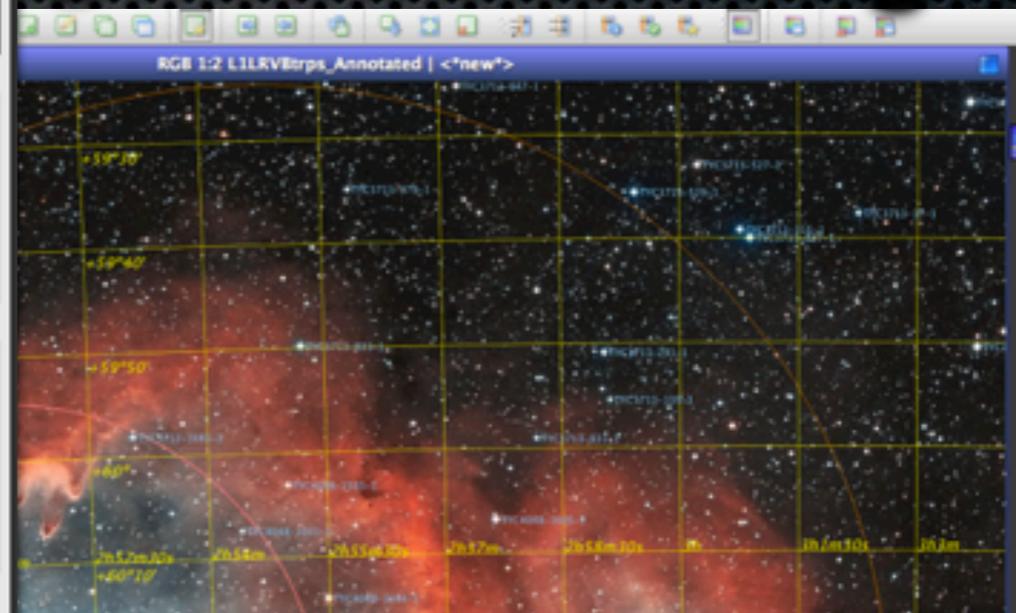
Maximum iterations: 4

Update FITS keywords Add WCS keywords

Reset OK Cancel

Le fun...

- ImageSolver
- AnnotateImage



10772 bytes transferred in 0.042 s @ 0.000 MB/s
Catalog TYCHO-2 size: 210 objects

Image Annotation Script
Image Annotation v1.11 — A script for annotating astronomical images. This script draws on the image coordinate grids and symbols of objects extracted from different astronomical catalogs. The script requires the image to have coordinates stored in FITS header keywords following the WCS convention. The Image Plate Solver script can be used to generate these coordinates and keywords.
Copyright © 2012 Andrés del Pozo

Layers

Layer	Description
<input checked="" type="checkbox"/> Grid	Grid in equatorial coordinates
<input checked="" type="checkbox"/> NamedSt...	HD-DM-GC-HR-HIP-Bayer-Flamsteed Cross Index(36...
<input checked="" type="checkbox"/> NGC-IC	NGC and IC catalogs (9900 objects)
<input checked="" type="checkbox"/> TYCHO-2	Tycho-2 catalog (2,539,913 stars)
<input type="checkbox"/> PGC	PGC HYPERLEDA I catalog of galaxies (983,261 galax...
<input type="checkbox"/> PPMXL	PPMXL catalog (910,469,430 objects)
<input checked="" type="checkbox"/> Sharpless	Catalog of HII Regions - Sharpless (313 nebulaes)
<input checked="" type="checkbox"/> VdB	Catalog of Reflection Nebulae - Van den Bergh (159 ...)

Grid Parameters

Show markers

Color: Custom (255,255, 0) 255

Width: 1

Show labels

Font: SansSerif 22 Bold Italic

Color: Custom (255,255, 0) 255

Grid density: 10

General Properties

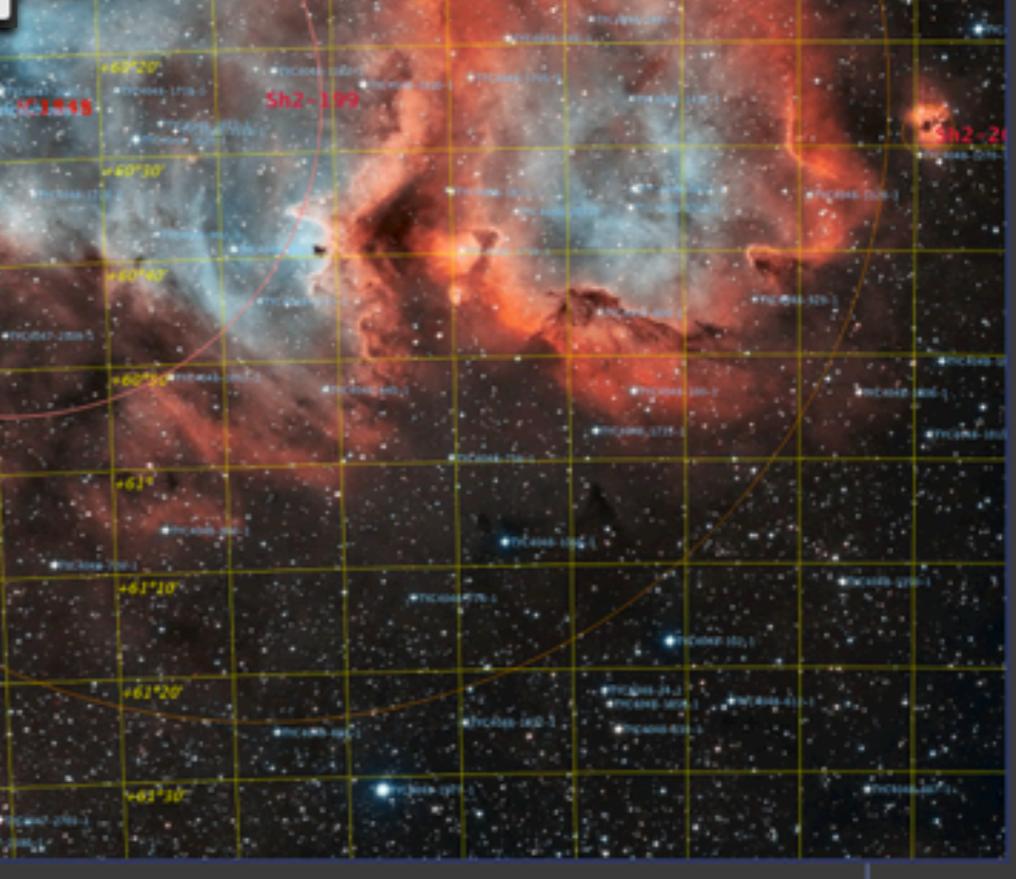
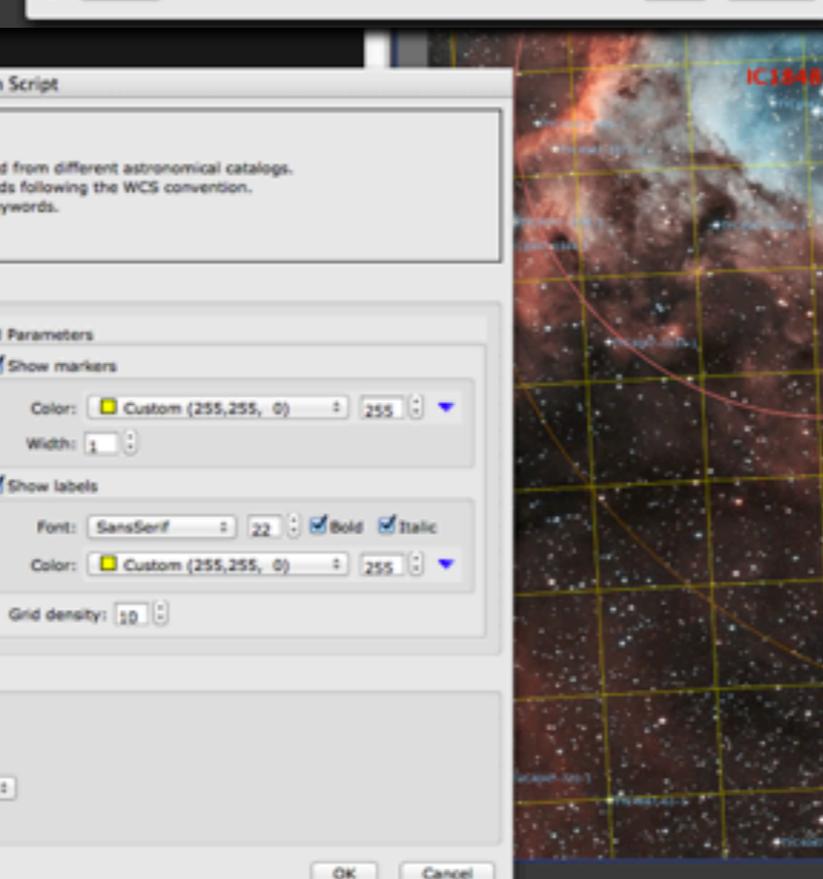
Output mode: Annotate image Apply STF before annotation

Epoch (ymd): 2000 1 1

Vizier server: CDS (vizier.u-strasbg.fr) Strasbourg, France

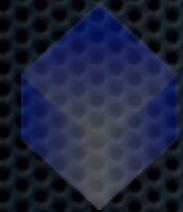
Remove duplicate objects

Reset OK Cancel



Une communauté active...

- site web : <http://pixinsight.com/>
- forum actif et riche en informations :
<http://pixinsight.com/forum/index.php>
- AIP organise régulièrement des stages de formation à Pixinsight
<http://www.astro-images-processing.fr/>
- Nombreux scripts et process développés par des utilisateurs
- tutoriels divers sur différents sites web



Merci...











