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Point Source Extraction Tool

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Overview

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Easiest way to do point source extraction of Herschel data

- Rather than exporting maps to some other tool

Specifically designed for Herschel

- Algorithms for confused fields
  - At longer wavelengths, neighbouring sources will be blurred into each other
- Modelling noise properties

Status

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Currently implements DAOPHOT algorithm

- Established method

Bayesian methods being implemented

- Written in IDL for Akari (Rich Savage)
- Being incorporated into HIPE (Rupert Ward, Huw Morris, AJS)

Testing for completeness, reliability, etc.

SUSSEXtractor

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Bayesian source extraction methods (Savage & Oliver 2007, ApJ)

- Model selection: background only vs. background+source
- Simultaneous estimation of background and fluxes
- Removal of e.g., spikes from data
- Extendible to reflect state of prior knowledge, e.g.:
  - Estimation of the point response function (PRF)
  - Simultaneous multiwavelength extraction
  - Prior position information

Source extraction in HIPE: Graphical User Interface (GUI)

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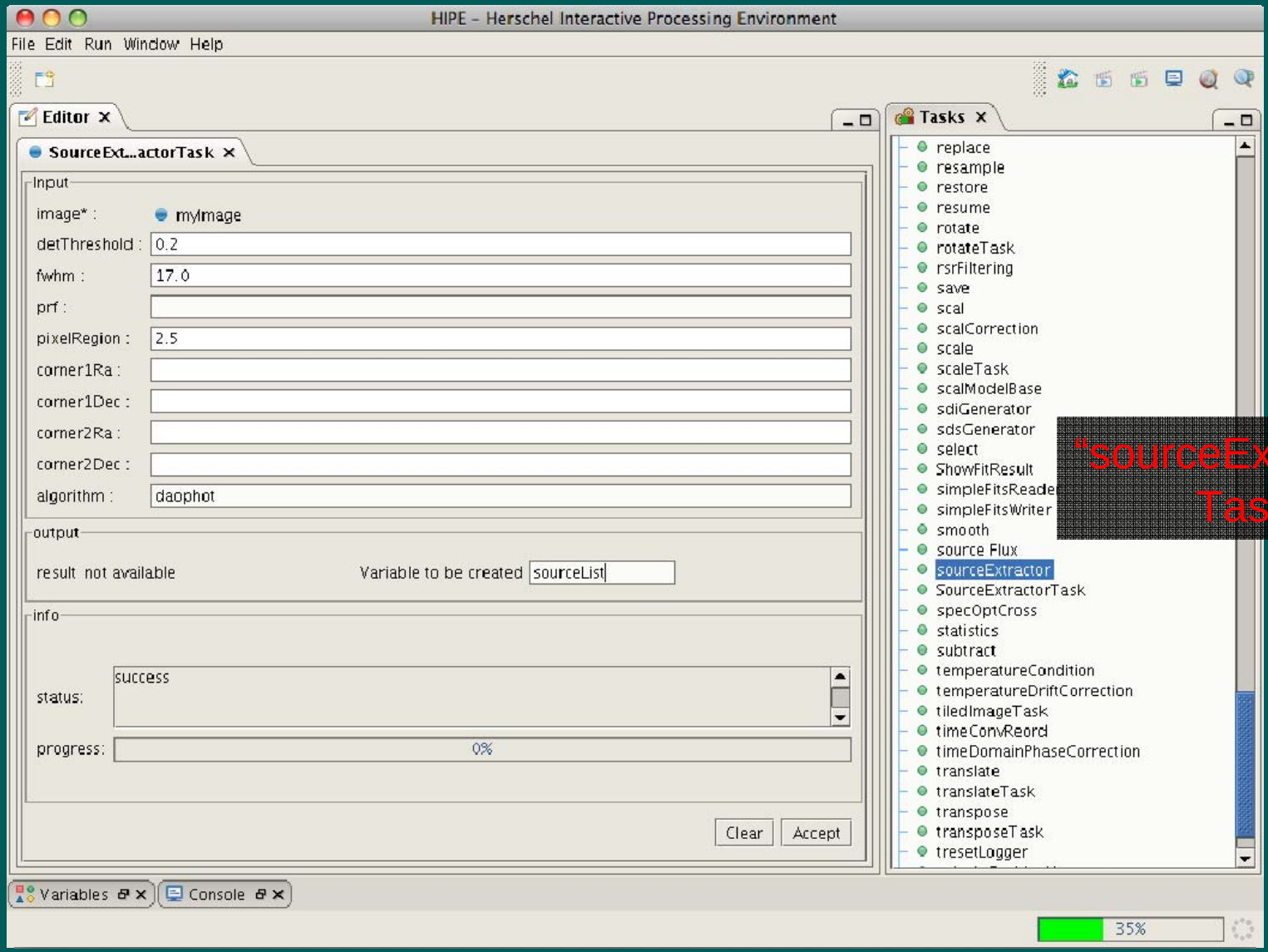

Source extraction in HIPE: Jython script

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```
# Extract a list of sources from the image
sourceList = sourceExtractor(
    image = myImage,              # Image name
    detThreshold = 0.2,           # Threshold in DAOPHOT H units
    fwhm = 17.0,                  # FWHM of PRF (arcsec)
    #prf = "",                    # FITS file containing PRF
    #corner1Ra = 0.3,             # Minimum RA to consider (degrees)
    #corner1Dec = 0.3,            # Minimum dec to consider (degrees)
    #corner2Ra = 0.5,             # Maximum RA to consider (degrees)
    #corner2Dec = 0.5,            # Maximum dec to consider (degrees)
    #algorithm = "daophot",       # DAOPHOT only at present
    pixelRegion = 2.5,            # Source search radius in pixels
    )
```

Extracted sources

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List of extracted sources is returned as a **SourceListProduct**

- TableDataset
  - With position and flux information for each source
- Meta data
  - With details about the observation, source extraction, etc.

Demo image

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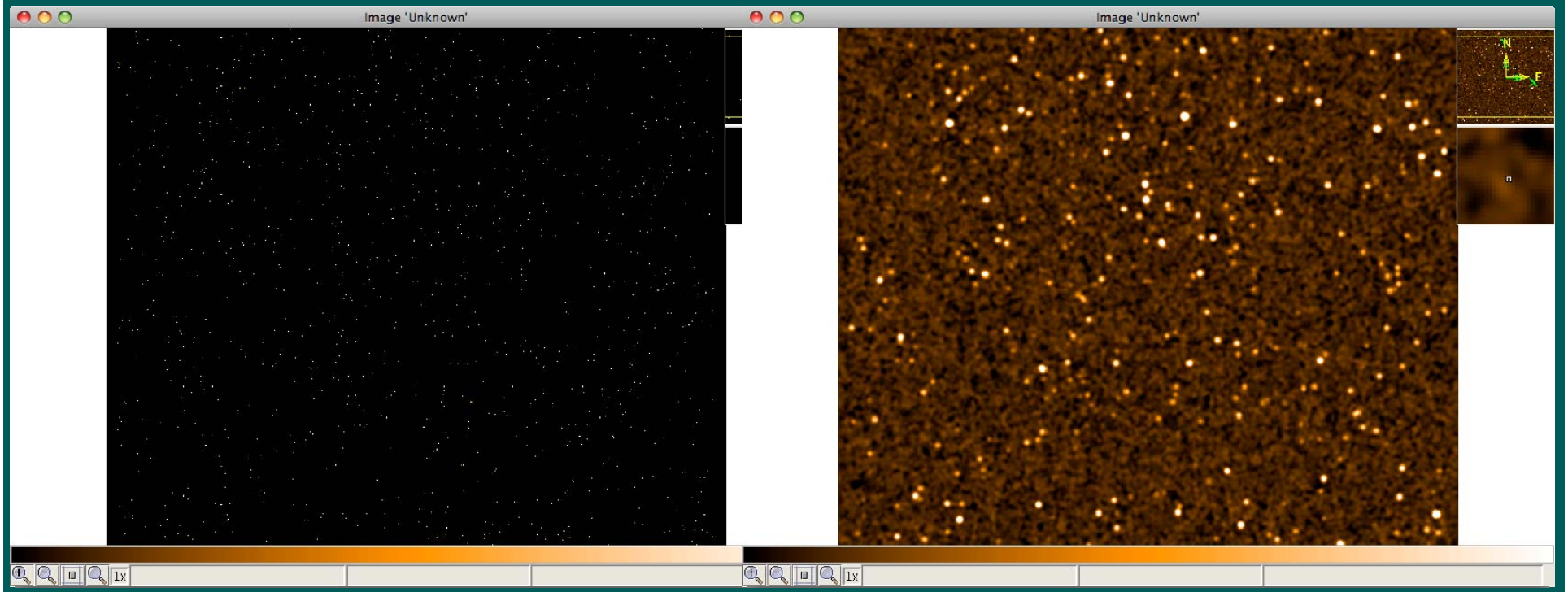
- From Fernandez-Conde et al. simulations
- 0.5 square degrees, 4 arcsec pixel size, intensity in mJy
- Point response function (PRF) with FWHM 17.0 arcsec
- Gaussian noise added



Demo script

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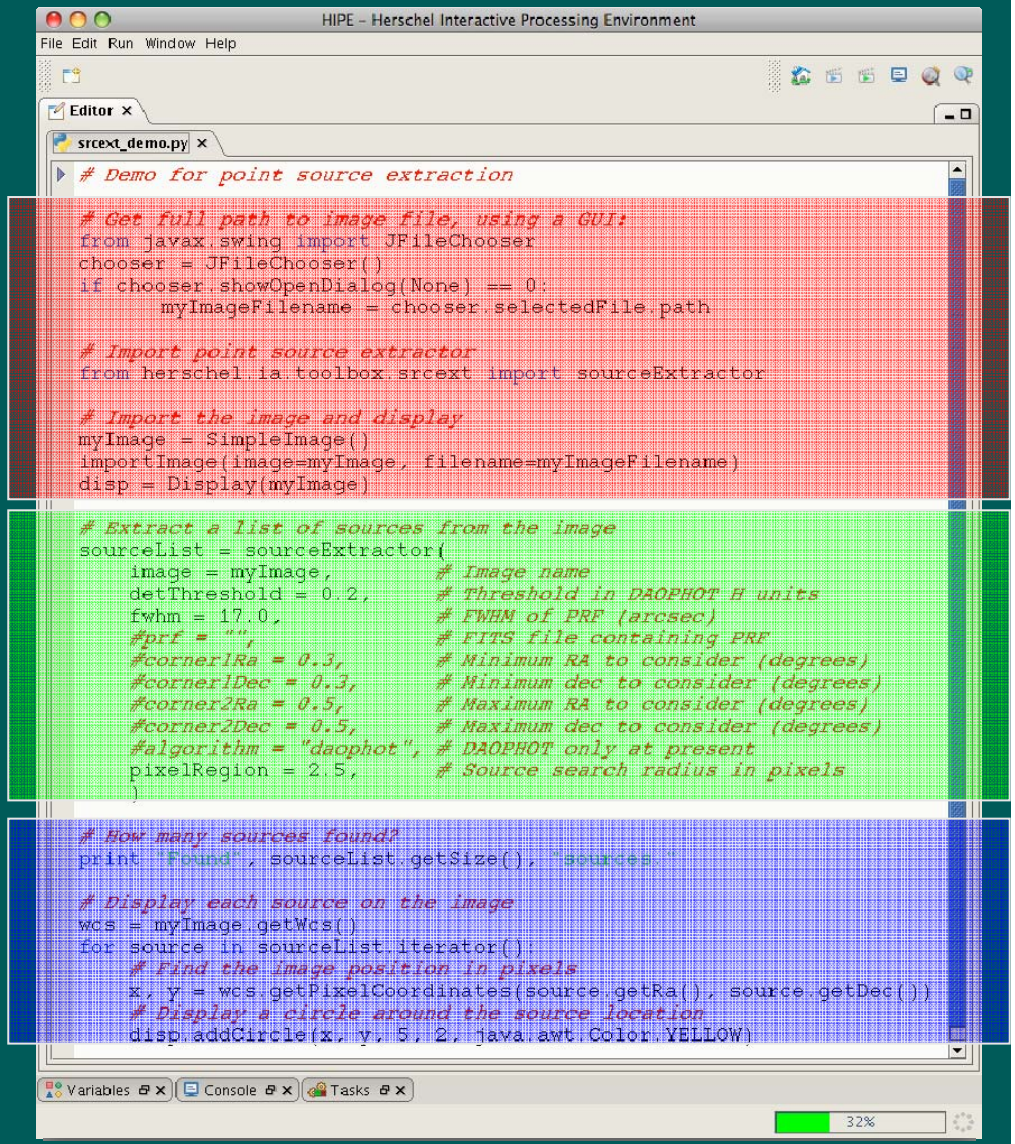
Import image and display

Run source extraction

Display results



Live demo

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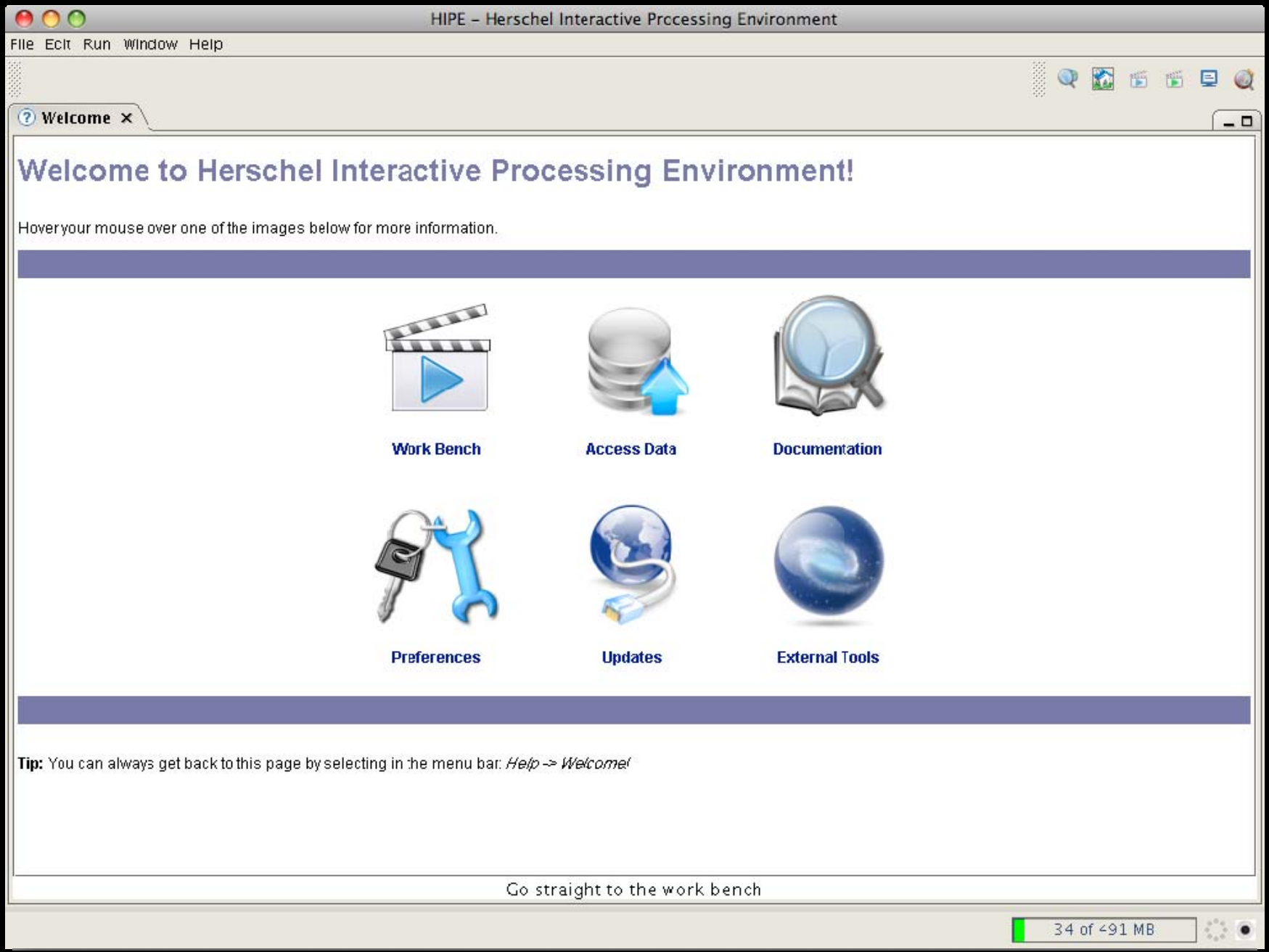
HIPE – Herschel Interactive Processing Environment
File Edit Run Window Help
Welcome
Welcome to Herschel Interactive Processing Environment!
Hover your mouse over one of the images below for more information.
Work Bench
Access Data
Documentation
Preferences
Updates
External Tools
Tip: You can always get back to this page by selecting in the menu bar: Help -> Welcome!
Go straight to the work bench
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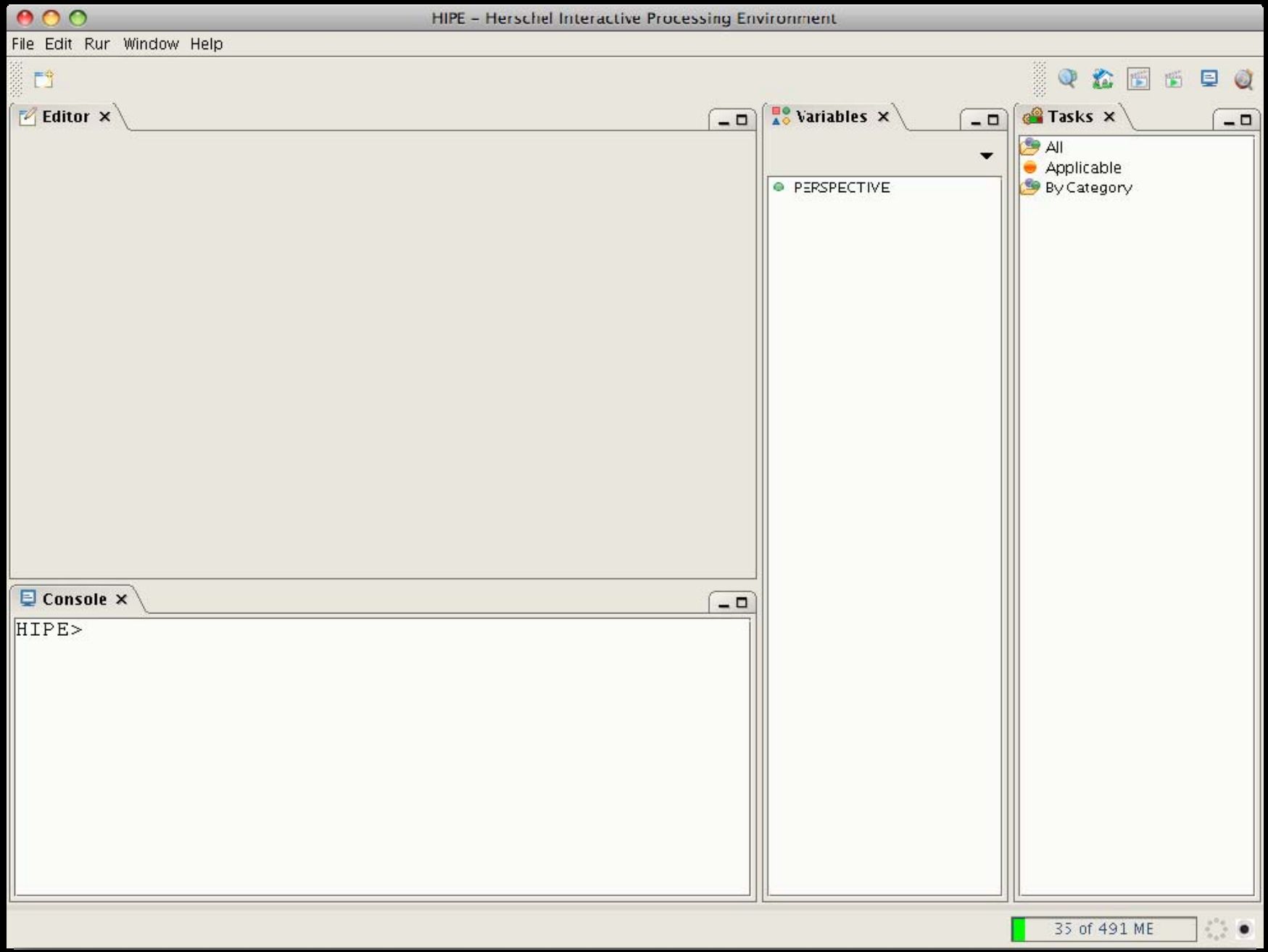
HIPE – Herschel Interactive Processing Environment
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Variables
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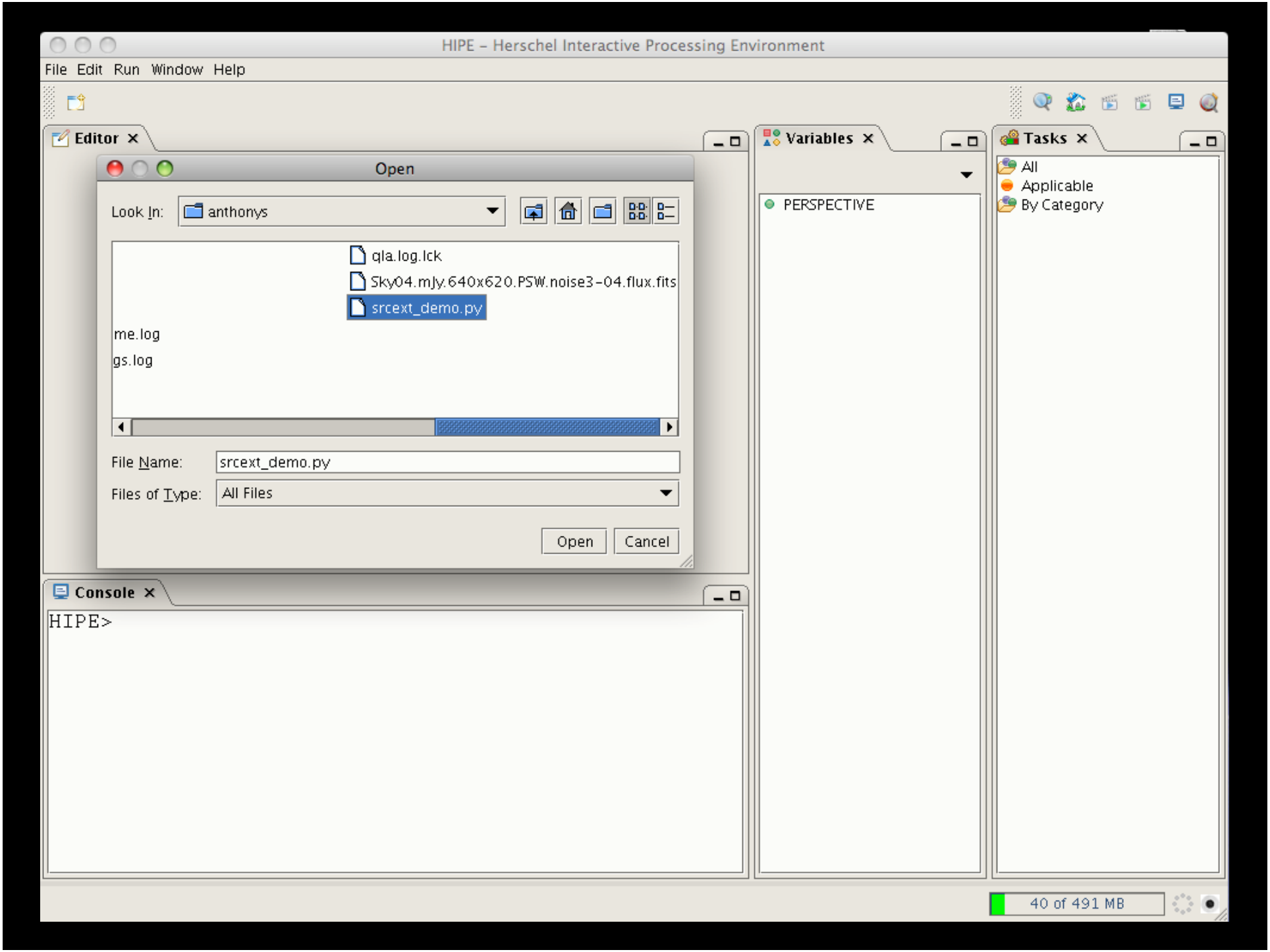
HIPE – Herschel Interactive Processing Environment
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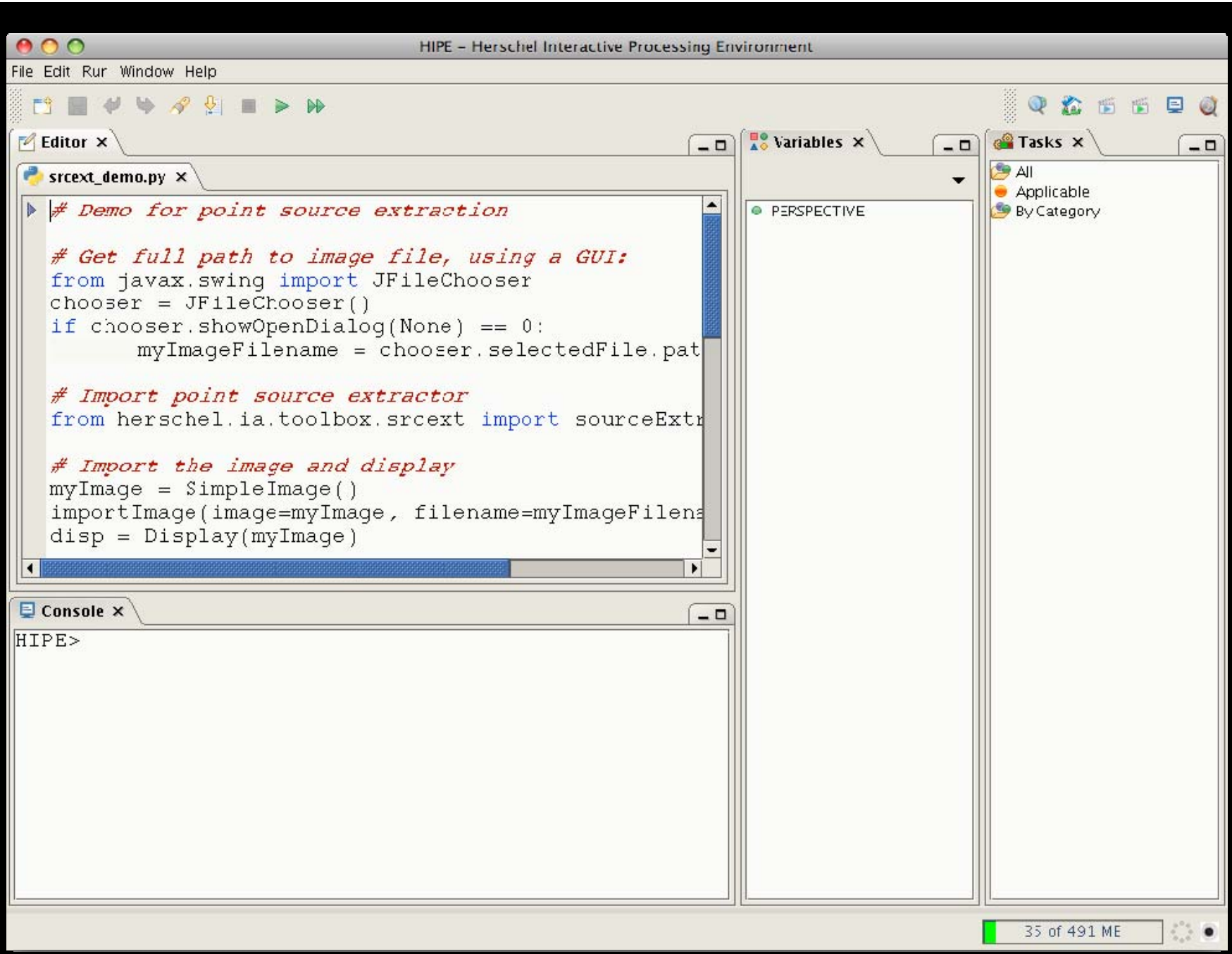
HIPE – Herschel Interactive Processing Environment
File Edit Rur Window Help
Editor
srcext_demo.py
# Demo for point source extraction
# Get full path to image file, using a GUI:
from javax.swing import JFileChooser
chooser = JFileChooser()
if chooser.showOpenDialog(None) == 0:
myImageFilename = chooser.selectedFile.pat
# Import point source extractor
from herschel.ia.toolbox.srcext import sourceExtr
# Import the image and display
myImage = SimpleImage()
importImage(image=myImage, filename=myImageFilena
disp = Display(myImage)
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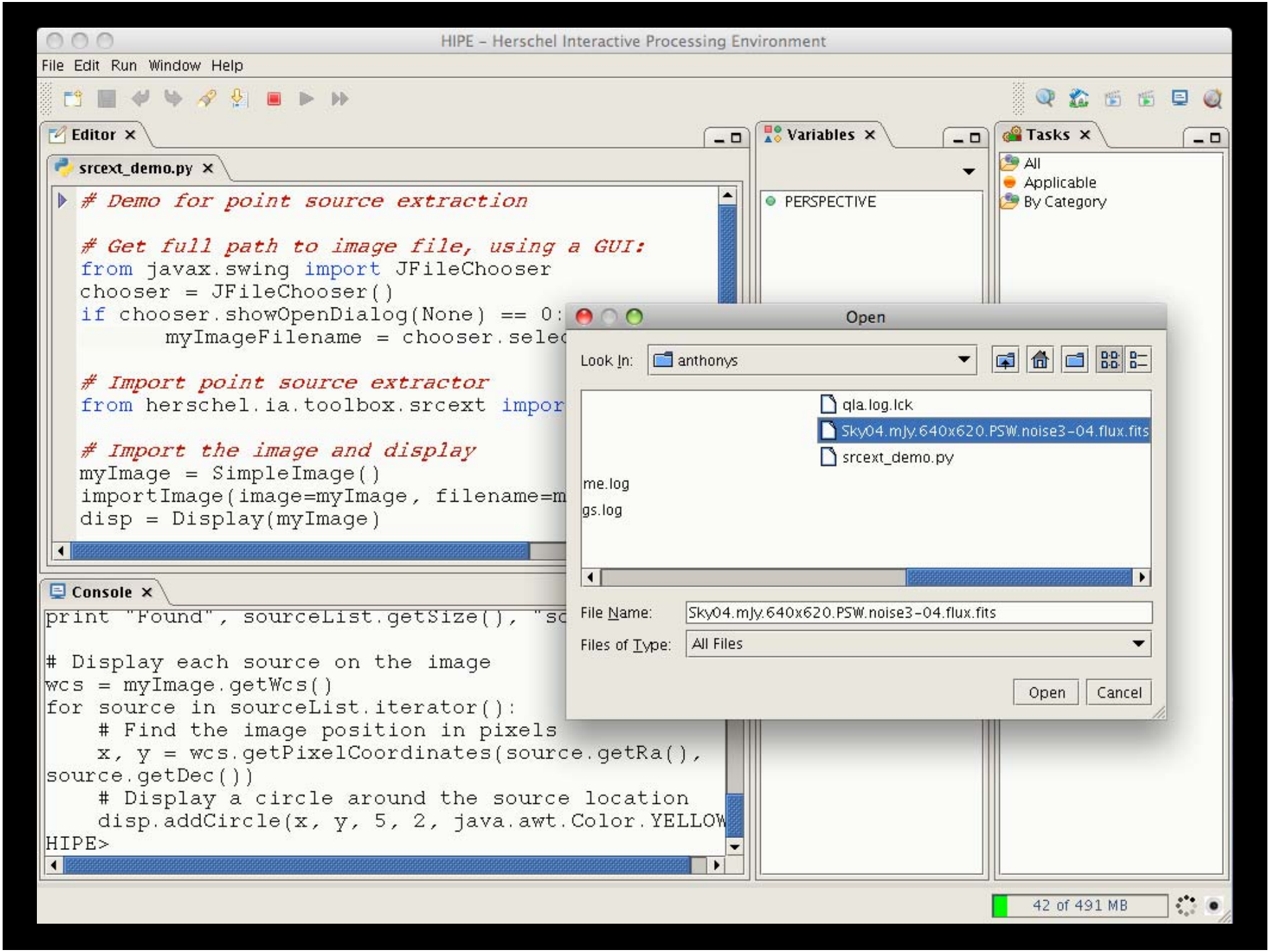
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File Name:
Sky04.mJy.640x620.PSW.noise3-04.flux.fits
Files of Type:
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Open
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Console
print "Found", sourceList.getSize(), "so
# Display each source on the image
wcs = myImage.getWcs()
for source in sourceList.iterator():
# Find the image position in pixels
x, y = wcs.getPixelCoordinates(source.getRa(),
source.getDec())
# Display a circle around the source location
disp.addCircle(x, y, 5, 2, java.awt.Color.YELLOW
HIPE>
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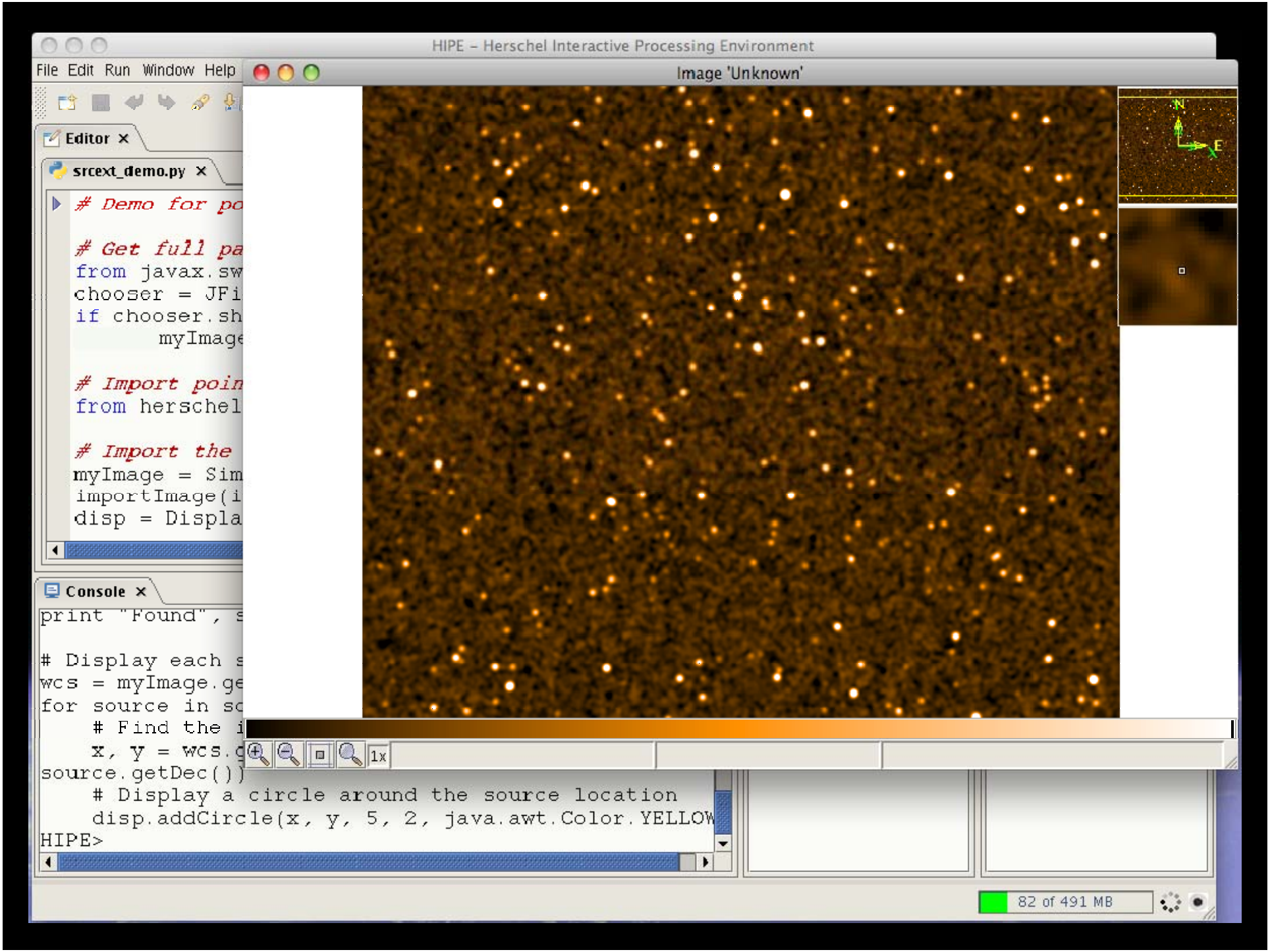
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disp.addCircle(x, y, 5, 2, java.awt.Color.YELLOW
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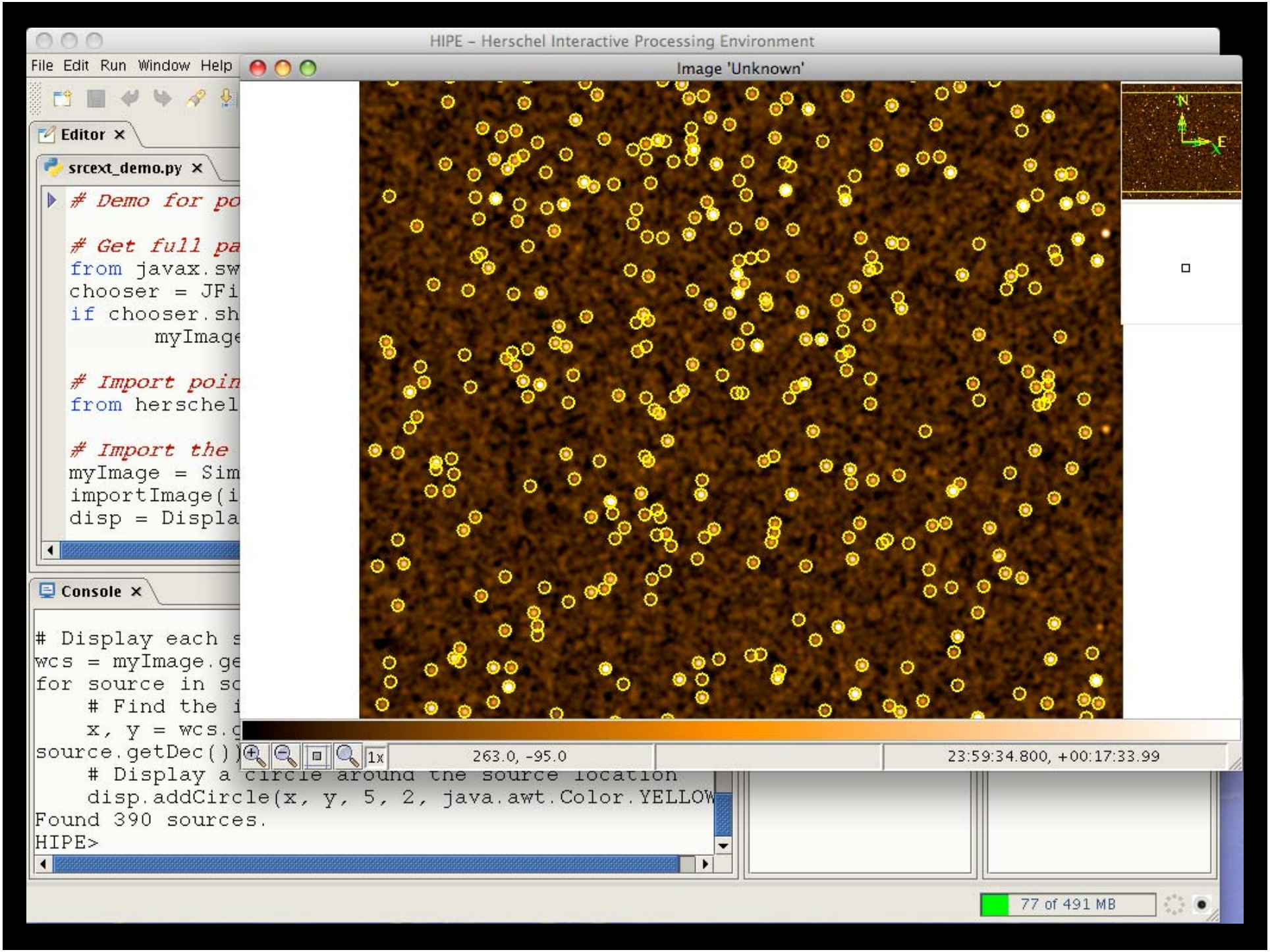
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# Display a circle around the source location
disp.addCircle(x, y, 5, 2, java.awt.Color.YELLOW
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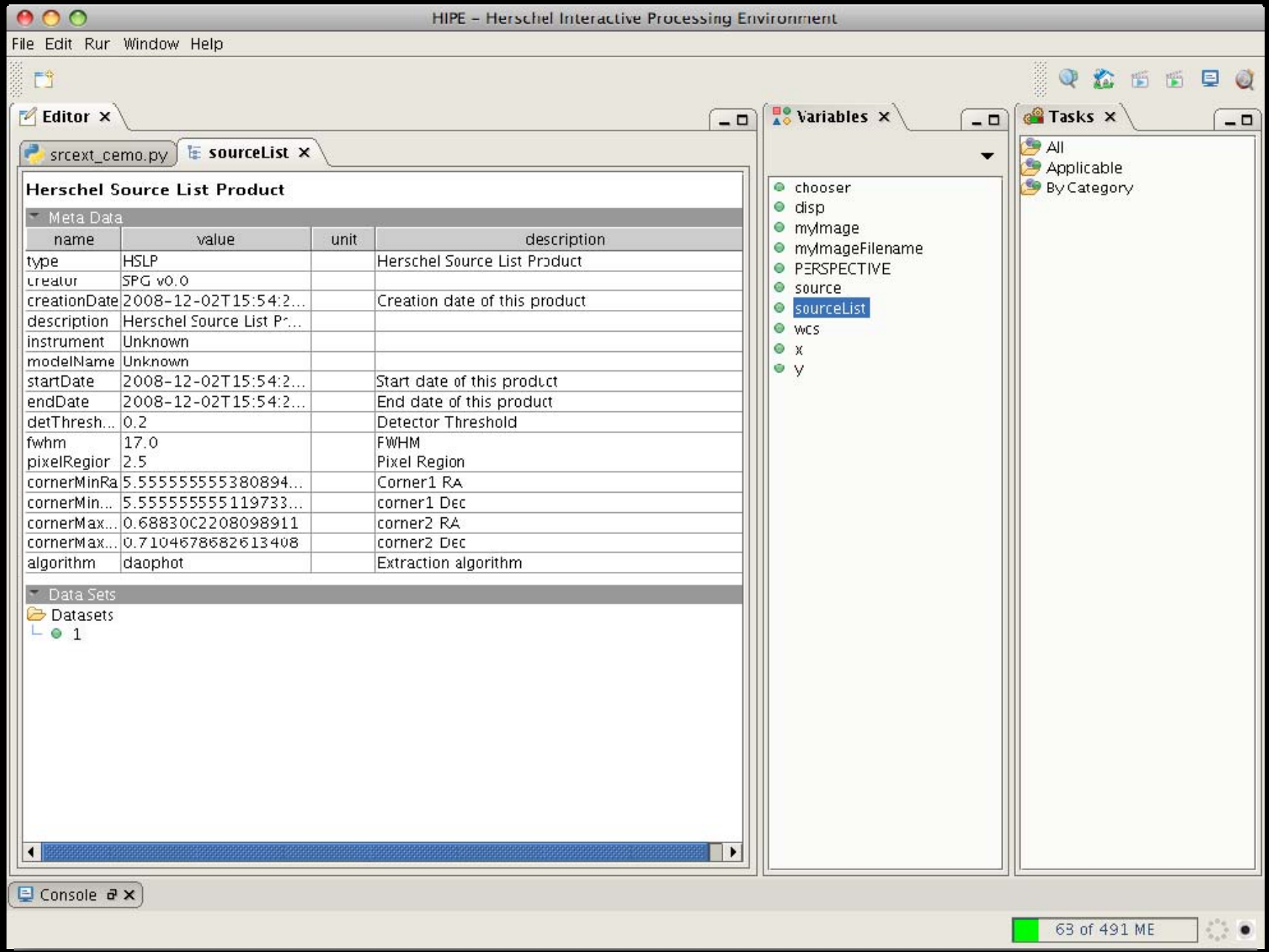
HIPE – Herschel Interactive Processing Environment
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Meta Data
name value unit description
type HSLP Herschel Source List Product
creator SPG v0.0
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description Herschel Source List P...
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modelName Unknown
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endDate 2008-12-02T15:54:2... End date of this product
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cornerMin... 5.555555555119733... corner1 Dec
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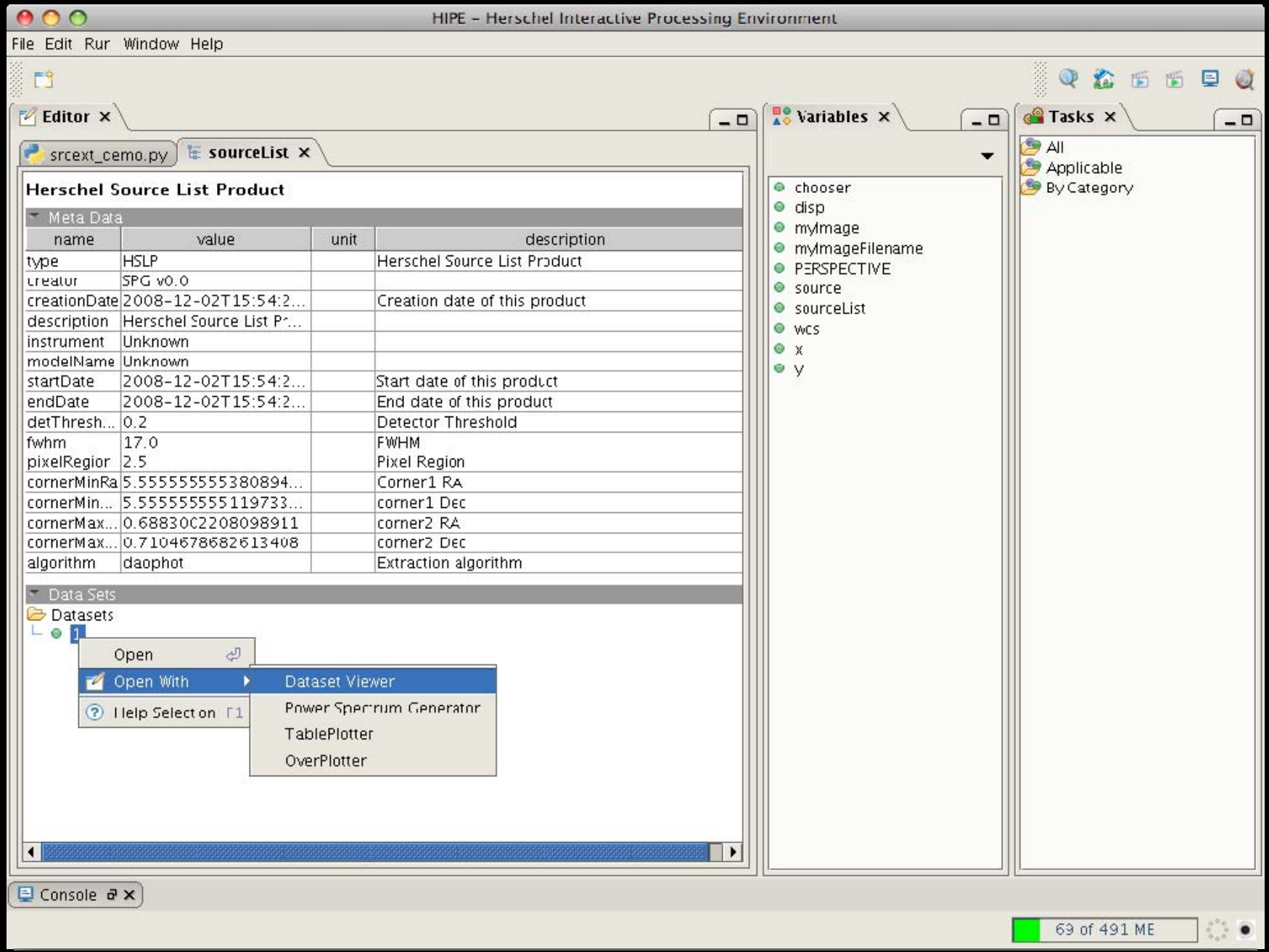
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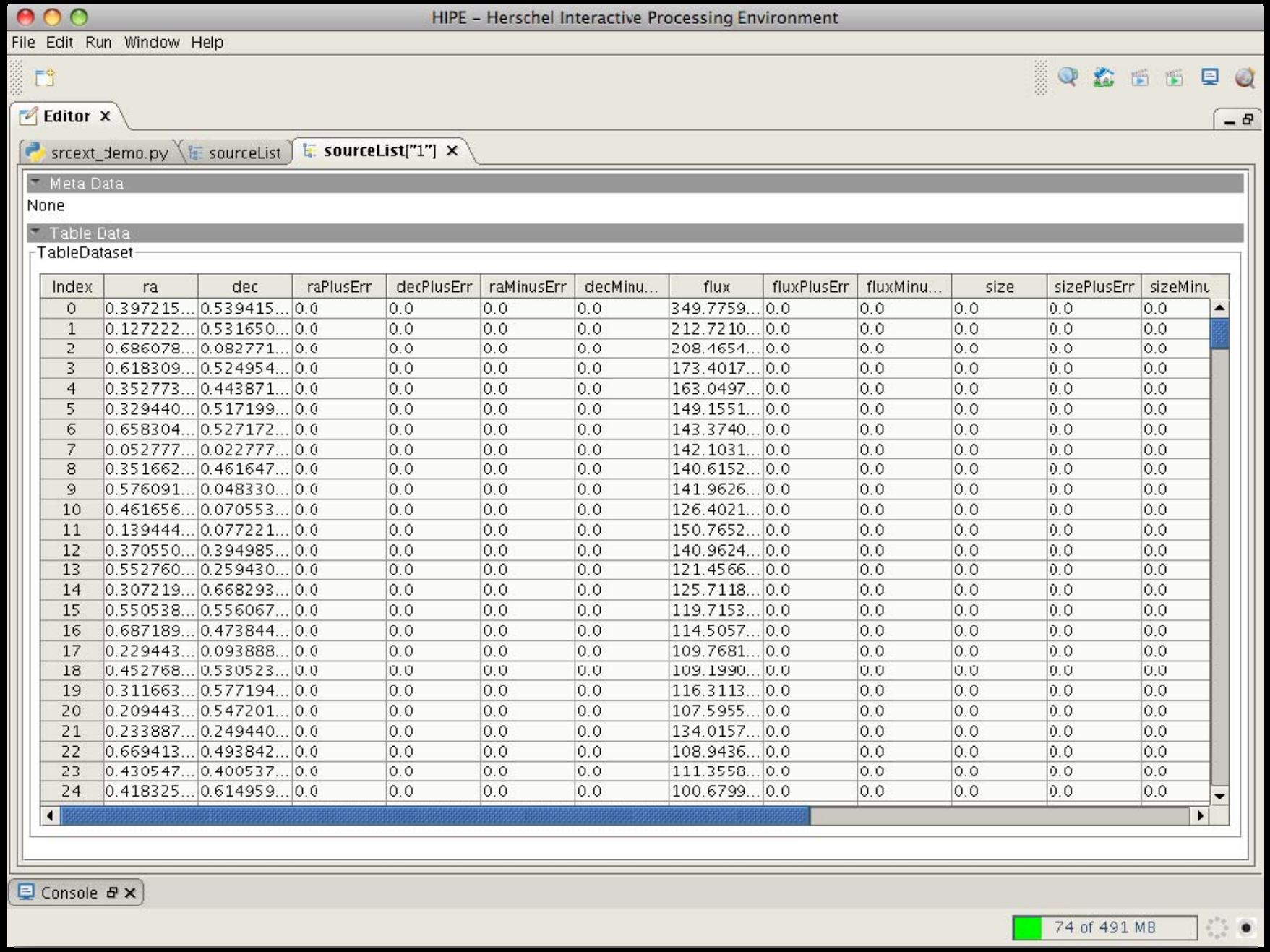
HIPE – Herschel Interactive Processing Environment
File Edit Run Window Help
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srcext_demo.py
sourceList
sourceList["1"]
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1 0.127222... 0.531650... 0.0 0.0 0.0 0.0 212.7210... 0.0 0.0 0.0 0.0 0.0
2 0.686078... 0.082771... 0.0 0.0 0.0 0.0 208.4654... 0.0 0.0 0.0 0.0 0.0
3 0.618309... 0.524954... 0.0 0.0 0.0 0.0 173.4017... 0.0 0.0 0.0 0.0 0.0
4 0.352773... 0.443871... 0.0 0.0 0.0 0.0 163.0497... 0.0 0.0 0.0 0.0 0.0
5 0.329440... 0.517199... 0.0 0.0 0.0 0.0 149.1551... 0.0 0.0 0.0 0.0 0.0
6 0.658304... 0.527172... 0.0 0.0 0.0 0.0 143.3740... 0.0 0.0 0.0 0.0 0.0
7 0.052777... 0.022777... 0.0 0.0 0.0 0.0 142.1031... 0.0 0.0 0.0 0.0 0.0
8 0.351662... 0.461647... 0.0 0.0 0.0 0.0 140.6152... 0.0 0.0 0.0 0.0 0.0
9 0.576091... 0.048330... 0.0 0.0 0.0 0.0 141.9626... 0.0 0.0 0.0 0.0 0.0
10 0.461656... 0.070553... 0.0 0.0 0.0 0.0 126.4021... 0.0 0.0 0.0 0.0 0.0
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14 0.307219... 0.668293... 0.0 0.0 0.0 0.0 125.7118... 0.0 0.0 0.0 0.0 0.0
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23 0.430547... 0.400537... 0.0 0.0 0.0 0.0 111.3558... 0.0 0.0 0.0 0.0 0.0
24 0.418325... 0.614959... 0.0 0.0 0.0 0.0 100.6799... 0.0 0.0 0.0 0.0 0.0
Console
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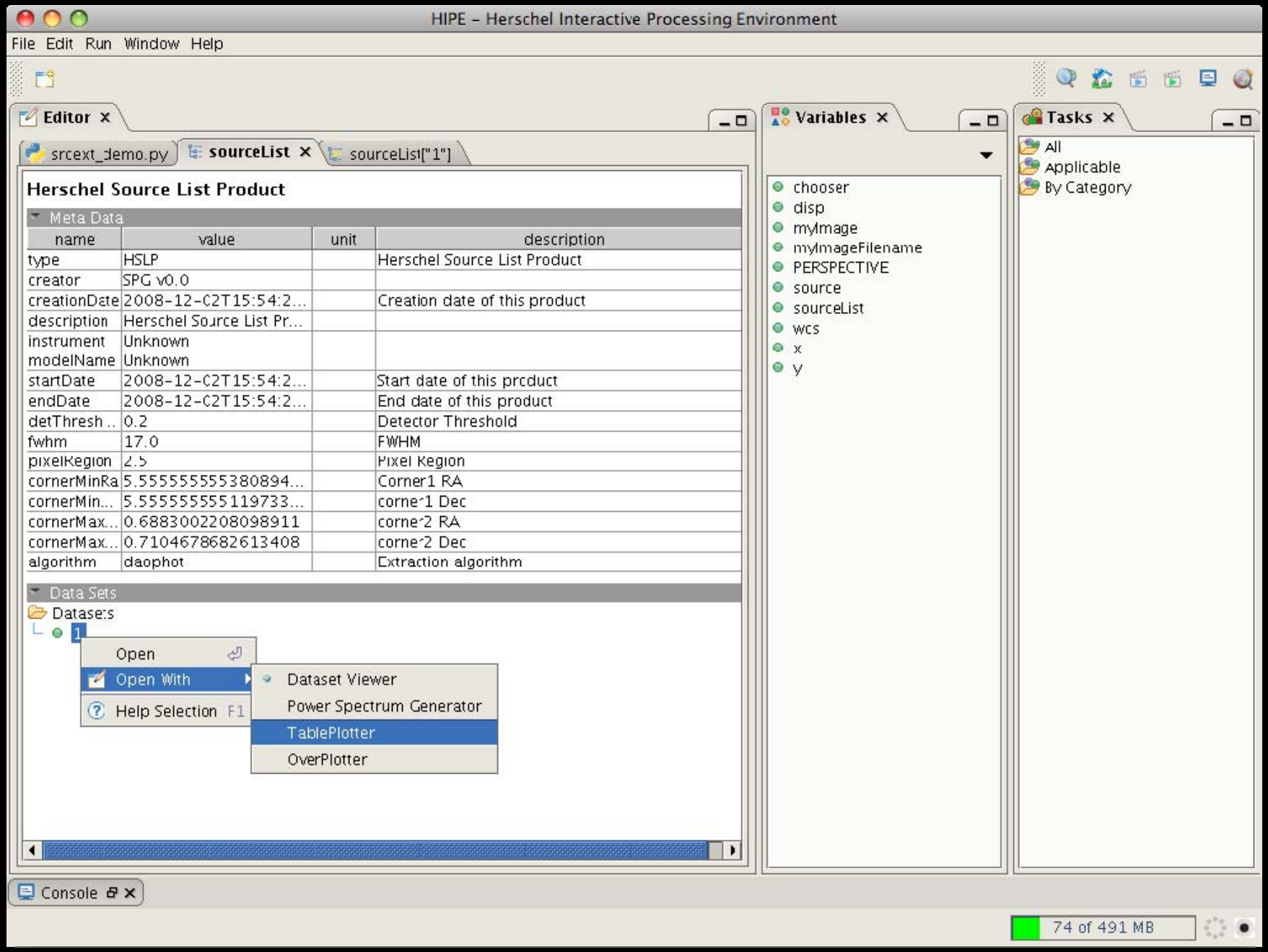
HIPE – Herschel Interactive Processing Environment
File Edit Run Window Help
Editor
srcext_demo.py
sourceList
sourceList["1"]
Herschel Source List Product
Meta Data
name value unit description
type HSLP Herschel Source List Product
creator SPG v0.0
creationDate 2008-12-02T15:54:2... Creation date of this product
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modelName Unknown
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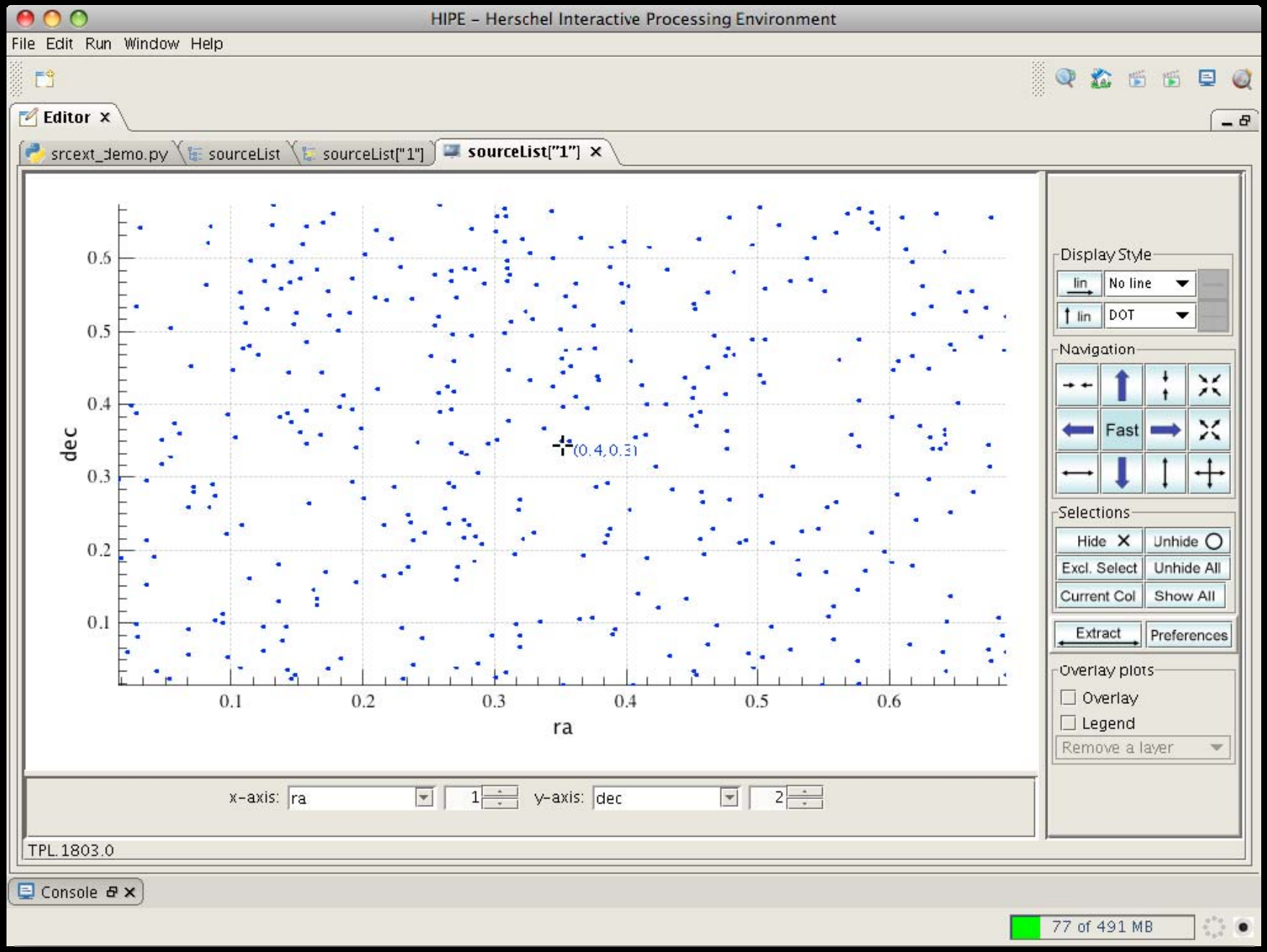
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srcext_demo.py
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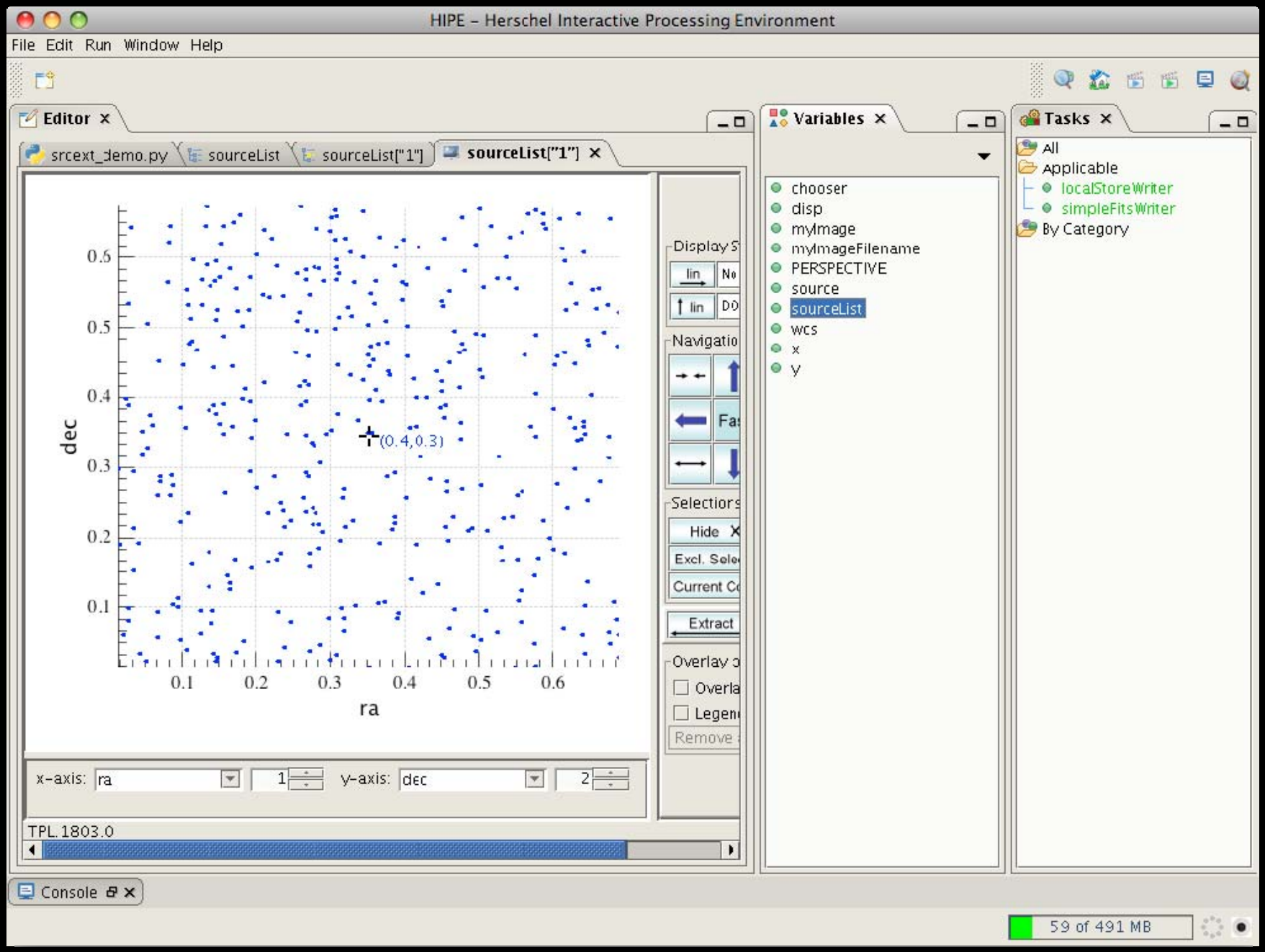
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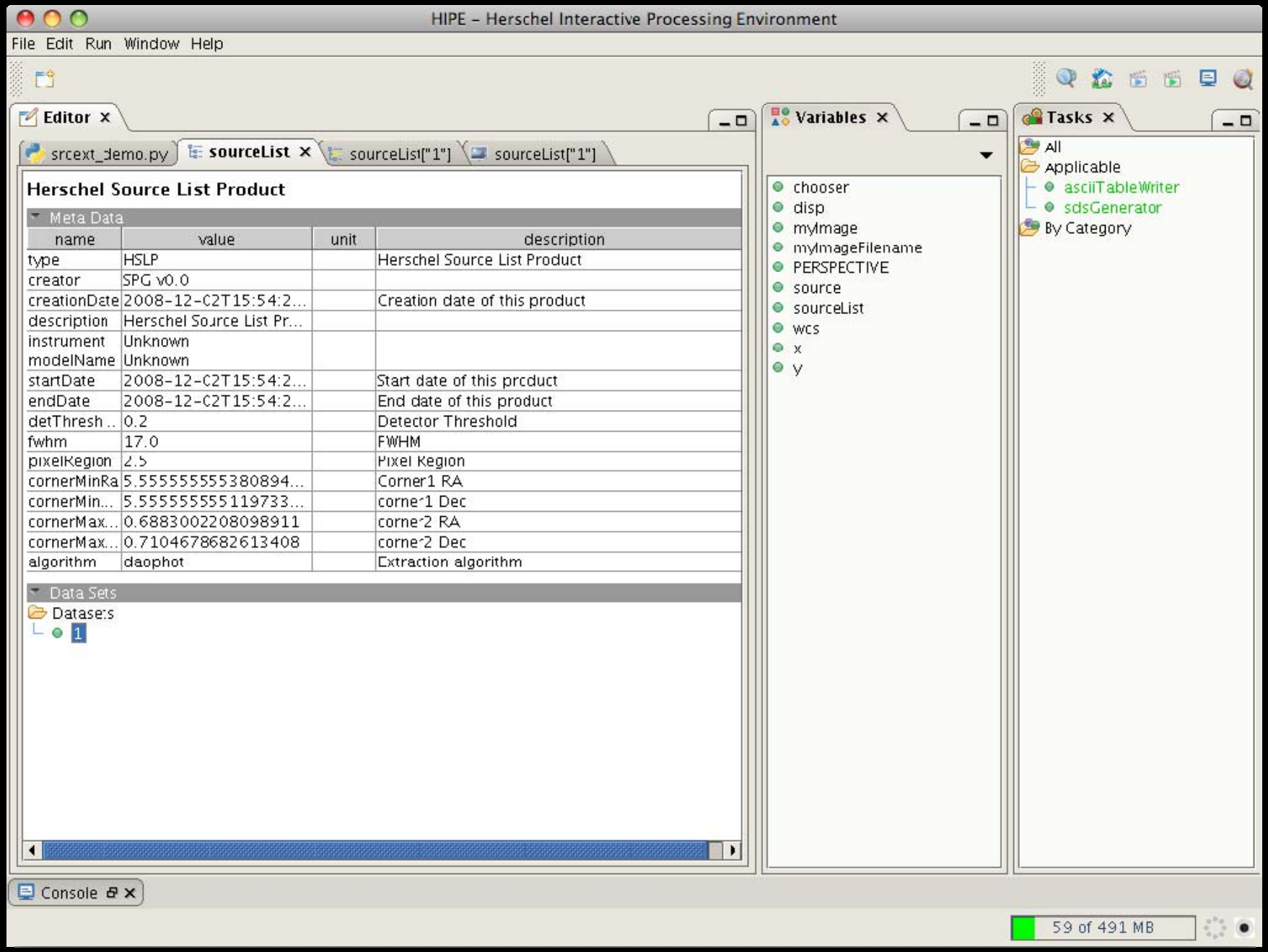
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