

Displaying polarisation in CARTA

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with thanks to George Bendo and Jack Radcliffe

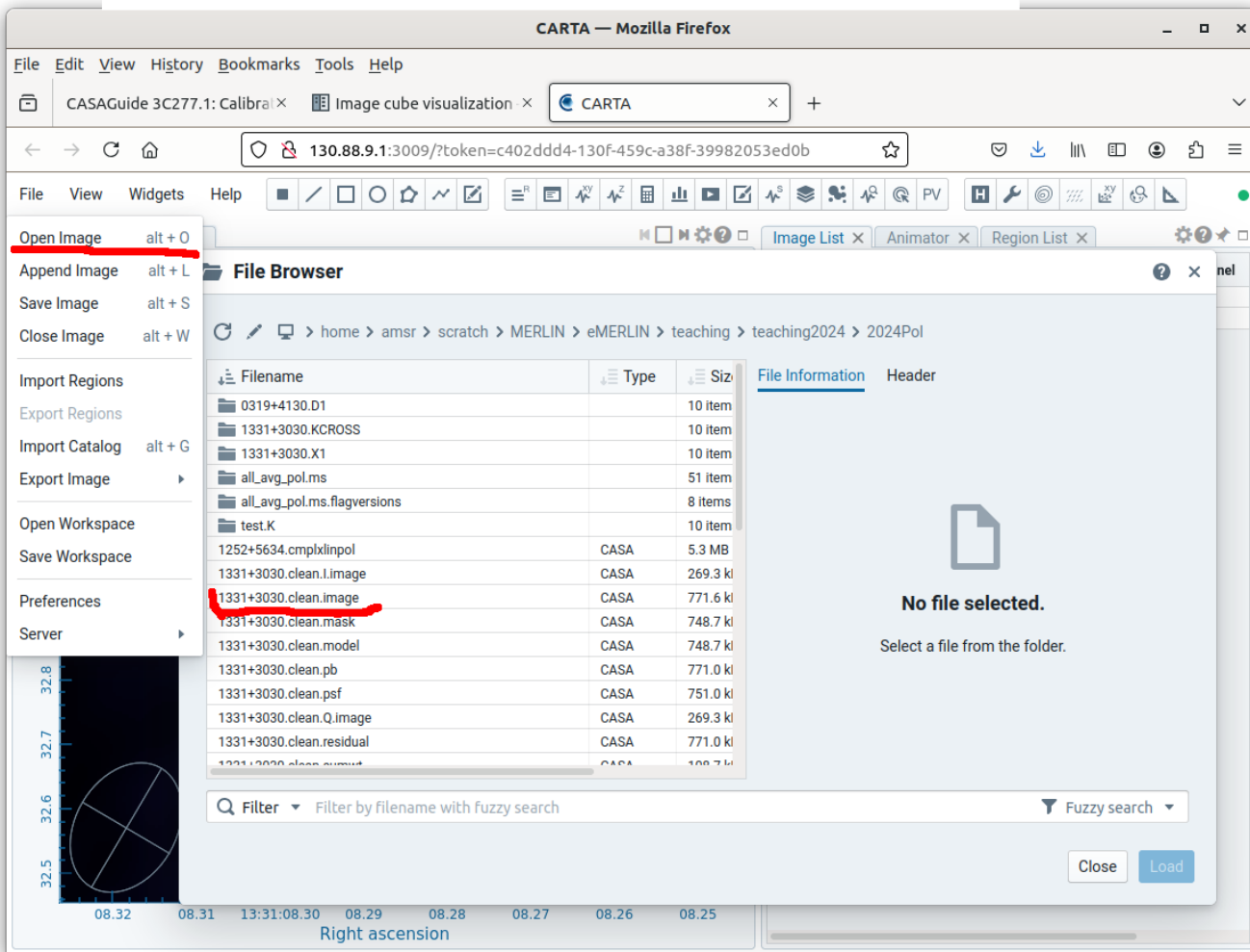


<https://cartavis.org/>

Image credit: N. Ramírez-Olivencia; NASA, ESA, (STScI/AURA)-ESA/Hubble Collaboration and A. Evans



Load Stokes cube



- For compatibility with Mac o/s iclean, script image names have been changed:
- $1331+3030 >$
pol3C286
- $1252+3654 >$
pol3C277p1

Animator shows total intensity

CARTA — Mozilla Firefox

File Edit View History Bookmarks Tools Help

CASAGuide 3C277.1: Calibra Image cube visualization CARTA

130.88.9.1:3009/?token=c402ddd4-130f-459c-a38f-39982053

File View Widgets Help


- Open Image alt + O
- Append Image alt + L
- Save Image alt + S
- Close Image alt + W
- Import Regions
- Export Regions
- Import Catalog alt + G
- Export Image
- Open Workspace
- Save Workspace
- Preferences
- Server

File Browser

home > amsr > scratch > MERLIN > eMERLIN > teaching > tea

Filename	Type	Size
0319+4130.D1		10 item
1331+3030.KCROSS		10 item
1331+3030.X1		10 item
all_avg_pol.ms		51 item
all_avg_pol.ms.flagversions		8 items
test.K		10 item
1252+5634.cmplxlinpol	CASA	5.3 MB
1331+3030.clean.l.image	CASA	269.3 kb
1331+3030.clean.image	CASA	771.6 kb
1331+3030.clean.mask	CASA	748.7 kb
1331+3030.clean.model	CASA	748.7 kb
1331+3030.clean.pb	CASA	771.0 kb
1331+3030.clean.psrf	CASA	751.0 kb
1331+3030.clean.Q.image	CASA	269.3 kb
1331+3030.clean.residual	CASA	771.0 kb
1331+3030.clean.summary	CASA	109.7 kb

Filter Filter by filename with fuzzy search



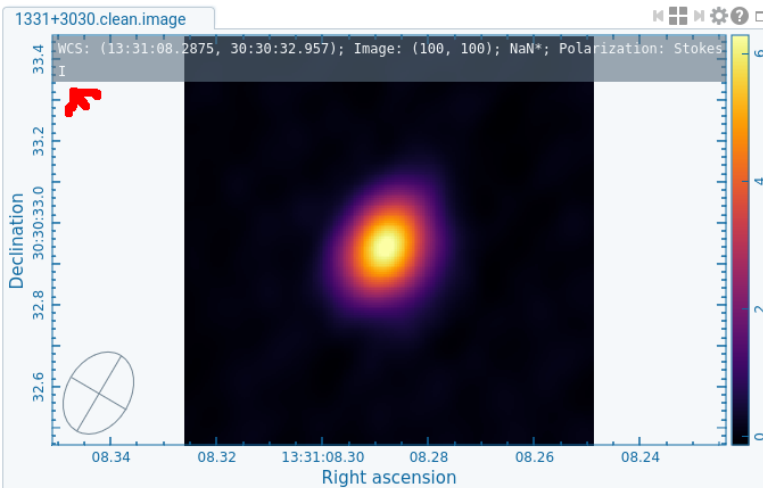
Mozilla Firefox

130.88.9.1:3006/?token=2b1a757a-e0c0-4b11-9684-cde61dd5c29c

File View Widgets Help

1331+3030.clean.image

WCS: (13:31:08.2875, 30:30:32.957); Image: (100, 100); NaN*; Polarization: Stokes

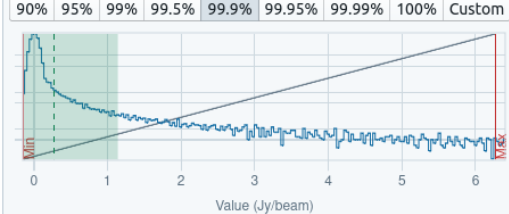


Declination

Right ascension

Render Configuration

90% 95% 99% 99.5% 99.9% 99.95% 99.99% 100% Custom



Clip min -0.144311147226

Clip max 6.269204635681

Scaling Linear

Colormap

Invert colormap

Bias / Contrast

Image List Animator Region List

Frame rate 5

Polarization

- Stokes I
- Stokes Q
- Stokes U
- PF linear
- PF total
- PF angle

Close Load

Load same cube to use for polarisation

The screenshot shows the CARTA software interface in Mozilla Firefox. The main window displays a radio astronomy data cube with a red line overlaid on it. A 'File Browser' window is open, showing a directory tree with files for '1331+3030'. A red arrow points from the 'File Browser' window to the 'Append Image' menu item. A red text overlay reads 'Same Stokes cube again.' with a cursor icon pointing to the text. The 'Render Configuration' window at the bottom shows a plot of the Stokes I parameter.

Filename	Type
0319+4130.D1	
1331+3030.KCROSS	
1331+3030.X1	
all_avg_pol.ms	
all_avg_pol.ms.flagversions	
test.K	
1252+5634.cmpxlpol	CASA
1331+3030.clean.I.image	CASA
1331+3030.clean.image	CASA
1331+3030.clean.mask	CASA
1331+3030.clean.model	CASA
1331+3030.clean.pb	CASA
1331+3030.clean.psf	CASA
1331+3030.clean.Q.image	CASA
1331+3030.clean.residual	CASA
1331+3030.clean.summary	CASA

- 1331+3030 IQUV cube
- 1st for I
- 2nd for POLI (polarised intensity, plinear)
 - Could also use Stokes I, POLI, and later POLA images

Load same cube to use for polarisation

The screenshot shows the CARTA software interface in Mozilla Firefox. The File menu is open, listing options such as Open Image, Append Image, Save Image, Close Image, Import Regions, Export Regions, Import Catalog, Export Image, Open Workspace, Save Workspace, Preferences, and Server. A File Browser window is also open, displaying a directory structure with files like 0319+4130.D1, 1331+3030.KCROSS, 1331+3030.X1, all_avg_pol.ms, all_avg_pol.ms.flagversions, test.K, 1252+5634.cmpxlinpol, 1331+3030.clean.I.image, 1331+3030.clean.image, 1331+3030.clean.mask, 1331+3030.clean.model, 1331+3030.clean.pb, 1331+3030.clean.psrf, 1331+3030.clean.Q.image, 1331+3030.clean.residual, and 1331+3030.clean.summary. A red line highlights the '1331+3030.clean.image' file in the File Browser.

The screenshot shows the CARTA software interface in Mozilla Firefox. The main window displays two image panels side-by-side. The left panel shows the 'Total intensity' image, and the right panel shows the 'Polarization' image. The 'Polarization' image is self-scaled, showing a value of 5.8712e-3 Jy/beam. The 'Render Configuration' panel is open, showing the 'Polarization' image selected. The 'Clip max' is set to 0.788, which is approximately 12% of the total intensity. The 'Scaling' is set to 'Linear'. The 'Colormap' is set to a color scale from 0 to 1.0. The 'Cursor' is at 6.15 Jy/beam. The 'Render Configuration' panel also shows a graph of the image intensity distribution.

Display Plinear calculated on the fly

self-scaled, ~12% of total intensity

Plot linear polarisation contours

1331+3030.clean.image

WCS: (13:31:08.2830, 30.334)
Image: (111, 37); Value: 9.96738e-3 Jy/beam ;
Polarization: PLinear

Declination 33.4 33.2 33.0 32.8 32.6
Right ascension 13:31:08.300 08.285 08.270

Generator start-step-multiplier **Generate**

Parameters Start 5.592e-1
Step 4.165e-1
N 5
Multiplier 1

Levels 8.00e-2 × 0.16 × 0.32 × 0.64 ×

Clear Apply Close

Cursor: 2.03e-3 Jy/beam Bias / Contrast

Toggle multi-panels

DON'T

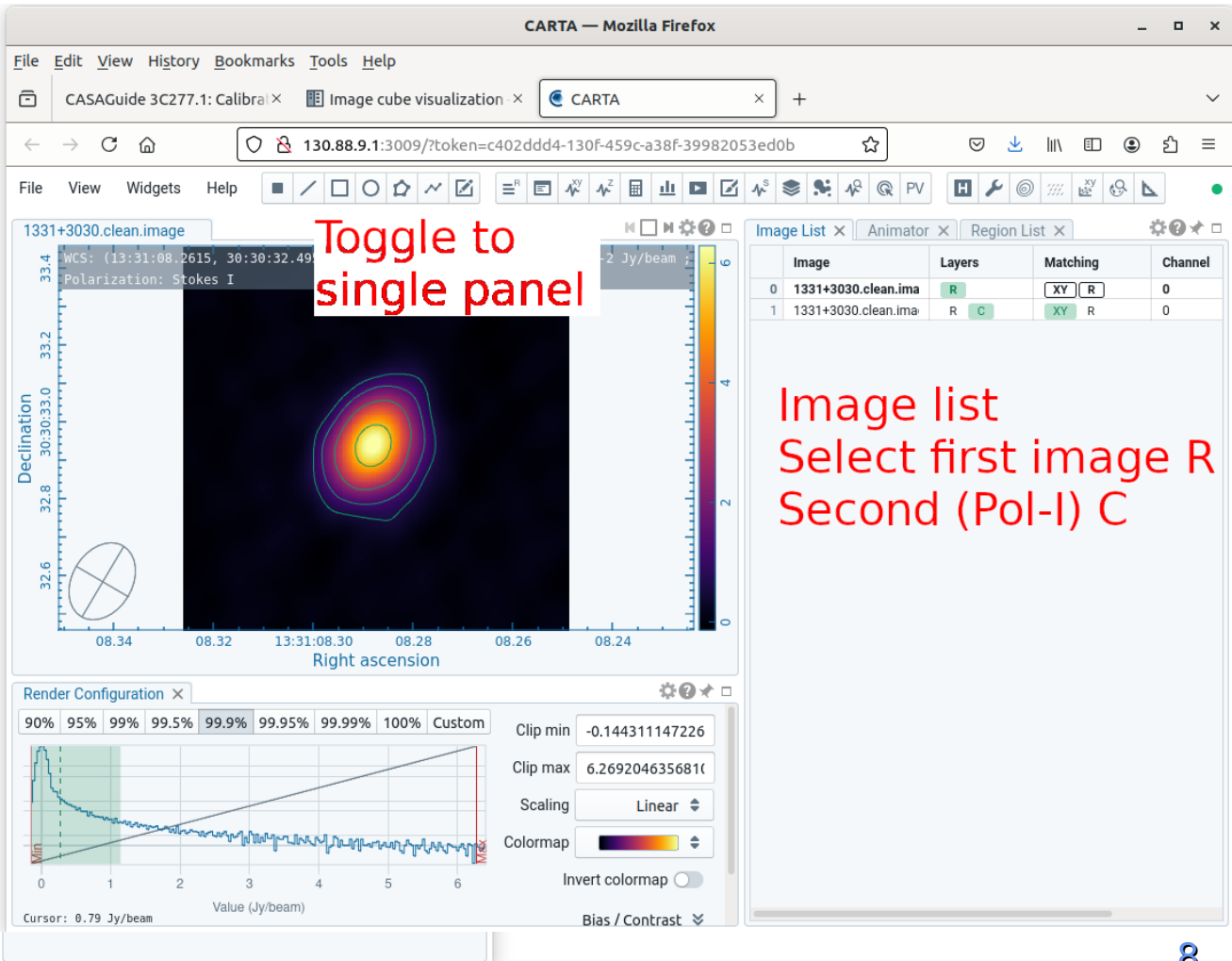
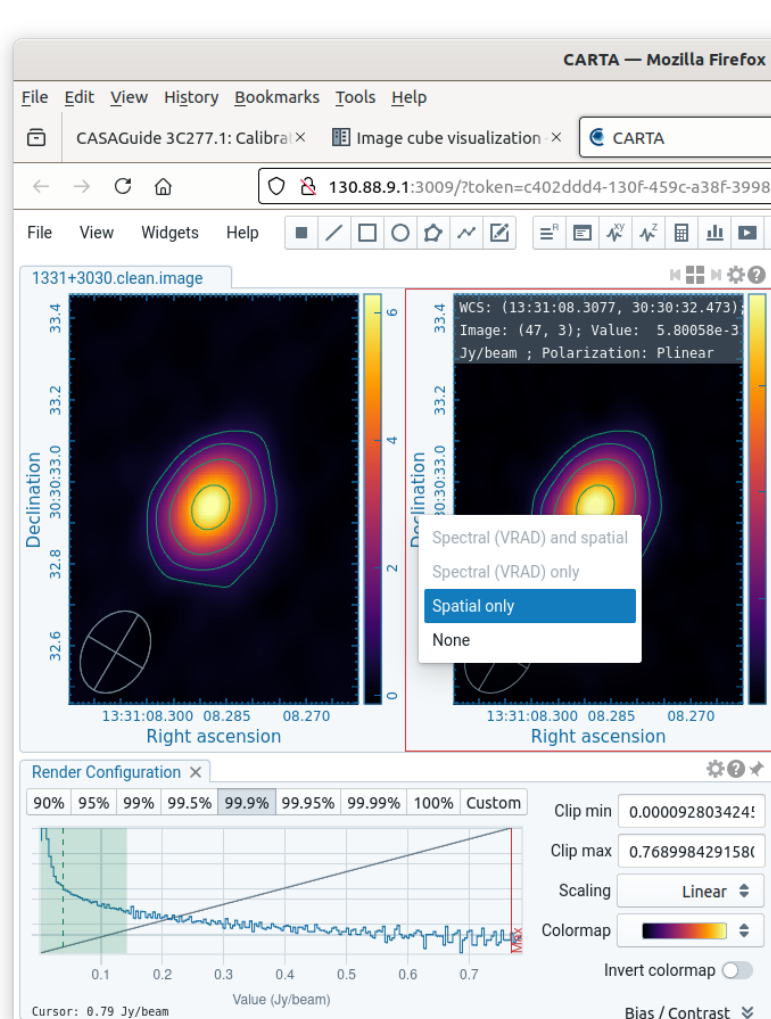
- Open contour 'widget'
 - Automatic levels may not be helpful
 - Estimate useful levels from rms
 - $(1,2,4) \times \sigma_{\text{rms}}$
 - 80, 160, 320 mJy

Align and overlay images

The screenshot displays the CARTA software interface within a Mozilla Firefox browser window. The browser address bar shows the URL `130.88.9.1:3009/?token=c402ddd4-130f-459c-a38f-39982053ed0b`. The CARTA interface features a toolbar with various icons for image manipulation and a main workspace with two image panels. The left panel shows a reference image with a color scale from 0 to 6. The right panel shows a second image with a color scale from 0 to 0.6. A context menu is open over the right image, listing options: 'Spectral (VRAD) and spatial', 'Spectral (VRAD) only', 'Spatial only' (highlighted), and 'None'. The WCS information for the right image is displayed as: `WCS: (13:31:08.3077, 30:30:32.473); Image: (47, 3); Value: 5.80058e-3; Jy/beam ; Polarization: PLinear`. The 'Render Configuration' panel at the bottom includes a 'Clip min' of 0.000092803424, a 'Clip max' of 0.768998429158, 'Scaling' set to 'Linear', and a 'Colormap' selector. A graph shows the intensity profile of the image, with a cursor at 0.79 Jy/beam. The 'Image List' and 'Animator' panels on the right show the current image and polarization settings.

Hover on image
Select WCS
matching

Plot Pol-I contours over colour total intensity



Overlay polarisation vectors

CARTA — Mozilla Firefox

File Edit View History Bookmarks Tools Help

CASAGuide 3C277.1: Calibra Image cube visualization CARTA

130.88.9.1:3009/?token=c402ddd4-130f-459c-a38f-39982053ed0b

File View Widgets Help

Theme Layouts Images File Header Contours Vector Overlay Image Fitting Online Catalog Query

Vector Overlay Configuration

Configuration Styling

Angular source Computed PA

Intensity source Computed PI

Pixel averaging

Averaging width (px) 4

Polarization intensity Absolute Fractional

Threshold enabled

Threshold (Jy/beam) 2 (total intensity level)

Debiasing

Stokes Q error 0.03

Stokes U error 0.03

Clear Apply Close

Render Configuration

90% 95% 99% 99.5% 99.9% 99.95% 99.99% 100% Custom

Clip min -0.14431114722

Clip max 6.26920463568

Scaling Linear

Colormap

Invert colormap

Bias / Contrast

Cursor: 0.79 Jy/beam

Value (Jy/beam)

- Open vector 'View'
 - Set cutoff based on total intensity rms to avoid noise vectors
 - Set debiasing levels based on Q and U σ_{rms}

Adjust vector spacing and length

CARTA — Mozilla Firefox

File Edit View History Bookmarks Tools Help

CASAGuide 3C277.1: Calibra... Image cube visualization × CARTA

130.88.9.1:3009/?token=c402ddd4-130f-459c-a38f-39982053ed0b

File View Widgets Help

- Theme
- Layouts
- Images
- File Header
- Contours
- Vector Overlay**
- Image Fitting
- Online Catalog Query

Decination: 33.4, 33.2, 33.0, 32.8, 32.6

Right ascension: 08.34, 08.32, 13:31:08.30, 08.28, 08.26, 08.24

Render Configuration ×

90% 95% 99% 99.5% 99.9% 99.95% 99.99% 100% Custom

Clip min: -0.14431114722
Clip max: 6.26920463568

Scaling: Linear

Colormap: [Color bar]

Invert colormap

Bias / Contrast

Cursor: 0.79 Jy/beam

Value (Jy/beam)

CARTA — Mozilla Firefox

File Edit View History Bookmarks Tools Help

CASAGuide 3C277.1: Calibra... Image cube visualization × CARTA

130.88.9.1:3009/?token=c402ddd4-130f-459c-a38f-39982053ed0b

File View Widgets Help

1331+3030.clean.image

WCS: (13:31:08.2673, 30:30:33.251); Image: (152, 158); Value: -1
Polarization: Stokes I

Decination: 33.4, 33.2, 33.0, 32.8, 32.6

Right ascension: 08.34, 08.32, 13:31:08.30, 08.28, 08.26

Render Configuration ×

90% 95% 99% 99.5% 99.9% 99.95% 99.99% 100% Custom

Clip min
Clip max
Scaling
Colormap

Invert colormap

Bias / Contrast

Cursor: 0.79 Jy/beam

Value (Jy/beam)

Vector Overlay Conf...

Data: 1331+3030.clean.image

source

Configuration Styling

Angular source: Computed F

Intensity source: Computed F

Pixel averaging:

Averaging width (px): 7

Polarization intensity: Absolute Fractional

Threshold enabled:

Threshold (Jy/beam): 2

Clear Apply Close

Invert colormap

Bias / Contrast

Vector Overlay Conf...

Data: 1331+3030.clean.image

source

Configuration Styling

Line thickness (px): 1

Intensity (Jy/beam): Min 2.288e, Max 7.706e

Line length (px): Min 0, Max 200

Rotation offset (deg): 0

Color mode: Constant color

Clear Apply Close

Admire!

- Use rotation offset to check expected 3C286 polarisation angle 33°
- 3C277.1 will be more interesting...

