World coordinate systems

astropy.wcs

Translate coordinates between images and the sky

Key concepts: WCS objects

Initialization

Image Distortion

astropy.wcs

- WCS = World Coordinate System
- projections of celestial sphere onto a plane
- convert between image and sky coordinates
- footprint of image on sky
- not specific to FITS, but today will be FITS

WCS objects

Initialization

Image Distortion

astropy.wcs

WCS objects

Initialization

Image Distortion

- WCS constructor

```
>>> from astropy.wcs import WCS
```

- Initialize from an image header (FITS or text)

```
>>> from astropy.io import fits
>>> w = WCS(fits.getheader('data/sip.fits')
```

- Create from scratch

astropy.wcs

WCS objects

Initialization

Image Distortion

- Handles image distortion conventions
- SIP convention
  - pixel-based polynomials
  - used by space-based observatories
- TPV convention
  - implemented in SExtractor/SWarp/SCamp
  - used by ground-based observatories

Displaying images with WCS

astropy.visualization

Transform image values, for visualization

Key concepts:

Scale & Stretch

Contour intervals

WCS axes

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Scale & Stretch

Contour intervals

WCS axes

- Scale: choose lower and upper image values to map to the interval [0:1]
- Stretch: Transform [0:1] to [0:1] linearly or non-linearly

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Scale & Stretch

Contour intervals

WCS axes

- Percentile intervals
- Manual intervals
- Asymmetric Percentile intervals
- ZScale intervals

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Scale & Stretch

Contour intervals

WCS axes

- Connects WCS object to matplotlib
- Labeled axes
- Coordinate grids
- Overlay markers with celestial coordinates