Astronomía Observacional 2017

Reducción de espectros



Facultad de Ciencias Astronómicas Y Geofísicas

UNIVERSIDAD NACIONAL DE LA PLATA













Pasos a seguir

- Corrección por Overscan y Trimming
- Corrección por Bias
- Corrección por Flat
- Extracción de los espectros
- Calibración en longitud de onda
- Calibración en flujo y/o normalización

Corrección por Overscan y trimming

Overscan: Son los valores que se obtienen de una sobrelectura de los píxeles a lo largo de una fila, o una columna. No son píxeles físicos, sino el resultado de agregar algunas lecturas extra luego de haber sido descargada la imagen.

En estos valores solo hay ruido y un valor sistemático que agrega la electrónica (ese valor es el valor del overscan).

Trimming: recortado de los bordes de la imagen.

Corrección por Overscan y Trimming

DS9

Tarea

- 1. Determinar la región del overscan. -
- 2. Ajustar un polinomio que caracterice adecuadamente la región del overscan.
- Calcular y sustraer el polinomio de cada píxel de la imagen ccd.

Todas las imágenes (bias, flats, ciencia y comparaciones) deben ser corregidas por overscan y hay que recortarles los bordes.

Corrección por Overscan y Trimming 1. Región del overscan



Corrección por Overscan y Trimming Tarea ccdproc

	xgterm (or					
Contract	Contractor codpro					
Correct	images = "estrella.fit"	List of CCD images to correct				
	(output = "")	List of output CCD images				
Tarea codo	(ccdtype = "object")	CCD image type to correct				
raica ccupi	(max_cache = 0)	Maximum image caching memory (in Mbytes)				
	(noproc = no)	List processing steps only?\n				
	(fixpix = yes)	Fix bad CCD lines and columns?				
	(overscan = yes)	Apply overscan strip correction?				
	(trim = yes)	Irim the image?				
	(zerocor = yes)	Apply zero level correction?				
	(darkcor = yes)	Hpply dark count correction?				
	(flatcor = yes)	Hpply flat field correction?				
	(111umcor = no)	Hpply illumination correction?				
	(fringecor = no)	Hppiy fringe correction?				
	(readcor = no)	Convert Zero level image to readout correction?				
	(mendavie = "line")	Donvert flat fleid image to scan correction on				
	(readaxis = line) (fixfile = "")	File decemibing the bad lines and columns				
	(fixfile -)	Pile describing the bad lines and columns Duenecer strip image section				
	(Drassec -) (trimsec - "")	Trim data section				
	(0.10360 - 7)	Zero level calibration image				
	(dank = "")	Derk count calibration image				
	(flat = "")	Elat field images				
	(illum = "")	Illumination correction images				
	(fringe = "")	Fringe correction images				
	(minreplace = 1.)	Minimum flat field value				
	(scantupe = "shortscan")	Scan type (shortscan longscan)				
	(nscan = 1)	Number of short scan lines\n				
	(interactive = no)	Fit overscan interactively?				
	(function = "legendre")	Fitting function				
	(order = 3)	Number of polynomial terms or spline pieces				
	(sample = "*")	Sample points to fit				
	(naverage = 1)	Number of sample points to combine				
	(niterate = 1)	Number of rejection iterations				
	(low_reject = 3.)	Low sigma rejection factor				
	(high_reject = 3.)	High sigma rejection factor				
	$(grow = 0_{\star})$	Rejection growing radius				
	(mode = "ql")					







Corrección por Overscan y Trimming 2. Ajuste del polinomio



irafterm

NOAO/IRAF V2.16.1 yael@yael-mint17 Thu 20:11:23 31-Aug-2017 func=legendre, order=3, low_rej=3, high_rej=3, niterate=1, grow=1 total=569, sample=569, rejected=6, deleted=0, RMS= 0.4548 Overscan vector for estrella.fit from section [385:394,1:576]

2.



Corrección por Bias

1. Combinar los bias.

2. Sustraer el Bias promedio de todas las imagenes restantes (flats, ciencia, comparaciones).

Tarea ZEROCOMBINE Tarea CCDPROC

Corrección por Flat

 Combinar los flats.
Normalizar el Flat promedio.
Dividir todas las imagenes restantes (ciencia, comparaciones) por el Flat promedio normalizado.
Tarea FLATCOMBINE Tarea RESPONSE
Tarea CCDPROC

longslit≻lpar n	response	
calibration =		Longslit calibration images
normalizatio =		Normalization spectrum images
response =		Response function images
(interactive =	yes)	Fit normalization spectrum interactively?
(threshold =	INDEF)	Response threshold
(sample =	"*")	Sample of points to use in fit
(naverage =	1)	Number of points in sample averaging
(function =	"spline3")	Fitting function
(order =	1)	Order of fitting function
(low_reject =	0.)	Low rejection in sigma of fit
(high_reject =	0.)	High rejection in sigma of fit
(niterate =	1)	Number of rejection iterations
(grow =	0,)	Rejection growing radius
(graphics =	"stdgraph")	Graphics output device
(cursor =	"")	Graphics cursor input
(mode =	"ql")	

longslit> response calibrat=Flat.fits normaliz=Flat.fits response=NFlat.fits Fit the normalization spectrum for Flat.fits interactively (yes): Dispersion axis (1=along lines, 2=along columns, 3=along z) (1:3) (1):



Distintas vistas Teclas: "h", "j", "k" y "l"



Distintas vistas Teclas: "h", "j", "k" y "l"



Corrocción nor Elat

irafterm





Pasamos de una imagen bidimensional a una unidimensional

- 1. Encontrar el espectro.
- 2. Definir las ventanas de extracción y del fondo del cielo.
- 3. Trazar el centro del perfil espacial en función del eje de dispersión (traza del espectro).
- 4. Sumar el espectro dentro de la ventana de extracción, restando el cielo.

Información más detallada la pueden encontrar en User's Guide to Reducing Slit Spectra with IRAF



Extracción de los espectros Tarea APALL

	vtr	200
	XU	all
Ta	roa	
1 a	rca	

	apond acos ipar apari		
	input =	List of input images	
	nfind =	Number of apertures to be found automatically	
2	(output = "")	List of output spectra	
	(apertures = "")	Apertures	
	(format = "multispec")	Extracted spectra format	
/	(references = "")	List of aperture reference images	
	(profiles = "")	list of aperture profile images\n	
	(find = ues)	Find apertures?	
2	(recenter = yes)	Perenter apentures?	
2	(recenter - ges)	Recenter apentures:	
	(resize = ges)	Resize apentures?	
	(eait = yes)	Loit apertures?	
	(trace = yes)	Trace apertures?	
	(fittrace = yes)	Fit the traced points interactively?	
	(extract = yes)	Extract spectra?	RR
	(extras = yes)	Extract sky, sigma, etc.?	
	(review = yes)	Review extractions?\n	
	(line = INDEF)	Dispersion line	
	(nsum = 10)	Number of dispersion lines to sum or median\n\n	
	(1 ower = -5.)	Lower aperture limit relative to center	
	(upper = 5.)	Hoper aperture limit relative to center	
	/	Annalise ID ALLIS (
	ID TUNCTION = Chebushey	Rackoround tunction	
	(b order = 1)	Background function order	
	$(b_{\text{comple}} - 1)$	Background sample regions	
	$(b_{1}) = (b_{1}) = (b_{$	Packapound suppose on madian	
	$(D_naverage = -5)$	Background average or median	
	(D_n)	Background rejection iterations	
	(D_low_reject = 3.)	Background lower rejection sigma	
	(b_high_rejec = 3.)	Background upper rejection sigma	
		Basharound rejection growing rediver whether OPENTU	
	(widen - J.)	Troffic concoring widen	
	(radius = 10,)	Profile centering radius	
	(threshold = 0.)	Detection threshold for profile centering\n\n#	
	(minsep = 5.)	Minimum separation between spectra	
	(maxsep = 100000.)	Maximum separation between spectra	
	(order = "increasing")	Order of apertures\n\n# RECENTERING PARAMETERS\n	
	(aprecenter = "")	Apertures for recentering calculation	
	(npeaks = INDEF)	Select brightest peaks	
	(shift = yes)	Use average shift instead of recentering?\n\n#	
	(llimit = INDEE)	Lower aperture limit relative to center	
			4777
	(ulevel = 0.1)	Eraction of peak or intensity for automatic wid	
	(310001 - 011)		
	(bko = ues)	Subtract background in automatic width?	
	(DK9 - 965)		
	(avolimits = po)	Average limits over all apentures?\n\n# TPOCINC	
	(avgrinites - 10)	Number of disconsion lines to sur	
	$(t_nsum = 10)$	Tunner of dispersion lines to sum	
	$(t_step = 10)$	Marken af annanation times an file is less to f	
	$(t_niost = 3)$	Number of consecutive times profile is lost bef	
	(t_function = "legendre")	Irace fitting function	
	$(t_order = 2)$	Irace fitting function order	
	(t_sample = "*")	Irace sample regions	
	(t_naverage = 1)	Trace average or median	
	(t_niterate = 0)	Trace rejection iterations	12
	(t_low_reject = 3.)	Trace lower rejection sigma	
	(t, high rejec = 3.)	Trace upper rejection sigma	
	(01/10/00 01)		111
	(t_grov = 0.)	Insee rejection growing redivelals# EVIPOCIION	
	(background = "none")	These nejection growing hadivelnln# EVTROCTION Background to outtract	
	(+_onov = 0.) (bookground = "nono") (skybox = 1)	These rejection grouing redivoluter EVTROCTION Background to cubtract Box car smoothing length for sky	
	(t_orou = 0.) (background = "nene") (skybox = 1) (weights = "none")	Proce rejection grouing redivolution FVTPORTION Prokenound to cubtoret Box car smoothing length for sky Extraction weights (nonelvariance)	
	(+_onov = 0.) (background = "nono") (skybox = 1) (weights = "none")	Bookground to outtract Bookground to outtract Book car smoothing length for sky Extraction weights (nonelvariance)	
	(+	These rejection grouing reducinent EVTPORTION Background to outtreat Box car smoothing length for sky Extraction weights (nonelvariance) Fromie fitting type (fittinfit2d) Detect and replace had pixels?	
	(+ = 0) (background = "none") (skybox = 1) (weights = "none") (pric = "ricio") (clean = no) (saturation = INDEE)	These rejection grouing reducible# EVTPORTION Packground to outtreast Box car smoothing length for sky Extraction weights (nonelvariance) Fromie ficting type (ficting fictor) Detect and replace bad pixels? Saturation level	
	(+ = 0.) (background = "none") (skybox = 1) (weights = "none") (prit = "ritid") (clean = no) (saturation = INDEF) (readnoice = "0.")	These rejection ensuing radius how EVTPORTION Packground to subtract Box car smoothing length for sky Extraction weights (nonelvariance) Fromile Fitting type (Fitial Fit2d) Detect and replace bad pixels? Saturation level Read out noise sigma (shotons)	
	(+ = 0.) (background = "none") (skybox = 1) (weights = "none") (prit = "ritid") (clean = no) (saturation = INDEF) (readnoise = "0.")	These rejection proving redivoluter EVTPORTION Box car smoothing length for sky Extraction weights (nonelvariance) Fronte ficting type (fittidific2d) Detect and replace bad pixels? Saturation level Read out noise sigma (photons) Photom control (chotom (data surtar))	
	(+	Packground to outproof Box car smoothing length for sky Extraction weights (nonelvariance) Frontie fitting type (fittinfit2u) Detect and replace bad pixels? Saturation level Read out noise sigma (photons) Photon gain (photons/data number)	
	(+	Packground to outtract Bookground to outtract Bookground to outtract Bookground to outtract Bookground to outtract Extraction weights (nonelvariance) Frofile fitting type (fittinfit2d) Detect and replace bad pixels? Saturation level Read out noise sigma (photons) Photon gain (photons/data number) Lower rejection threshold	
	<pre>(+ o) (background = "none") (skybox = 1) (weights = "none") (clean = no) (saturation = INDEF) (readnoise = "0.") (gain = "1.") (lsigma = 4.) (usigma = 4.)</pre>	Packground to outtract Box car smoothing length for sky Extraction weights (nonelvariance) Frome fitting type (fittinfit2d) Detect and replace bad pixels? Saturation level Read out noise sigma (photons) Photon gain (photons/data number) Lower rejection threshold Upper rejection threshold	
	(+	Prove rejection environ reducted at EVTPORTION Box car smoothing length for sky Extraction weights (nonelvariance) Frome fitting type (fittinfft2d) Detect and replace bad pixels? Saturation level Read out noise sigma (photons) Photon gain (photons/data number) Lower rejection threshold Upper rejection threshold Number of subapertures per aperture	

Parámetros de la apertura

Parámetros del cielo

Parámetros de la traza

Extracción de los espectros 1. Encontrar el espectro

Extracción de los espectros 1. En 🗮 🖸 irafterm \odot (\mathbf{X}) 35000 30000 25000 20000 15000 10000 5000 0 н H 100 200 300 aperture = 1 beam = 1 center = 118.76 low = -2.88 upper = 3.04

2. Definir las ventanas de extracción y del fondo del cielo



3. Trazar el centro de la apertura en función del eje de dispersión



4. Sumar el espectro dentro de la ventana de extraccion, restando el cielo


Calibración en longitud de onda

- 1. Extraer los espectros de comparación.
- 2. Determinar la solución de dispersión.
- 3. Aplicar la solución a los espectros de ciencia.

Tarea APALL Tarea IDENTIFY Tareas REFSPEC DISPCOR

Información más detallada la pueden encontrar en User's Guide to Reducing Slit Spectra with IRAF

Calibración en longitud de onda Tarea IDENTIFY

apextract> lpar	identifu			
images =		Images containing features to be identified		
crval =		Approximate coordinate (at reference pixel)		
cdelt =		Approximate dispersion		
(section =	"middle line")	Section to apply to two dimensional images		
(database =	"database")	Database in which to record feature data		
(coordlist = "linelists\$idhenear.dat")				
(units =	ⁿⁿ)	Coordinate units		
(nsum =	"10")	Number of lines/columns/bands to sum in 2D imag		
(match =	-3.)	Coordinate list matching limit		
(maxfeatures =	50)	Maximum number of features for automatic identi		
(zwidth =	100.)	Zoom graph width in user units		
(ftype =	"emission")	Feature type		
(fwidth =	4.)	Feature width in pixels		
(cradius =	5.)	Centering radius in pixels		
(threshold =	0.)	Feature threshold for centering		
(minsep =	2.)	Minimum pixel separation		
(function =	"spline3")	Coordinate function		
(order =	1)	Order of coordinate function		
(sample =	***)	Coordinate sample regions		
(niterate =	0)	Rejection iterations		
<pre>(low_reject =)</pre>	3.)	Lower rejection sigma		
(high_reject =	3.)	Upper rejection sigma		
(grow =	0,)	Rejection growing radius		
(autowrite =	no)	Automatically write to database		
(graphics =	"stdgraph")	Graphics output device		
(cursor =	ⁿⁿ)	Graphics cursor input		
(aidpars =	ⁿⁿ)	Automatic identification algorithm parameters		
(mode =	"al")			

Calibración en longitud de onda 2. Determinar la solución de la dispersión









NOAO/IRAF V2.15.1a yael@chapel.fcaglp.unlp.edu.ar Tue 18:27:00 05-Sep-2017 func=spline3, order=1, low_rej=3, high_rej=3, niterate=0, grow=0 total=25, sample=25, rejected=0, deleted=0, RMS= 0.5736

 (\mathbf{X})





Calibración en flujo

Para realizar la calibración en flujo es necesario contar con,
al menos, una estrella estándar de flujo observada en la misma noche que el objeto de ciencia.

1. Estimar la cantidad de cuentas por longitud de onda.

2. Ajustar la función de sensitividad como una función de la longitud de onda.

3. Aplicar la función de sensitividad al espectro de ciencia. Tarea STAND Tarea SENSFUNC Tarea CALIB

Calibración en flujo 1. Estimar la cantidad de cuentas



Calibración en flujo

2. Ajustar la función de sensitividad



Normalizar un espectro

- 1. Ajustar el continuo.
- 2. Dividir el espectro por el ajuste del continuo.



Normalizar un espectro Tarea SPLOT. Letra "t"

Distintas vistas con las letras



Normalizar un espectro Tarea SPLOT. Letra "t"

Distintas vistas con las letras





Astronomía Observacional 2017

Reducción de espectros











Pasos a seguir

- Corrección por Overscan y Trimming
- Corrección por Bias
- Corrección por Flat
- Extracción de los espectros
- Calibración en longitud de onda
- Calibración en flujo y/o normalización

Corrección por Overscan y trimming

Overscan: Son los valores que se obtienen de una sobrelectura de los píxeles a lo largo de una fila, o una columna. No son píxeles físicos, sino el resultado de agregar algunas lecturas extra luego de haber sido descargada la imagen.

En estos valores solo hay ruido y un valor sistemático que agrega la electrónica (ese valor es el valor del overscan).

Trimming: recortado de los bordes de la imagen.

Corrección por Overscan y Trimming

 Determinar la región del overscan. DS9
 Ajustar un polinomio que caracterice adecuadamente la región del overscan.
 Calcular y sustraer el polinomio de cada píxel de la imagen ccd.
 Todas las imágenes (bias, flats, ciencia y comparaciones) deben ser corregidas por overscan y hay que recortarles los bordes.

Corrección por Overscan y Trimming 1. Región del overscan





Corrección por Overscan y Trimming Tarea ccdproc

	xgterm (or		
Corroad	ccdred> lpar ccdpro		
Correct	images = "estrella.fit"	List of CCD images to correct	nmina
	(output = "")	List of output CCD images	
Tarea codo	(ccdtype = "object")	CCD image type to correct	
Turcu ooupi	(max_cache = 0)	Maximum image caching memory (in Mbytes)	
	(noproc = no)	List processing steps only/\n	
	(f1xp1x = yes)	Fix bad ULU lines and columns?	
	(overscan = yes)	Hppiy overscan strip correction?	
	(trim = ges)	Arim the image: Apply zero lovel connection?	
	(denkoon = yes)	Apply Zero level correction?	
	(flatcor = yes)	Apply dark count correction?	
	(illumcor = no)	Apply illumination correction?	
	(fringecor = no)	Apply fringe correction?	
	(readcor = no)	Convert zero level image to readout correction?	
	(scancor = no)	Convert flat field image to scan correction?\n	
	(readaxis = "line")	Read out axis (column line)	
	(fixfile = "")	File describing the bad lines and columns	
	(biassec = "")	Overscan strip image section	
	(trimsec = "")	Trim data section	
	(zero = "")	Zero level calibration image	
	(dark = "")	Dark count calibration image	
	(flat = "")	Flat field images	
	(illum = "")	Illumination correction images	
	(fringe = ``)	Fringe correction images	
	$(minreplace = 1_{+})$	Minimum flat field Value	
	(scantype = shortscan) (popp = 1)	Scan type (shortscanlingscan)	
	(interactive = no)	Fit overscen interactively?	
	(function = "legendre")	Fitting function	
	(orden = 3)	Number of polynomial terms or spline pieces	
	(sample = "*")	Sample points to fit	
	(naverage = 1)	Number of sample points to combine	
	(niterate = 1)	Number of rejection iterations	
	(low_reject = 3.)	Low sigma rejection factor	
	(high_reject = 3.)	High sigma rejection factor	
	$(grow = 0_{\star})$	Rejection growing radius	
	(mode = "ql")		



Corrección por Overscan y Trimming 2. Ajuste del polinomio







Corrección por Bias



Corrección por Flat



Corrección por Flat Normalización del Flat promedio

longslit>lpar response	
calibration =	Longslit calibration images
normalizatio =	Normalization spectrum images
response =	Response function images
(interactive = yes)	Fit normalization spectrum interactively?
(threshold = INDEF)	Response threshold
(sample = "*")	Sample of points to use in fit
(naverage = 1)	Number of points in sample averaging
(function = "spline3")	Fitting function
(order = 1)	Order of fitting function
(low_reject = 0.)	Low rejection in sigma of fit
(high_reject = 0.)	High rejection in sigma of fit
(niterate = 1)	Number of rejection iterations
(grow = 0.)	Rejection growing radius
(graphics = "stdgraph")	Graphics output device
(cursor = "")	Graphics cursor input
(m <u>o</u> de = "ql")	· · ·

Corrección por Flat Normalización del Flat promedio

longslit> response calibrat=Flat.fits normaliz=Flat.fits response=NFlat.fits Fit the normalization spectrum for Flat.fits interactively (yes): Dispersion axis (1=along lines, 2=along columns, 3=along z) (1:3) (1):
















	input = nfind =	List of input images Number of apertures to be found automatically	
Extracc	(apertures = "") (format = "multispec") (references = "") (profiles = "")	List of duput spectra Apertures Extracted spectra format List of aperture reference images List of aperture profile images\n	
Tarea APAL	(find = yes) (recenter = yes) (resize = yes) (edit = yes) (fittroe = yes) (extract = yes) (extract = yes) (review = yes) (line = INDEF) (nsum = 10) (lower = -5.) (upper = 5.)	Find apertures? Recenter apertures? Resize apertures? Edit apertures? Edit apertures? Fit the traced points interactively? Extract spectra? Extract sky, sigma, etc.? Review extractions? Nispersion line Number of dispersion lines to sum or median\n\n Lower aperture limit relative to center Upper aperture limit relative to center	Parámetros de la apertura
	(b_order = 1) (b_sample = "-10:-6,6:10") (b_naverage = -3) (b_niverate = 0) (b_low_reject = 3.) (b_high_rejec = 3.)	Background function orden Background sample regions Background sample regions Background average on median Background nejection iterations Background lower rejection sigma Background upper rejection sigma	Parámetros del cielo
	<pre>(threshold = 0.) (minsep = 5.) (maxsep = 100000.) (aprecenter = "increasing") (aprecenter = "") (npeaks = INDEF) (shift = yes) (limit = INDEF)</pre>	Detection threshold for profile centering\n\n# Minimum separation between spectra Maximum separation between spectra Order of apertures\n\mmaketRitERING PARAMETERS\n Apertures for recentering calculation Select brightest peaks Use average shift instead of recentering\n\n# Lower aperture limit relative to center	
	(ylevel = 0,1)	Fraction of peak or intensity for automatic wid	
	<pre>(bkg = ugs) (acglinits = ro) (t_nrum = 10) (t_nrum = 10) (t_nrot = 3) (t_order = 2) (t_order = 2) (t_order = 2) (t_order = 1) (t_order = 1) (t_order = 1) (t_order = 2) (t_high_rejce = 3.) (t_high_rejce = 3.) (t_high_rejce = 3.) (skybox = 1) (weights = "none") (weights = "none") (saturation = INDEF) (readmois = "0,") (agin = "1,") (laigma = 4.) (readmois = 1,")</pre>	Subtract background in automatic width? Subtract background in automatic width? Subtract Subtract Su	Parámetros de la traza

Extracción de los espectros 1. Encontrar el espectro



Extracción de los espectros 2. Definir las ventanas de extracción y del fondo del cielo





Extracción de los espectros 3. Trazar el centro de la apertura en función del eje de dispersión





Extracción de los espectros 4. Sumar el espectro dentro de la ventana de extraccion, restando el cielo





Calibración en longitud de onda



Calibración en longitud de onda Tarea IDENTIFY

<pre>images = Images containing features to be identified crval = Approximate coordinate (at reference pixel) cdelt = Approximate coordinate (at reference pixel) cdelt = Approximate dispersion (section = "middle line") Section to apply to two dimensional images (database = "database") Database in which to record feature data (coordlist = "linelists\$idhenear.dat") User coordinate list (units = "") Coordinate units (nsum = "10") Number of lines/columns/bands to sum in 2D imag (match = -3.) Coordinate list matching limit (maxfeatures = 50) Maximum number of features for automatic identi (zuidth = 100.) Zoom graph width in user units (ftype = "emission") Feature type (fwidth = 4.) Feature type (fwidth = 4.) Feature width in pixels (cradius = 5.) Centering radius in pixels (threshold = 0.) Feature threshold for centering (minsep = 2.) Minimum pixel separation</pre>
crval = Approximate coordinate (at reference pixel) cdelt = Approximate dispersion (section = "middle line") Section to apply to two dimensional images (database = "database") Database in which to record feature data (coordlist = "linelists\$idhenear.dat") User coordinate list (units = "") Coordinate units (nsum = "10") Number of lines/columns/bands to sum in 2D imag (match = -3.) Coordinate list matching limit (maxfeatures = 50) Maximum number of features for automatic identi (zuidth = 100.) Zoom graph width in user units (ftype = "emission") Feature type (fwidth = 4.) Feature width in pixels (cradius = 5.) Centering radius in pixels (threshold = 0.) Feature threshold for centering (minsep = 2.) Minimum pixel separation
cdelt = Approximate dispersion (section = "middle line") Section to apply to two dimensional images (database = "database") Database in which to record feature data (coordlist = "linelists\$idhenear.dat") User coordinate list (units = "") Coordinate units (nsum = "10") Number of lines/columns/bands to sum in 2D imag (match = -3.) Coordinate list matching limit (maxfeatures = 50) Maximum number of features for automatic identi (zwidth = 100.) Zoom graph width in user units (ftype = "emission") Feature type (fwidth = 4.) Feature width in pixels (cradius = 5.) Centering radius in pixels (threshold = 0.) Feature threshold for centering (minsep = 2.) Minimum pixel separation
<pre>(section = "middle line") Section to apply to two dimensional images (database = "database") Database in which to record feature data (coordlist = "linelists\$idhenear.dat") User coordinate list (units = "") Coordinate units (nsum = "10") Number of lines/columns/bands to sum in 2D imag (match = -3,) Coordinate list matching limit (maxfeatures = 50) Maximum number of features for automatic identi (zwidth = 100,) Zoom graph width in user units (ftupe = "emission") Feature type (fwidth = 4,) Feature type (fwidth = 4,) Feature width in pixels (cradius = 5,) Centering radius in pixels (threshold = 0,) Feature threshold for centering (minsep = 2,) Minimum pixel separation</pre>
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(threshold = 0.) Feature threshold for centering (minsep = 2.) Minimum pixel separation
(minsep = 2.) Minimum pixel separation
(function = "spline3") Coordinate function
(order = 1) Order of coordinate function
(sample = "*") Coordinate sample regions
(niterate = 0) Rejection iterations
(low_reject = 3.) Lower rejection sigma
(high_reject = 3.) Upper rejection sigma
(grow = 0,) Rejection growing radius
(autowrite = no) Automatically write to database
(graphics = "stdgraph") Graphics output device
(cursor = "") Graphics cursor input
(aidpars = "") Automatic identification algorithm parameters
(mode = "ql")

Calibración en longitud de onda 2. Determinar la solución de la dispersión













Calibración en flujo

Para realizar la calibración en flujo es necesario contar con, al menos, una estrella estándar de flujo observada en la misma noche que el objeto de ciencia.

1. Estimar la cantidad de cuentas por longitud de onda.	Tarea STAND
2. Ajustar la función de sensitividad como una función de la longitud de onda.	Tarea SENSFUNC
3. Aplicar la función de sensitividad	Tarea CALIB





Normalizar un espectro

1. Ajustar el continuo.

2. Dividir el espectro por el ajuste del continuo.

Tarea SPLOT





