TRIPOL PROCESSING

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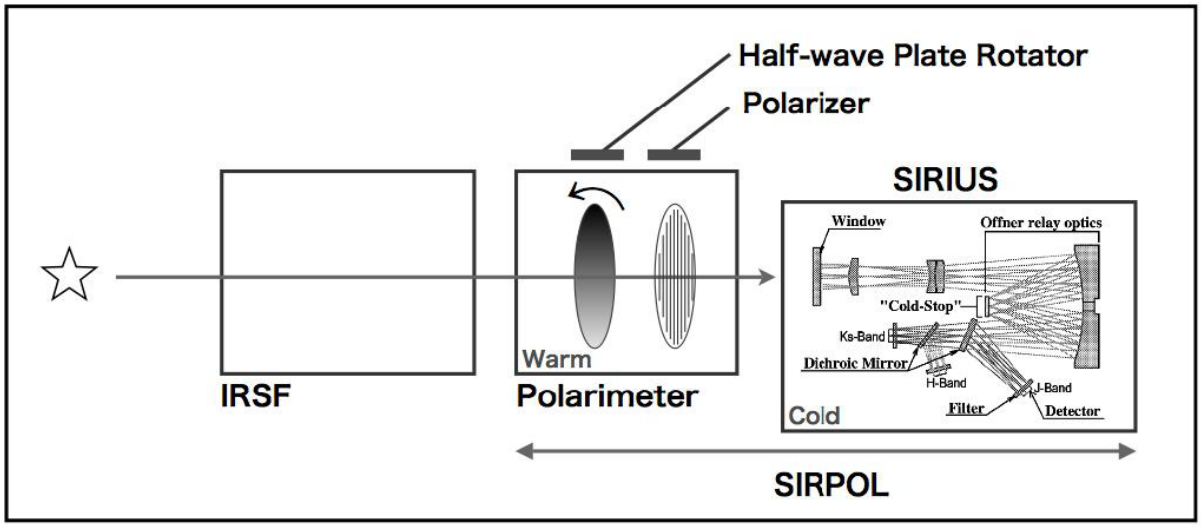
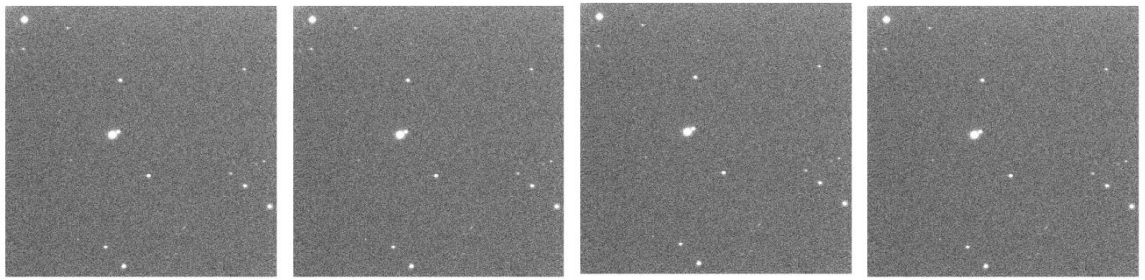
TRIPOL data reduction



The polarization intensity are different in four position angles, 0, 22.5, 45, and 67.5 degrees, and computed the level and polarization angle as.



0 22 45 67

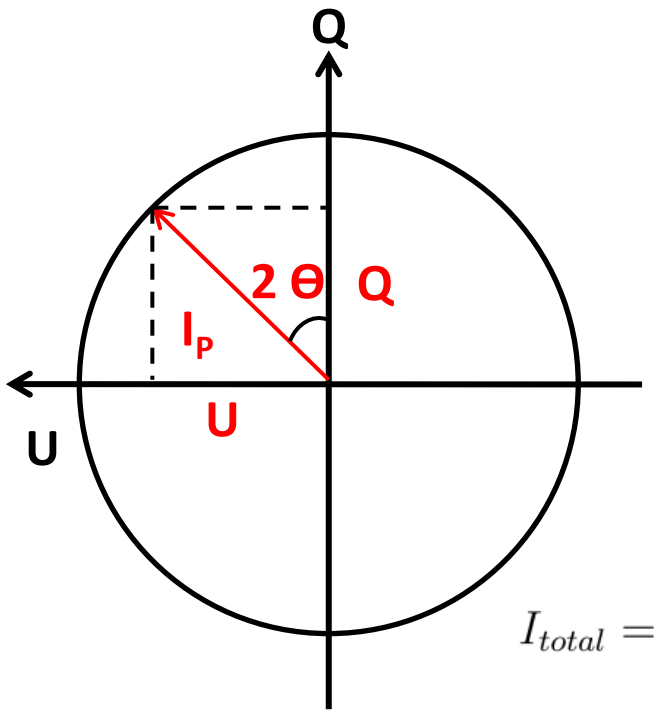
TRIPOL data reduction

TRIPOLreduction.pro, DARKMED1.pro, avgflat.pro

TRIPOLreduction.pro

- 1. Create a heard list
- 2. darkmed1, 'header.dat', 'dark', band, darktime (n), imdarkarr (512,512,n)
- 3. avgflat, 'header.dat', 'twflat', band, flatdark, 0, flat00 (512,512) ---- do four position angle.
- 4. reimg =
  (img-mdarkarr(*,*,exptsel))/flatarr(*,*,PAsel)
- 5. writefits, 'reduction\'+'re'+(list(bandf))[i], reimg,header

Polarization calculation



Ip: Polarization intensity

θ: Polarization angle

Q and U: Stokes parameter

$$Q = I_{0^\circ} - I_{45^\circ} \qquad U = I_{22.5^\circ} - I_{67.5^\circ}$$

$$I_{total} = \frac{(I_{0^\circ} + I_{22.5^\circ} + I_{45^\circ} + I_{67.5^\circ})}{2} \qquad I_p = \sqrt{Q^2 + U^2}$$

$$P = \frac{I_p}{I_{total}} \qquad \theta = \frac{1}{2} \arctan \frac{U}{Q}$$

Photometry of the point source in four position angles, 0, 22.5, 45, and 67.5 degrees yields the degree and position angle of the polarization.

TRIPOL pipeline

TRIPOLana1c.pro, calc_polangle_witherr.pro

- **APER, star00, xc, yc, i00, i00e, sky, skye, 1, /flux ----- do four position angle**
- **calc_polangle_witherr, i00,i45,i22,i67,i00e,i45e,i22e,i67e,0,The,Pol,dThe,dP**

$$P = \frac{\sqrt{(I_{0.0^o} - I_{45.0^o})^2 + (I_{22.5^o} - I_{67.5^o})^2}}{(I_{0.0^o} + I_{22.5^o} + I_{45.0^o} + I_{67.5^o})/2}$$

$$\theta = 0.5 \times \mathrm{atan}\left(\frac{I_{22.5^o} - I_{67.5^o}}{I_{0.0^o} - I_{45^o}}\right)$$

Polarization create by??

- Intrinsic: dust scatter and extinction.

(we can know standard stars intrinsic polarization.)

- Instrument: telescope reflection…
- Weather:

position angles
0 degree

position angles
45 degree

position angles
22.5 degree

position angles
67.5 degree

Polarization create by weather

- BD+33_2642 Unpolarized standard star in cloudy day g band.

Set	expos	flux	err	P(%)	Perr	PA(degree)
66	10	324552	440	6.52	0.25	-77 0
70	10	318789	437	6.80	0.14	51 0
74	10	210795	374	32.52	0.21	-10 0
78	10	280665	416	14.42	0.14	53 0
82	10	231470	384	21.72	0.09	61 0

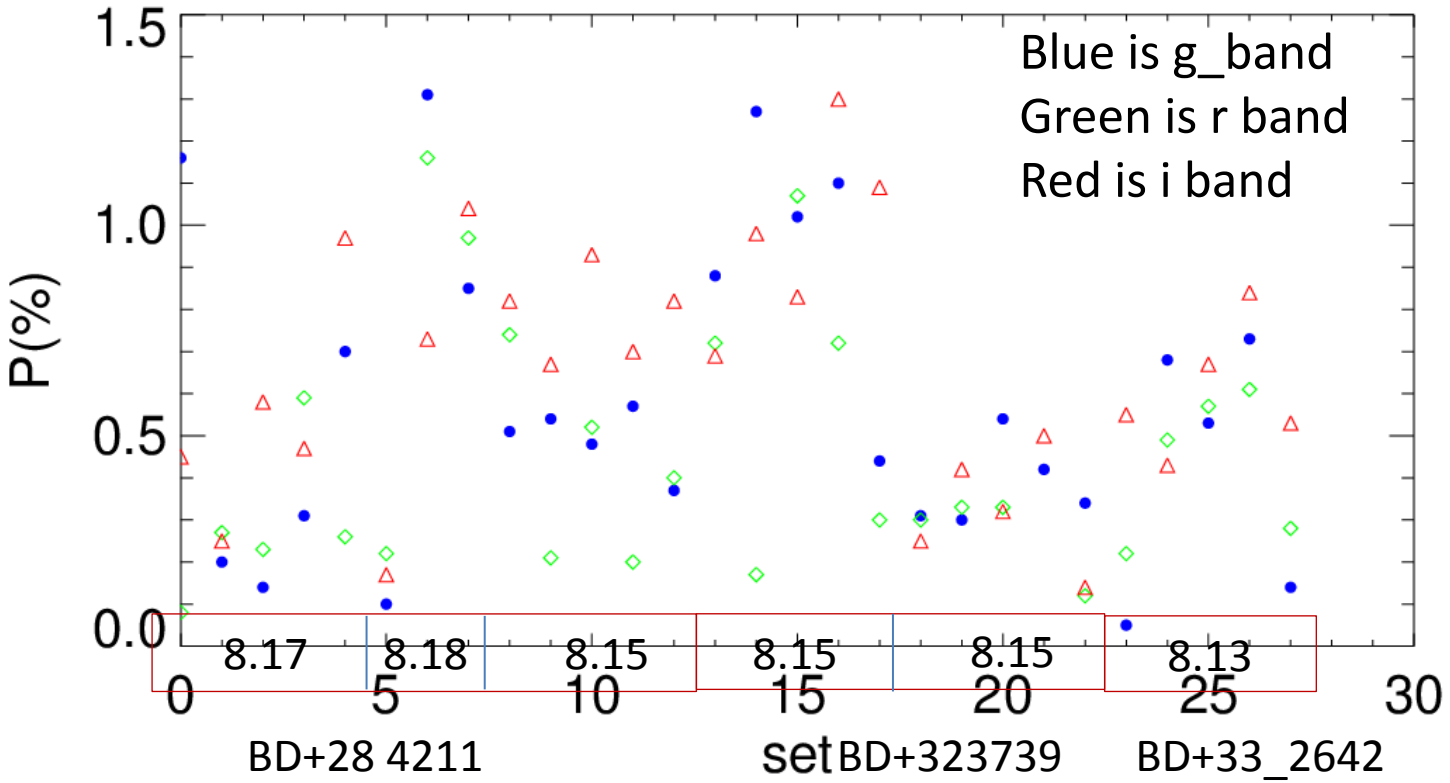
Unpolarized standard star

- BD+33_2642 Unpolarized standard star in clear time.

g P(%)	err	r P(%)	err	i P(%)	err
1.16	0.13	0.08	0.14	0.45	0.09
0.20	0.02	0.27	0.07	0.25	0.34
0.14	0.18	0.23	0.13	0.58	0.38
0.31	0.00	0.59	0.11	0.47	0.38
0.70	0.16	0.26	0.20	0.97	0.34

The polarization degree of unpolarization standard stars in clear day most smaller than 0.5. it may create by instrument.

Unpolarized stars in clear day



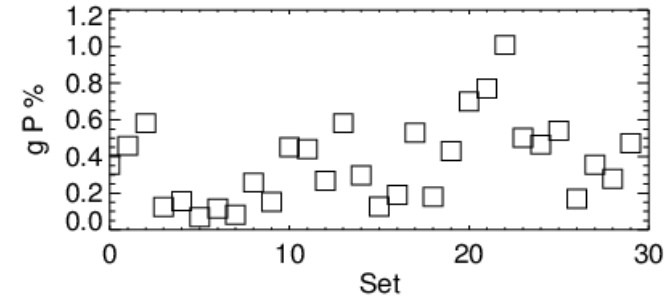
mean(gP) = 0.571071 (%)

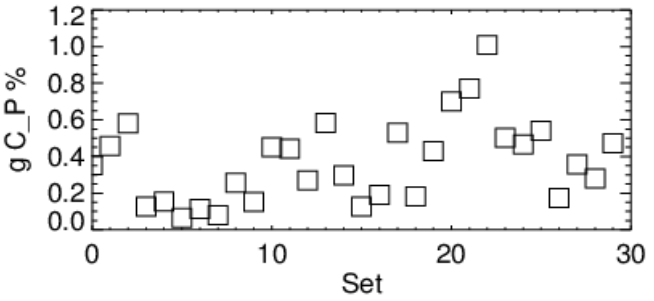
mean(rP) = 0.492143 (%)

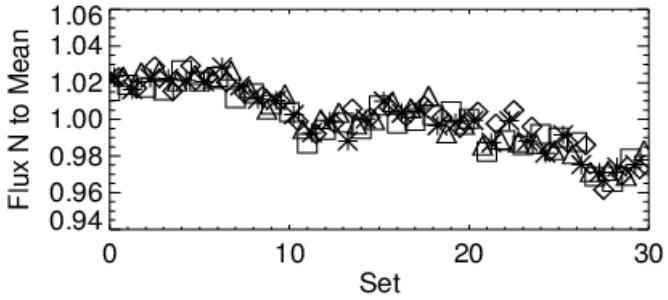
mean(iP) = 0.647857 (%)

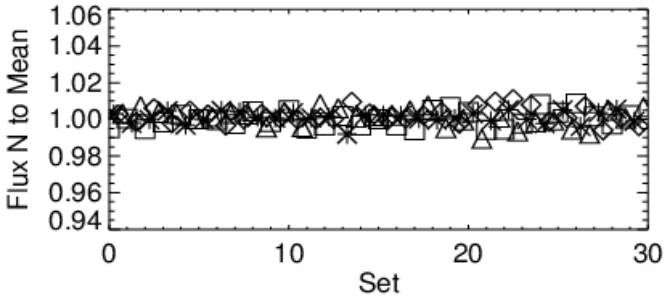
Never in clear day the polarization degree are different. It may cause by unstable weather.

Unpolarized stars in clear day









Set	expt	g flux	err	P	Perr	PA	err
avg	1-10	490129	1207	0.17	0.17	98	33
avg	11-20	481598	2234	0.23	0.23	117	71
avg	21-30	474417	2461	0.31	0.31	64	34
avg	1-30	481730	1721	0.24	0.24	90	58

THANK YOU