OAOWFC の現状報告

柳澤顕史 (OAO/NAOJ)

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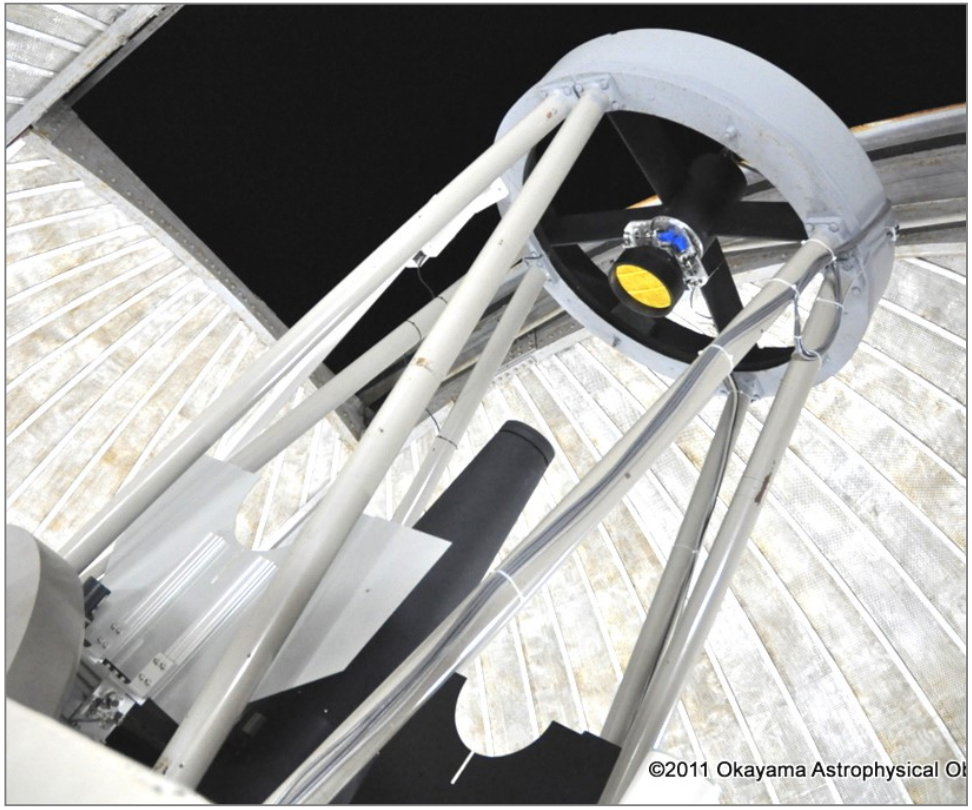
概要

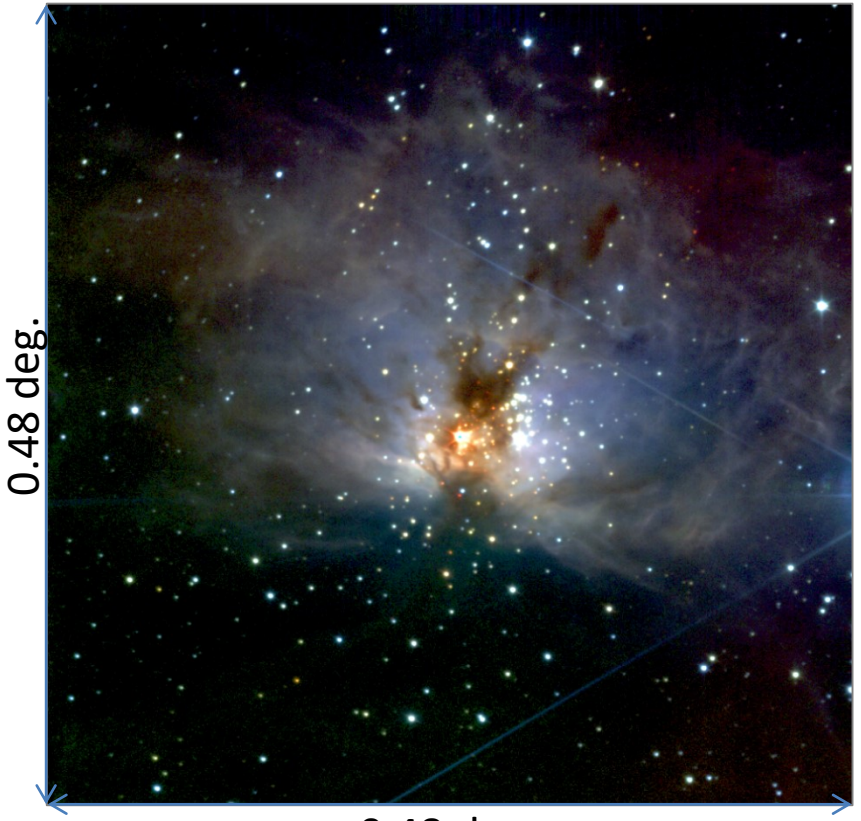
- OAOWFC
  - 30分角の視野をもつφ910mmの近赤外（Y,J,H,Ks）ロボットカメラ。
  - F/2.5 で近赤外では最も明るい光学系を持つ。
  - 昨年度、光学系の調整を完了した。
- 観測
  - 通常は K-band 銀河面モニタを実施し、Cepheid を探査中。腕の断面を見られる2天域をモニタ中。
  - 突発天体（重力波光学対応天体、GRB)のフォローアップを実施。GW151228などの観測を実施した。

OAOWFC

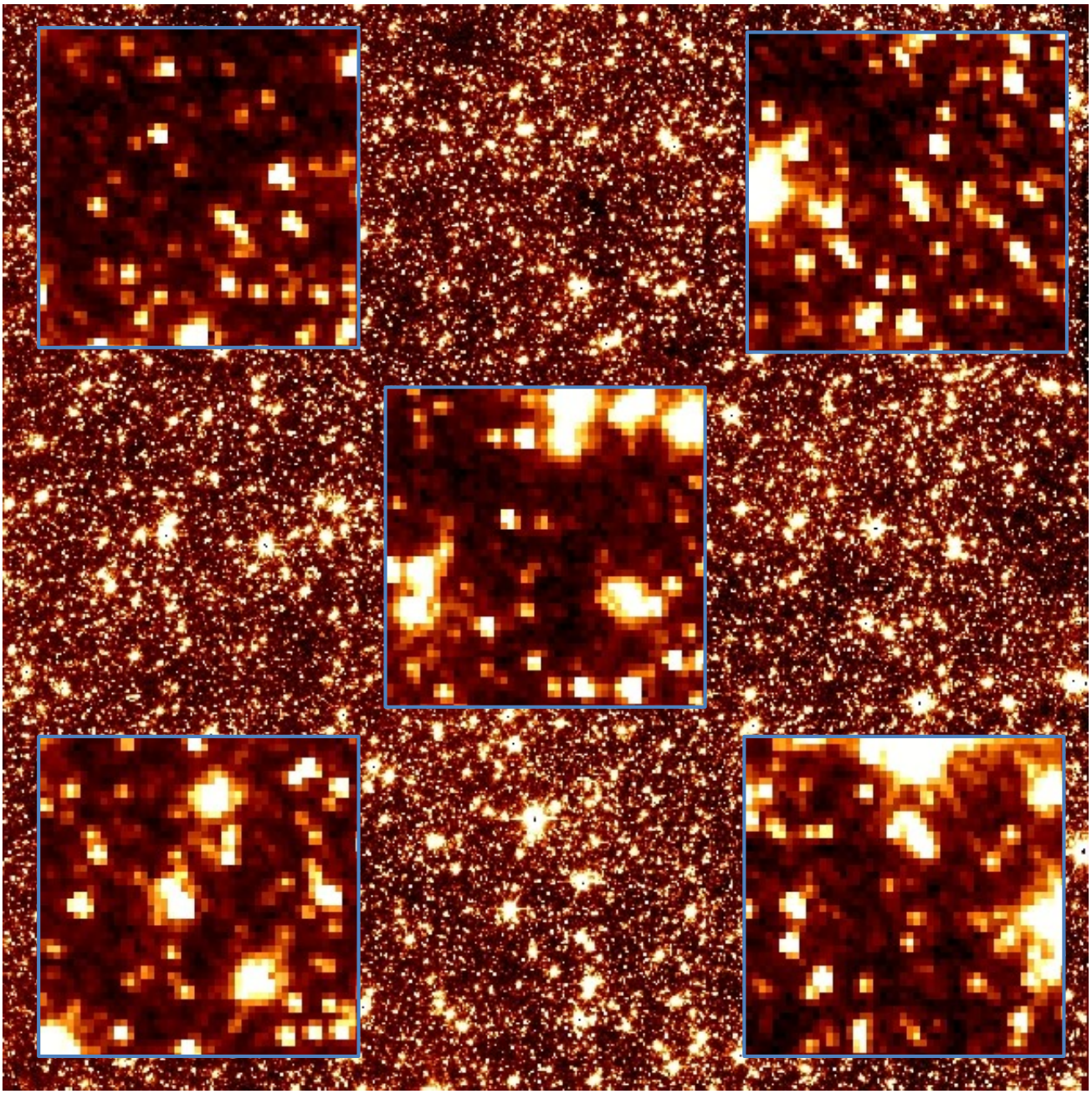
Okayama Astrophysical Observatory Wide Field Camera



OAOWFC

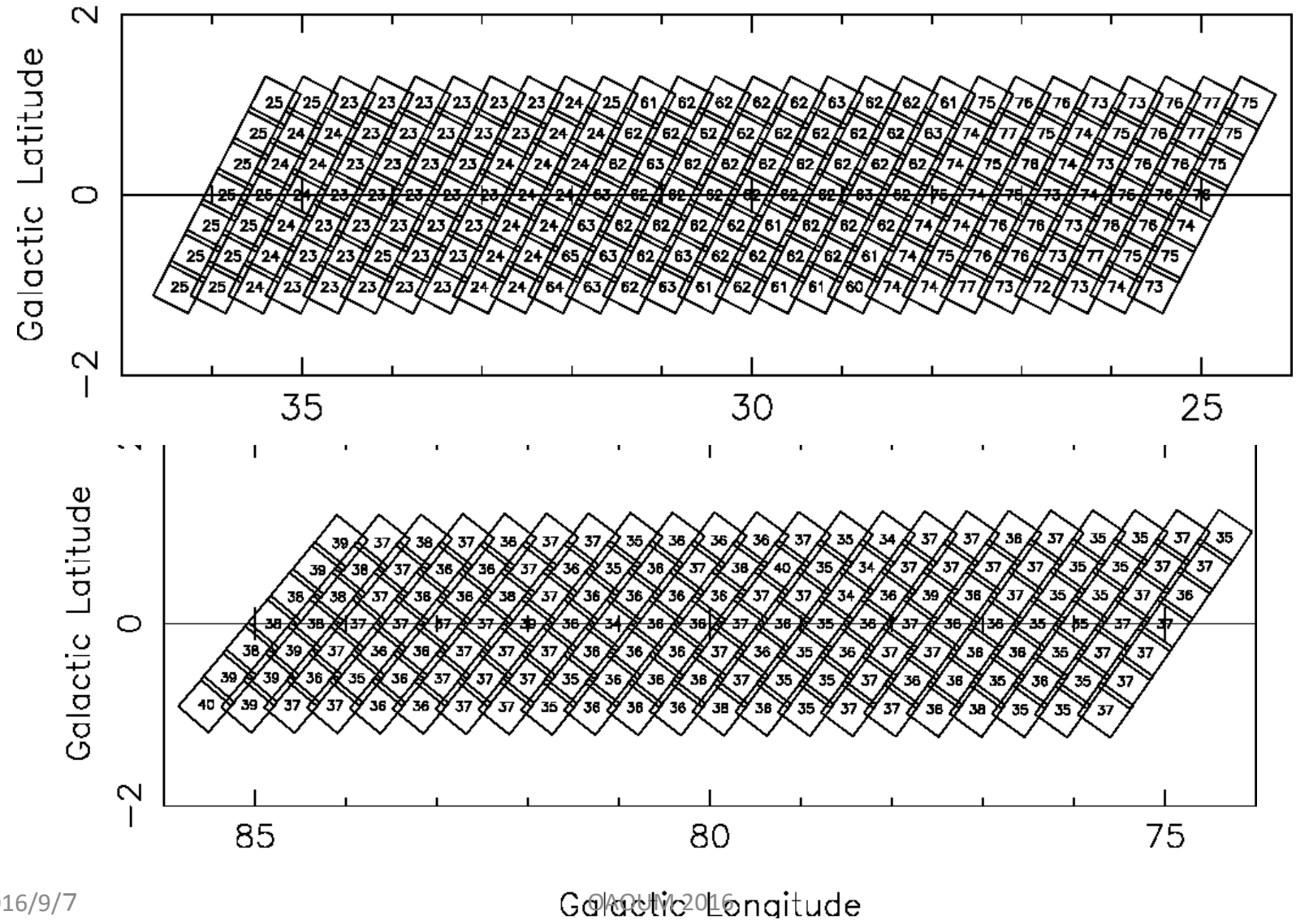


光学調整の結果視野全域でシャープな画像が得られるようになった

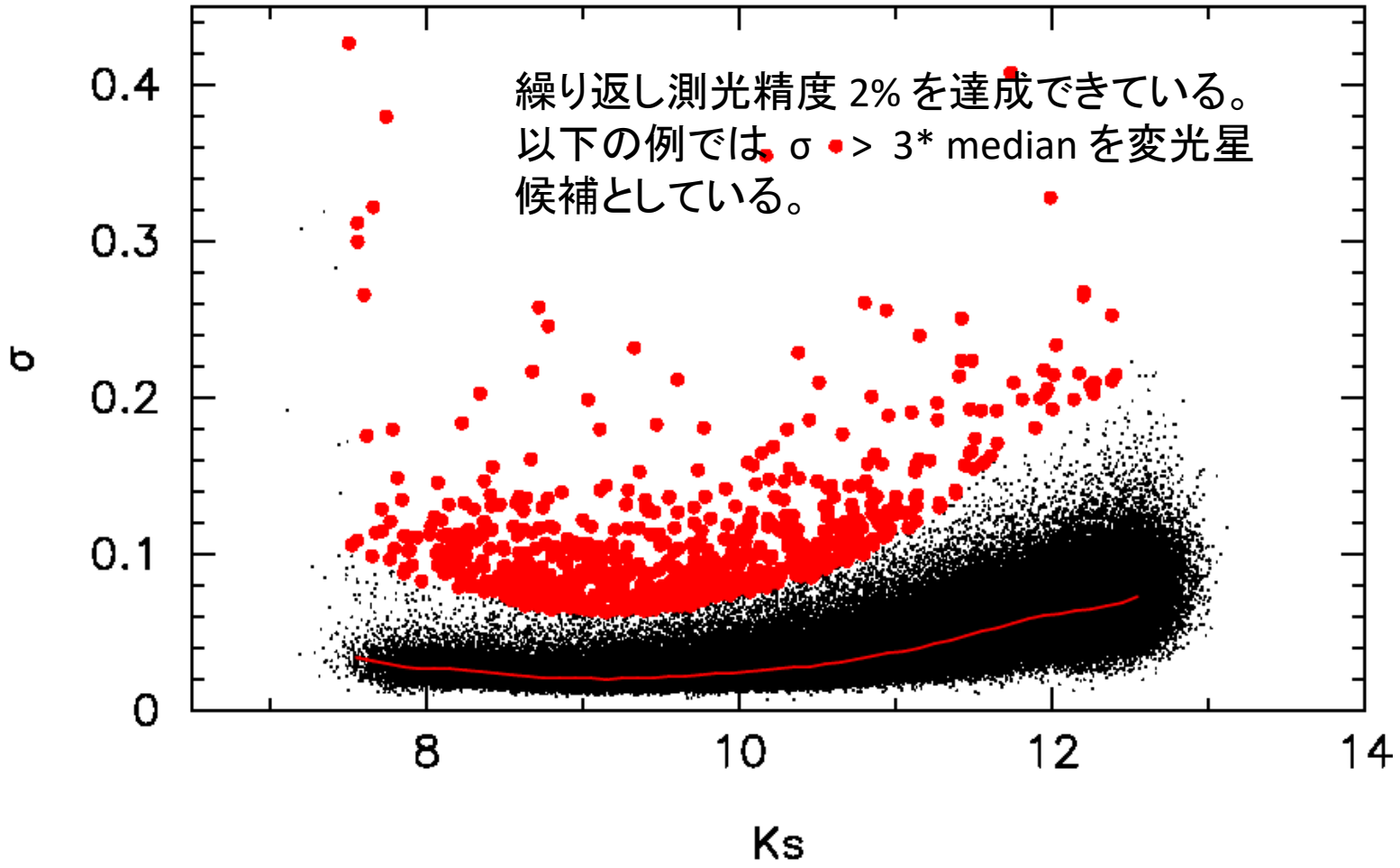


GP026_025_2015052617_141_coadd.fits 8 frames combined

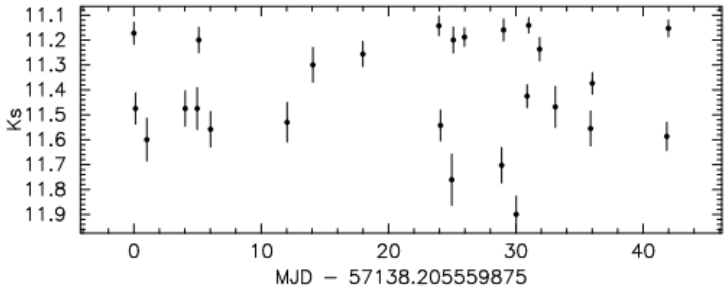
K-band 銀河面モニタ
カバー天域とモニタ回数

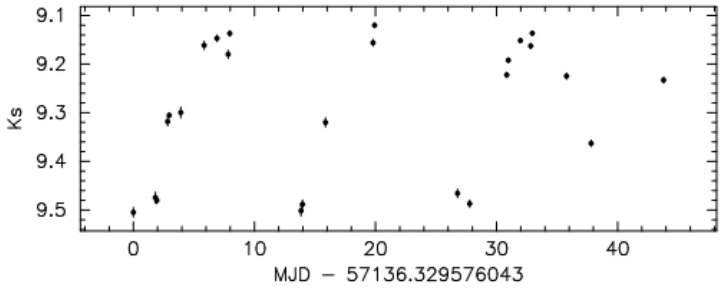


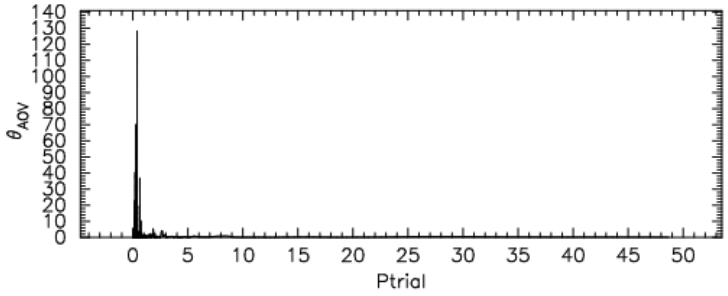
K-band 銀河面モニタ・繰り返し測光精度と変光星候補

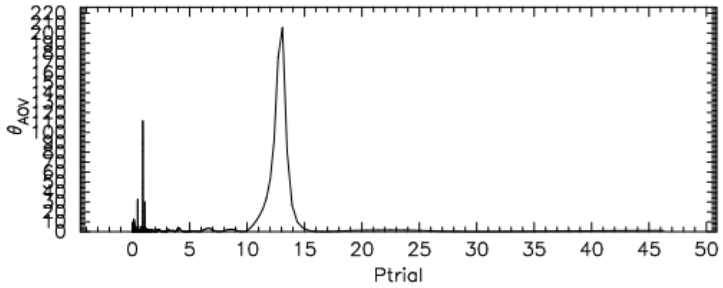


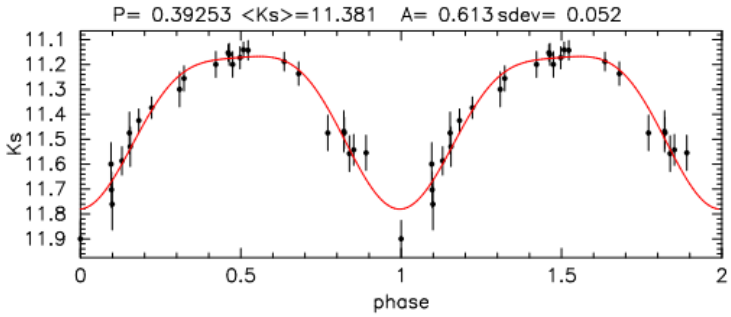
周期的変光星の解析例

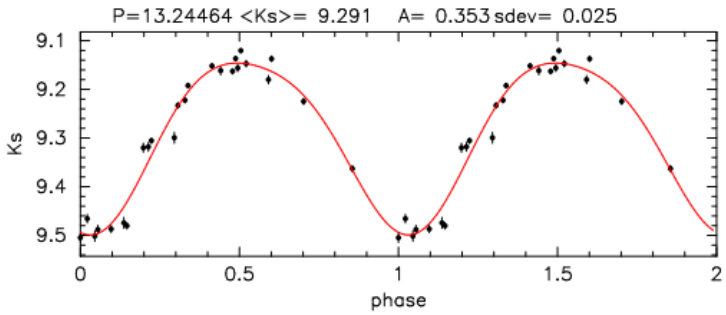

Ks
MJD − 57138.205559875


Ks
MJD − 57136.329576043


θAOV
Ptrial

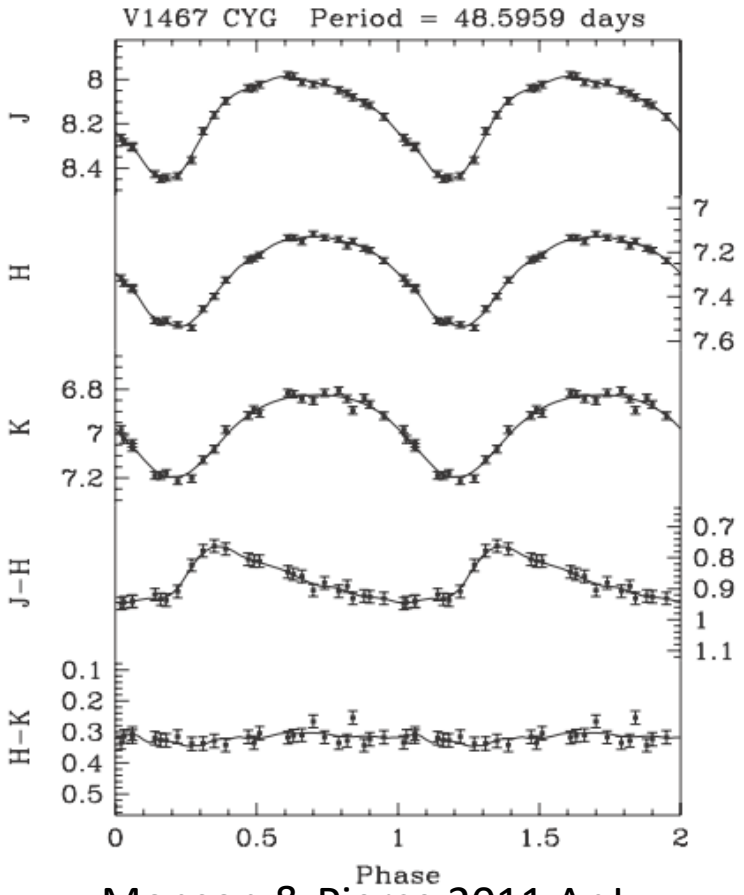

θAOV
Ptrial


P= 0.39253 <Ks>=11.381 A= 0.613 sdev= 0.052
Ks
phase


P=13.24464 <Ks>= 9.291 A= 0.353 sdev= 0.025
Ks
phase

Cepheid の距離算出

- 観測データと、2MASS PSC を使用
- $K - M_K - A_K = 5 \log D - 5$
  - K : 平均等級 (観測から求める)
  - M_K : 絶対等級 (観測から求める)
  - A_K : 星間吸収 (2MASS から求める)
  - D: 距離
- A_Kの算出
  - $A_K = 1.67\ E(H-K)$
  - Cepheid の H-K 位相を通じて一定
    - Laney & Stobie (1992), Dekany+ (2014)
  - $E(H-K) = (H_{2MASS} - K_{2MASS}) - (M_H(P) - M_K(P))$
    - Mx(P) は X-band の周期X等級関係



Monson & Pierce 2011 ApJ

重力波光学対応天体のフォローアップ観測

- 観測方法
  - 近傍銀河をターゲットとしたフォローアップ
  - 各フィールドごとに J-band, 15^{min} 露出
- 2MASSと同じ観測限界に到達
  - $J=17\text{-}18^{mag}$ (S/N=3)
- 対応天体の捜索
  - 画像を並べて目視確認
  - 画像差し引きによる差分画像により、より確実な捜索を実施

フォローアップ観測報告

TITLE: GCN CIRCULAR
NUMBER: 18774
SUBJECT: LIGO/Virgo G211117: OAO-WFC NIR follow-up observations
DATE: 15/12/30 14:31:26 GMT
FROM: Michitoshi Yoshida at J-GEM <yoshidam@hiroshima-u.ac.jp>

K. Yanagisawa, D. Kuroda (OAO/NAOJ), K. Ohta(Kyoto), N. Kawai(Tokyo Tech.) and M. Yoshida (Hiroshima) on behalf of the J-GEM collaboration

We carried out J-band imaging observations of 66 nearby galaxies to search for new point sources associated with the objects, in responce to G211117.

The observations were made on 28th and 29th December 2015, with a wide-field infrared camera (D=0.91 m), OAOWFC, of Okayama Astrophysical Observatory (Japan).

We could find no new point sources brighter than the limiting magnitude of J=17-18(S/N=3) in Vega system. The photometric calibration was made against 2MASS field stars.

#---
#Time(UT) exposure[sec] ra[deg.] width[arcmin] dec[deg.]
#width[arcmin] J-Upperlimit(3-sigma) Object

2015-12-28T08:43:12.520	1200	29.1850	4.0	4.0900	4.0	17.8	PGC1263321
2015-12-28T09:10:19.131	900	29.2078	4.0	4.0256	4.0	17.8	UGC01424
2015-12-28T09:30:41.517	900	29.3356	4.0	4.3485	4.0	17.8	PGC007354
2015-12-28T09:51:03.997	900	29.8521	4.0	5.5928	4.0	17.9	PGC1285927
2015-12-28T10:11:16.345	900	31.1301	4.0	6.6357	4.0	18.0	PGC3091794
2015-12-28T10:31:28.310	900	33.0117	4.0	9.5161	4.0	17.9	UGC01694
2015-12-28T10:51:47.454	900	33.4026	4.0	10.3363	4.0	18.0	UGC01714
2015-12-28T11:12:02.227	900	34.4222	4.0	12.4706	4.0	18.0	IC1791
2015-12-28T11:32:13.798	900	34.5632	4.0	13.2044	4.0	18.2	UGC01773
2015-12-28T11:52:30.558	900	35.5554	4.0	12.0300	4.0	18.2	UGC01834
2015-12-28T12:12:45.699	900	37.1137	4.0	15.6071	4.0	18.3	UGC01946
2015-12-28T12:33:12.572	900	39.3358	4.0	20.4153	4.0	18.2	PGC009935
2015-12-28T12:53:45.424	900	39.3678	4.0	21.1420	4.0	18.3	PGC009944
2015-12-28T13:13:53.799	900	39.7754	4.0	18.3839	4.0	18.3	UGC02140
2015-12-28T13:34:15.913	900	40.8671	4.0	20.5960	4.0	18.3	PGC2807171
2015-12-28T13:54:34.347	900	42.2875	4.0	23.0175	4.0	18.3	UGC02290
2015-12-28T14:14:47.967	900	42.7106	4.0	22.7720	4.0	18.3	PGC010806
2015-12-28T14:34:57.807	900	43.2791	4.0	25.4904	4.0	18.2	IC1861
2015-12-28T14:55:22.717	900	43.6767	4.0	23.3781	4.0	18.2	PGC087212
2015-12-28T15:15:37.143	900	44.5133	4.0	25.4492	4.0	18.0	PGC011222
2015-12-28T15:36:02.888	900	49.2784	4.0	31.5834	4.0	18.1	UGC02629
2015-12-28T15:56:23.389	900	55.6185	4.0	38.9676	4.0	18.1	PGC013618
2015-12-28T16:16:33.489	900	55.9870	4.0	39.2952	4.0	18.0	UGC02836
2015-12-28T16:36:42.387	900	56.9158	4.0	39.3469	4.0	17.9	UGC02861
2015-12-28T16:56:57.534	900	57.0385	4.0	37.4571	4.0	17.8	PGC165376
2015-12-28T17:17:23.059	900	57.7660	4.0	36.8959	4.0	17.8	UGC02877
2015-12-28T17:37:34.003	900	58.2341	4.0	40.1128	4.0	17.8	PGC097023
2015-12-28T17:58:04.786	900	73.0778	4.0	49.5490	4.0	17.8	PGC016210
2015-12-28T18:18:24.226	900	77.2006	4.0	51.5931	4.0	17.9	PGC097076
2015-12-28T18:38:40.918	900	78.5205	4.0	50.0097	4.0	17.8	PGC016947
2015-12-28T19:00:03.052	900	197.4194	4.0	-7.8334	4.0	17.7	NGC4995
2015-12-28T19:20:20.267	900	197.5713	4.0	-7.4543	4.0	17.4	PGC045697
2015-12-28T19:40:34.433	900	197.6181	4.0	-7.6504	4.0	17.8	PGC045726
2015-12-28T20:00:59.196	900	197.8193	4.0	-7.2722	4.0	16.9	PGC1021744
2015-12-28T20:21:16.212	900	194.2792	4.0	-0.8078	4.0	18.2	PGC1134210
2015-12-28T20:41:32.724	900	194.3536	4.0	-0.6225	4.0	18.2	PGC044291
2015-12-29T09:39:12.292	900	27.1256	4.0	-0.2127	4.0	17.9	PGC1149052
2015-12-29T09:59:21.550	900	27.1274	4.0	-0.0629	4.0	17.9	PGC006630
2015-12-29T10:19:30.971	900	27.5294	4.0	-0.7401	4.0	18.5	UGC01296
2015-12-29T10:39:48.056	900	29.2010	4.0	5.3101	4.0	18.1	NGC741_ZM98_0105
2015-12-29T10:59:53.151	900	29.2283	4.0	5.2558	4.0	18.1	NGC741_ZM98_9936
2015-12-29T11:20:13.887	900	29.3083	4.0	5.2938	4.0	18.0	NGC741_ZM98_0061
2015-12-29T11:40:34.299	900	29.3442	4.0	5.7128	4.0	17.3	PGC1287898
2015-12-29T12:00:36.618	900	29.4207	4.0	5.8331	4.0	17.6	PGC007384
2015-12-29T12:20:46.822	900	29.5218	4.0	3.0830	4.0	17.8	PGC007415
2015-12-29T12:41:01.414	900	29.5696	4.0	6.0622	4.0	17.3	NGC741_ZM98_9835
2015-12-29T13:01:04.548	900	29.6379	4.0	6.0711	4.0	18.0	PGC1294057
2015-12-29T13:21:14.921	900	29.7225	4.0	5.5939	4.0	17.5	UGC01461
2015-12-29T13:41:29.615	900	30.2732	4.0	6.5230	4.0	18.1	UGC01505
2015-12-29T14:01:35.508	900	30.6981	4.0	7.8151	4.0	18.1	PGC138496
2015-12-29T14:21:51.343	900	32.1156	4.0	6.3949	4.0	17.9	IC0208
2015-12-29T14:46:06.233	900	55.4349	4.0	39.3371	4.0	17.9	UGC02818
2015-12-29T15:06:16.196	900	59.8890	4.0	42.6166	4.0	18.1	UGC02912
2015-12-29T15:26:56.055	900	103.1141	4.0	57.1628	4.0	18.2	UGC03569
2015-12-29T15:47:20.769	900	106.2100	4.0	56.5203	4.0	18.4	UGC03647
2015-12-29T16:07:34.551	900	109.0435	4.0	56.8232	4.0	17.3	PGC020543
2015-12-29T16:27:55.082	900	116.5172	4.0	57.1019	4.0	18.5	PGC021738
2015-12-29T16:51:02.961	720	54.9038	4.0	38.6897	4.0	17.8	UGC02808
2015-12-29T17:08:22.887	960	194.2792	4.0	-0.8078	4.0	17.8	PGC1134210
2015-12-29T17:29:55.263	900	194.3536	4.0	-0.6225	4.0	18.7	PGC044291
2015-12-29T17:50:12.111	900	195.1905	4.0	-2.7181	4.0	17.8	PGC1084547
2015-12-29T18:10:21.448	900	195.2346	4.0	-2.9222	4.0	18.3	PGC1079855
2015-12-29T18:30:32.650	2700	197.8193	4.0	-7.2722	4.0	18.9	PGC1021744

光学対応天体捜索のために用意した差分画像の例