Modern Search for Wolf-Rayet Stars in the Magellanic Clouds. II. A Second Year of Discoveries

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【概要】

- WR探索サーベイの話.
- 1st. Resultsの続編（Massey et al. 2014, ApJ, 788, 83）
  →9個のWR星を新規同定.
- 今回４個のWR星を同定 → 計13個
- そのうち8個：WN3/O3（hot or cool）
  → O3Vより2-3mag暗い.
  → mass lossが小さく、stellar windが小さい.
- 1個はWN11 (= Ofpe/WN9)
- 空間分布
  → 必ずしもクラスターに集中しているわけではなく全体に分布。
  → クラスターに埋もれたWR星は見逃している？
- WC/WNがモデルより低い？

【撮像観測】

- Las Campanas Swope 1-m telescope.
- SITe#3 CCD (4110x4096), FOV = 29.8′ x 29.7′
- Filter：CIII λ4650 (WC filter), HeII λ4686 (WN filter), continuum λ4650 (CT filter)

【分光観測】

- 6.5-m Magellan telescope
- Magellan Echellette (MagE) Spectrograph
- 3100 – 10,000Å
- R = 4,100
- Slit = 1″

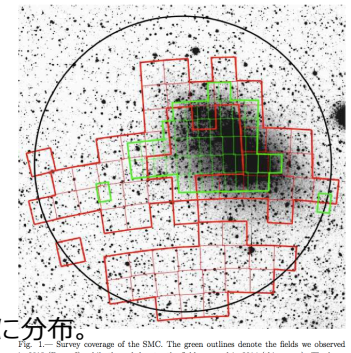

Fig. 1.— Survey coverage of the SMC. The green outlines denote the fields we observed in 2013 (Paper I), while the red denotes the fields covered in 2014 (this paper). The large circle shows the regions of our intended survey and has a diameter of 6° and is centered on α_{2000}=1h08m00s δ_{2000}=−73°10′00″. The image come from the R-band "parking lot" camera image of Bothun & Thompson (1988).

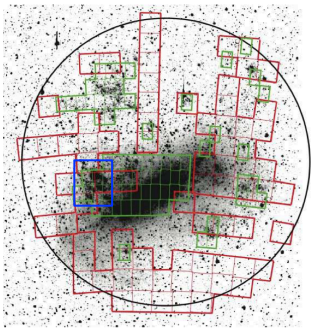

Fig. 2.— Survey coverage of the LMC. The green outlines denote the fields we observed in 2013 (Paper I), while the red denotes the fields covered in 2014 (this paper). The large circle shows the regions of our intended survey and has a diameter of 7° and is centered on α_{2000}=5h18m00s δ_{2000}=−68°45′00″.The image come from the R-band "parking lot" camera image of Bothun & Thompson (1988).

Fig.1&2 左：SMC：63領域（14.5deg^2）
右：LMC：74領域（17.0deg^2）
赤囲みが今回解析した領域、緑囲みがPaper I.
青囲み：ANIR/TTO sourvey

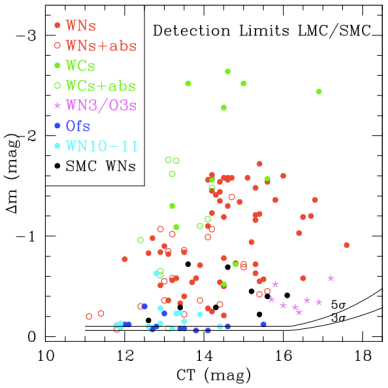

Fig.9： Detection limit. Continuumからのline成分のexcess（のようなもの）→ emission sourceをピックアップ.

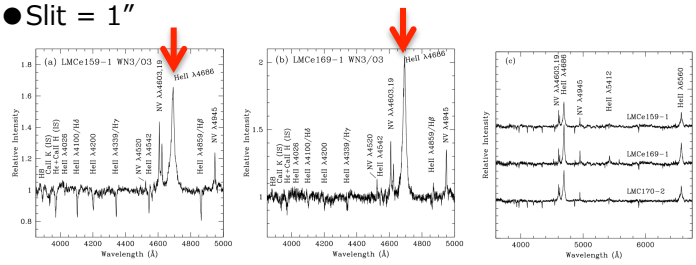

Fig.3： LMCe159-1のスペクトル．WN3/O3の特徴.

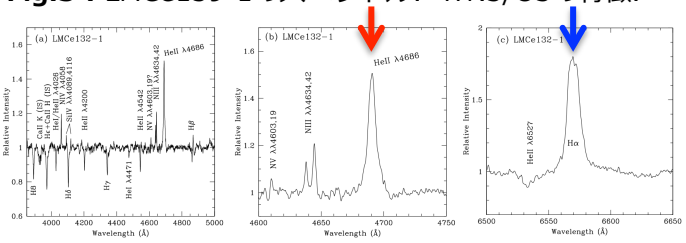

Fig.4： LMCe132-1のスペクトル．O3.5(or WN5)の特徴.

Table 1
Newly Found WRs

ID[a]	α_{2000}	δ_{2000}	Other ID [M2002][b]	Other ID IRSF[c]	V[d]	CT	M_V[e]	C III or He II log(-EW)	C III or He II FWHM	Sp. Type	Comments
LMC079-1	05 07 13.33	−70 33 33.9	71747	05071333-7033339	16.06	16.3	−2.8	1.3	30	WN3 + O3 V	2 obs
LMC143-1	05 35 28.52	−69 40 08.9	···	05352853-6940090	14.09	14.1	−4.8	1.2	28	WN3 + O8-9 III	2 obs
LMC170-2	05 29 18.18	−69 19 43.2	143741	05291819-6919432	16.04	16.1	−2.9	1.3	29	WN3 + O3 V	2 obs
LMC172-1	05 35 00.90	−69 21 20.2	···	05350090-6921202	15.95	15.9	−3.0	1.6	40	WN3 + O3 V	2 obs
LMC173-1	05 37 47.62	−69 21 13.6	169271	05374762-6921136	14.56	14.5	−4.3	1.3	29	WN3 + O7.5 V	2 obs
LMC174-1	05 40 03.57	−69 37 53.1	···	05400357-6937531	17.11	17.2	−3.0[f]	1.7	30	WN3 + early O	
LMC195-1	05 18 10.33	−69 13 02.5	···	05181033-6913025	···	14.8	−4.1[g]	2.6	71	WO2	Crowded (LH41, NGC 1910)
LMC199-1	05 28 27.12	−69 06 36.2	···	05282712-6906362	16.65	16.5	−2.3	0.2	8	WN3 + O3 V	
LMC277-2	05 04 32.65	−68 00 59.7	···	05043264-6800594	15.83	15.7	−3.1	1.4	29	WN3 + O3 V	

Table 1. Newly Found WRs

ID[a]	α_{2000}	δ_{2000}	V[b]	$B-V$[b]	CT	$WN-CT$ mag	$WN-CT$ σ	He II λ4686 log(-EW)	He II λ4686 FWHM	M_V[c]	Sp. Type	Comment
LMCe063-1	05 38 24.30	−69 29 13.5	13.04[d]	+0.28[d]	13.2	−0.08	4.1	0.4	8	−5.9	WN11	Sk−69°240
LMCe132-1	05 14 17.55	−67 20 35.7	14.34	−0.13	14.4	−0.08	4.2	0.7	8	−5.9	O3.5 If*/WN5	
LMCe159-1	05 24 56.89	−66 26 44.5	16.34	−0.23	16.4	-0.22	10.2	1.3	20	-2.6	WN3/O3	
LMCe169-1	05 21 22.84	−65 52 49.0	17.12	−0.19	16.9	-0.34	15.5	1.4	27	-1.8	WN3/O3	

Table.1： 新発見のWR.（上：paper I、下：今回）

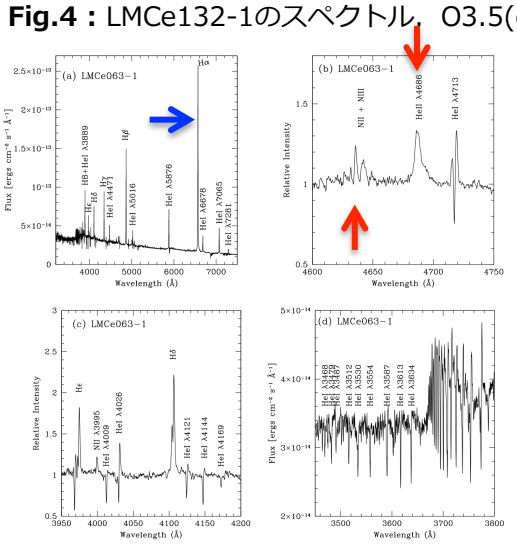

Fig.5： LMCe063-1のスペクトル．WN11の特徴.

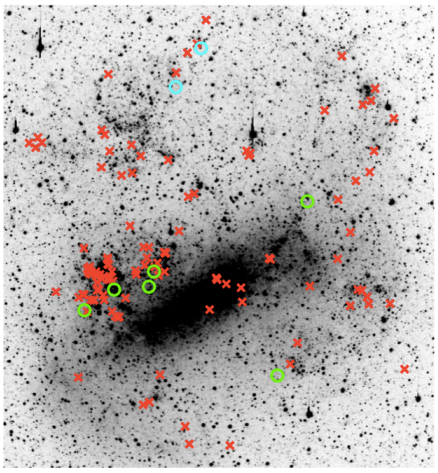

Fig. 8.— The location of WRs in the LMC. "Normal" WRs are shown with red x's, while the WN3/O3s are shown as circles (green if from Paper I and cyan from the present paper).

Fig.8： LMCのWR分布.
赤：normal、
緑（paper I）&青(今回)
：WN3/O3.

ANIR/TTO survey
11領域@LMC
= 0.076deg2
→ **0.05個！**
NIR探索の有効性は？