

The Three Young Nuclear Super Star Clusters in NGC 5253

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Abstract

- blue compact dwarf galaxy NGC5253 : very young central starburst
- $D = 3.32 \pm 0.25$ Mpc ($0.1'' = 1.6$ pc)
- 3つのcompact sources
 - : Radio thermal emission source (\leftarrow massive ultracompact HII region)
 - : 2 Optical & IR sources : massive very young super star clusters (SSCs)
- これらが $<0.5''$ に密集.
- HSTの画像をGaia DR2 reference frameに再マッピング.
 → 3つの独立したsource
 → nuclear star clusterのbuilding blocks

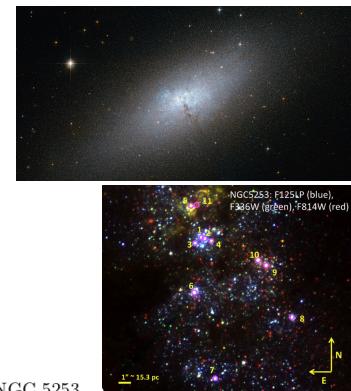


Table 1. Coordinates of central sources in NGC 5253

Reference	Designation	RA (J2000)	Dec (J2000)	Accuracy (mas)	Telescope	Wavelength
Turner et al. (2000)	Supernebula	13 39 55.964	-31 38 24.38	± 10	VLA	2, 1.3 cm
	Secondary-East	13 39 55.982	-31 38 24.37	± 10	VLA	1.3 cm
Turner & Beck (2004)	Supernebula Core	13 39 55.9631	-31 38 24.388	± 4	VLA, Pie Town	7 mm
	Cloud D1	13 39 55.9651	-31 38 24.364	± 6	ALMA	CO(3-2)
Calzetti et. al. (2015)	Cluster 5	13 39 55.986	-31 38 24.54	100–300	HST/HRC	H α
	Cluster 11	13 39 55.951	-31 38 24.45	100–300	HST/NICMOS	P α
This paper	Cluster 5	13 39 55.9914	-31 38 24.399	± 12	HST/HRC	F814W
	Cluster 11	13 39 55.968	-31 38 24.339	± 12	HST/HRC	F814W

Data

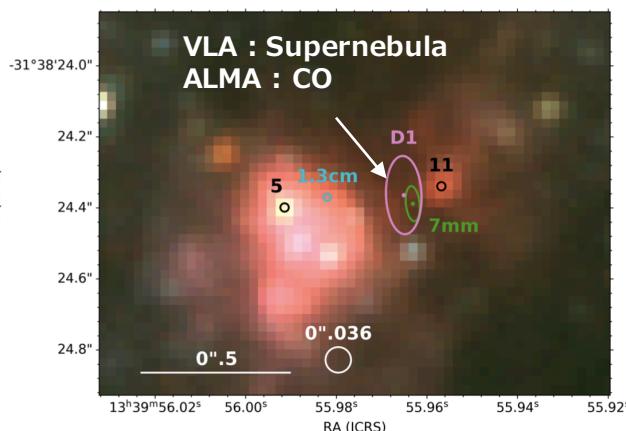
- VLA / 2cm, 1.3cm
- ALMA / CO(3-2)
- HST/HRC, ACS, NICMOS

Method

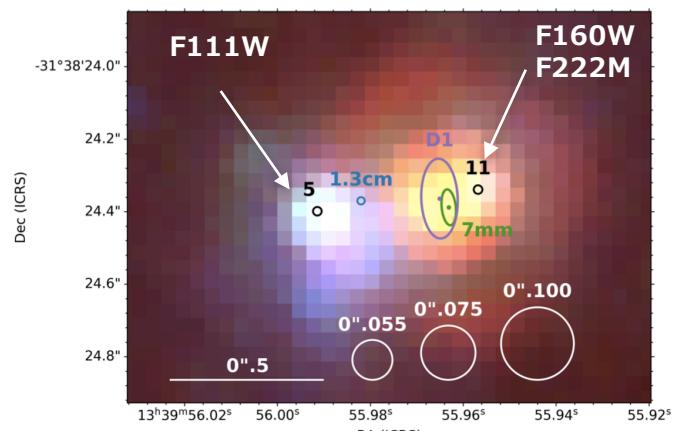
- Position
- DrizzlePac function twealreg
 → HST imageへGaiaの正確な位置を貼り付け.
- 9.5年のproper motionも考慮.
- WFC/F814W : 4 arcsec以内の65 Gaia sourceで位置補正
 → <10 masの精度
- ACS/HRC : 150天体 → ~ 12 mas
- NICMOS/NIC2 : 100天体 → ~ 20 mas
- Radius (size) : GALFIT

Table 2. HST Archive Images of NGC 5253

Instrument/ Camera	Drizzled Pixel Size (arcsec)	Filter	Exposure Time (s)	Date of Observation	GO Program
ACS/WFC	0.04	F814W	2360	2005 Dec 27	10765
ACS/SBC	0.025	F125LP	2660	2009 Mar 07	11579
ACS/HRC	0.025	F330W	1796	2006 Feb 20	10609
		F435W	600	2006 Feb 20	10609
		F550M	800	2006 Feb 20	10609
		F658N	240	2006 Feb 20	10609
		F814W	368	2006 Feb 20	10609
NICMOS/NIC2	0.04	F110W	96	1998 Jan 04	7219
		F160W	96	1998 Jan 04	7219
		F187N	256	1998 Jan 04	7219
		F190N	256	1998 Jan 04	7219
		F222M	640	1998 Jan 04	7219



▲ACS/HRC F435W, F550M, F814W



▲NICMOS/NIC2 F110W, F160W, F222M

Discussion & Conclusions

- 3つの異なる（独立した）sources
- 年齢 : 1 ± 1 Myr (~ H-rich WR spectra)
- Mass (\leftarrow SED (C#5,11), CO width (SN))
 - : C#11にはダスト, F110W, F160Wの超過.
 - : C#11とSNは銀河中心部で形成される最大cluster mass (M_{\odot})
- サイズ
 - : C#5,11 < 0.6 pc, SNはHII領域のサイズ
 - : C#11とSNはTwin (separation ~ 1.52 pc)
- 形成と今後の進化シナリオ
 - : In-situ formation at the galactic center from infalling gas (or migration of stellar clusters to the center)
 - : これらが銀河のポテンシャルの中にある → いずれマージ
 - : これらはnuclear star clusterのbuilding blocks

Table 3. Revised Properties of the Central SSCs in NGC 5253

Parameter	Cluster #5	Cluster #11	Supernebula
Age (Myr)	1 ± 1	1 ± 1	< 1
Mass (M_{\odot})	$7.5 \pm 0.3 \times 10^4$	$2.5 \pm 0.6 \times 10^5$	$2.5 \pm 0.9 \times 10^5$
Radius (pc)	< 0.6	$\lesssim 0.6$	0.80×0.32
Av (mag)	1.4 (foreground)	50 (mixed)	embedded
Projected separation (mas, pc)	362, 5.82	94.2, 1.52	0, 0