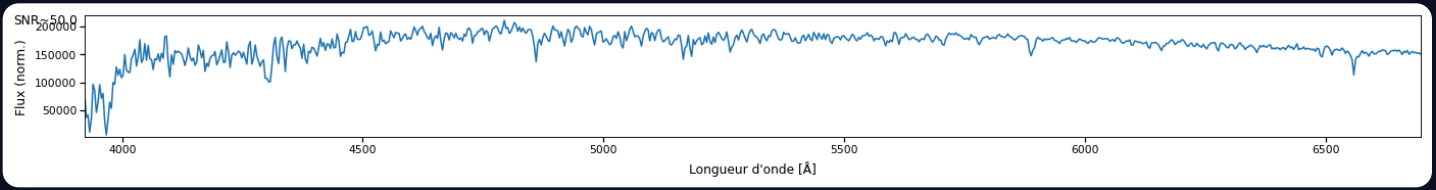
Rapport - Analyse Spectrométrique HD27022 - 16-10-2025 - G4-5III_20251016T214522.dat

RV (CCF) : -19.0 km/s (brute=+142.5, lin=-18.9, quad=-19.2, mode=linear, qual=OK)



Session

	=== Session ===
Fichier .DAT	HD27022 - 16-10-2025 - G4-5III_20251016T214522.dat
Fichier .FITS	HD27022 - 16-10-2025 - G4-5III_20251016T214522.fit

Objet etudié	HD27022
Date de prise de vue	2025-10-16T21:31:17.113

Instrument	UVEX4i-600l-500nm-35um
Spectroscope	UVEX4i
Réseau de	600 lignes
Réseau blazé à	500.0 nm
Largeur fente	35.0 µm

Télescope	Vixen VC200L
Observateur	François BERNIER - Astroghost
Classe spectrale	G45 III
- Lettre	G
- Sous-classe	45
- Luminosité	III

Paramètres d'analyse

Résolution de lecture (Å)	0.504
Tolérance clustering (Å)	0.050
Sensibilité raies fortes	0.200
Seeing utilisé (arcsec)	5.00

Données spectrales (.DAT)

Points	17822
Lambda min (A)	3922.150

Lambda max (A)	6698.151

Indicateurs

SNR	50.0
Teff	5800 K
Hα	ligne très faible (EW ≈ 0.00 Å)
RV (CCF) utilisée	-19.0 km/s (brute=+142.5, lin=-18.9, quad=-19.2, mode=linear, qual=OK)
z (CCF) utilisé	-0.000064 (brute=+0.000475, lin=-0.000063, quad=-0.000064)
R_th (géométrie prise en compte)	878
R_th,seeing(résolution max possible)	878
η_seeing	1.000
R (λ/FWHM) — médiane	878 (min 878, max 878, n=283)
R_eff	878
Δλ_eff(λ_ref	5310 Å) ≈ 6.05 Å
Na D (Δ	5.97 Å) : limite (Δλ_eff@5892≈6.71 Å)

Vérification classe spectrale (pics principaux)

Classe de référence	Type G

Couverture utilisée pour la concordance : [3933.66 6687.00] Å

— Pics principaux sélectionnés (max 25)

id_raie	Élément	λ0	[Å]	EW	[Å]	Profondeur
K	K	3934.00	0.000	0.001		
H	H	3968.00	0.000	0.001		
H	epsilon	H	epsilon	3970.00	0.001	0.001
N	II	N	II	3995.00	0.001	0.001
He	I	He	I	4027.00	0.000	0.001
N	IV	N	IV	4058.00	0.000	0.001
NH2	NH2	4056.00	0.000	0.001		
Sr	II	Sr	II	4077.00	0.000	0.001
Si	IV	4089	Si	IV	4088.86	0.001
Hδ	4101	H	I	4101.74	0.000	0.001
H	delta	H	delta	4102.00	0.001	0.001
He	II	+	H	delta	He	II
Si	IV	4116	Si	IV	4116.10	0.000
He	I	4121	He	I	4120.99	0.000
He	II	He	II	4200.00	0.001	0.001
CN	4215	band	CN	4215.00	0.000	0.001

id_raie	Élément	λ0	[Å]	EW	[Å]	Profondeur
Ca	I	4226	Ca	I	4226.73	0.001
Ca	I	Ca	I	4227.00	0.001	0.001
C	II	C	II	4267.00	0.000	0.001
CH	G	band	4300	CH	4300.00	0.000
He	II	+	H	gamma	He	II
H	gamma	H	gamma	4341.00	0.001	0.001
CN	CN	4380.00	0.000	0.001		
He	I	4388	He	I	4387.93	0.001
He	I	He	I	4471.00	0.001	0.001
He	I	4471	He	I	4471.50	0.001
Mg	II	4481	Mg	II	4481.23	0.000
Fe	II,III,	Mg	II	Fe	II,III,	Mg
He	II	He	II	4511.00	0.000	0.001
Ti	II	Ti	II	4534.00	0.001	0.001
He	II	He	II	4541.00	0.000	0.001
He	II	4541	He	II	4541.59	0.000
Ti	II/Fe	II	Ti	II/Fe	II	4550.00
Si	III	4552	Si	III	4552.62	0.001
Ba	II	Ba	II	4554.00	0.001	0.001
Si	III	4568	Si	III	4567.84	0.001
Si	III	4575	Si	III	4574.76	0.000
Fe	II/Cr	II	Fe	II/Cr	II	4585.00
Swan	-	C2	Swan	-	C2	4600.00
N	V	N	V	4603.00	0.001	0.001
N	V	N	V	4619.00	0.000	0.001
N	III	N	III	4634.00	0.000	0.001
N	III	4634	(em)	N	III	4634.14
N	III	4640	(em)	N	III	4640.64
N	III	N	III	4641.00	0.000	0.001
C	III	4647–51	C	III	4647.42	0.001
C	III/IV	C	III/IV	4650.00	0.001	0.001
Fe	I	Fe	I	4667.00	0.001	0.001
He	II	4686	He	II	4685.68	0.000
C2	Swan	C2	Swan	4737.00	0.001	0.001
SiC2	SiC2	4767.00	0.001	0.001		
TiO	TiO	4775.00	0.001	0.001		
SiC2	SiC2	4807.00	0.000	0.001		
SiC2	SiC2	4832.00	0.001	0.001		

id_raie	Élément	λ0	[Å]	EW	[Å]	Profondeur
H	beta	H	beta	4861.00	0.001	0.001
SiC2	SiC2	4867.00	0.000	0.001		
Fe	II,III,	Si	II	Fe	II,III,	Si
SiC2	SiC2	4909.00	0.000	0.001		
Fe	I/II	Fe	I/II	4919.00	0.000	0.001
He	I	He	I	4921.00	0.001	0.001
Fe	II	Fe	II	4924.00	0.001	0.001
N	V	N	V	4933.00	0.000	0.001
TiO	bands	4950–5190	TiO	4950.00	0.000	0.001
SiC2	SiC2	4957.00	0.001	0.001		
[O	III]	[O	III]	4959.00	0.001	0.001
SiC2	SiC2	4977.00	0.000	0.001		
TiO	TiO	4990.00	0.000	0.001		
Swan	-	C2	Swan	-	C2	5000.00
[O	III]	[O	III]	5007.00	0.001	0.001
Fe	I/II	Fe	I/II	5012.00	0.000	0.001
Fe	II	Fe	II	5018.00	0.001	0.001
Si	II	Si	II	5100.00	0.001	0.001
Mg	I	b	5167	Mg	I	5167.32
C2	Swan	C2	Swan	5165.00	0.000	0.001
Fe	II	Fe	II	5169.00	0.001	0.001
Mg	I	b	5172	Mg	I	5172.68
Mg	Mg	5173.00	0.001	0.001		
Mg	I	b	5183	Mg	I	5183.60
Mg	Mg	5184.00	0.001	0.001		
TiO	TiO	5190.00	0.000	0.001		
Fe	II	Fe	II	5198.00	0.001	0.001
Fe	II	Fe	II	5235.00	0.001	0.001
Fe	I/Ca	I	Fe	I/Ca	I	5270.00
Fe	II	Fe	II	5276.00	0.001	0.001
N	III	N	III	5314.00	0.000	0.001
Fe	II	Fe	II	5317.00	0.000	0.001
ZrO	ZrO	5404.00	0.000	0.001		
He	II	He	II	5411.00	0.001	0.001
CH4	CH4	5430.00	0.000	0.001		
TiO	bands	5448–5670	TiO	5448.00	0.001	0.001
TiO	TiO	5480.00	0.001	0.001		
Si	II	Si	II	5500.00	0.000	0.001

id_raie	Élément	λ0	[Å]	EW	[Å]	Profondeur
Fe	II	Fe	II	5535.00	0.001	0.001
ZrO	ZrO	5545.00	0.001	0.001		
O	V	O	V	5572.00	0.001	0.001
O	I	O	I	5577.00	0.000	0.001
ZrO	ZrO	5629.00	0.000	0.001		
C2	Swan	C2	Swan	5636.00	0.000	0.001
TiO	TiO	5640.00	0.001	0.001		
O	VII	O	VII	5670.00	0.001	0.001
N	II	N	II	5679.00	0.000	0.001
Na	I	5682.633	Na	I	5682.63	0.000
Na	I	5688.205	Na	I	5688.20	0.001
C	III	C	III	5696.00	0.000	0.001
ZrO	ZrO	5718.00	0.001	0.001		
N	II	N	II	5755.00	0.001	0.001
CH4	CH4	5760.00	0.000	0.001		
DIB	DIB	5780.00	0.000	0.001		
DIB	DIB	5797.00	0.001	0.001		
C	IV	C	IV	5801.00	0.000	0.001
He	I	He	I	5875.00	0.000	0.001
He	I	He	I	5876.00	0.000	0.001
NaI	NaI	5889.00	0.000	0.001		
NaI	NaI	5890.00	0.001	0.001		
Na	I	D	(5889–5896)	Na	I	5891.58
Na	I	D1	5895.92	Na	I	5895.92
NaI	NaI	5896.00	0.001	0.001		
TiO	TiO	5930.00	0.001	0.001		
CH4	CH4	5960.00	0.001	0.001		
Swan	-	C2	Swan	-	C2	6005.00
Swan	-	C2	Swan	-	C2	6059.00
O	VIII	O	VIII	6068.00	0.001	0.001
Swan	-	C2	Swan	-	C2	6122.00
Ba	II	6141.713	Ba	II	6141.71	0.001
Si	II	Si	II	6150.00	0.000	0.001
ZrO	ZrO	6154.00	0.000	0.001		
Na	I	6154.226	Na	I	6154.23	0.000
Na	I	6160.747	Na	I	6160.75	0.001
TiO	bands	6159–6395	TiO	6159.00	0.000	0.001
CH4	CH4	6190.00	0.001	0.001		

id_raie	Élément	λ0	[Å]	EW	[Å]	Profondeur
CN	CN	6206.00	0.000	0.001		
ZrO	ZrO	6229.00	0.001	0.001		
TiO	TiO	6250.00	0.000	0.001		
CN	CN	6259.00	0.001	0.001		
ZrO	ZrO	6261.00	0.001	0.001		
O2	a	band	(repère)	O2	6277.00	0.000
O2	a	band	6276–6287	O2	6276.00	0.000
O2	a	band	(repère)	O2	6280.00	0.001
O2	a	band	(repère)	O2	6283.00	0.001
O	I	O	I	6300.00	0.001	0.001
ZrO	ZrO	6350.00	0.000	0.001		
CN	CN	6355.00	0.000	0.001		
CN	CN	6358.00	0.000	0.001		
O	I	O	I	6364.00	0.001	0.001
ZrO	ZrO	6378.00	0.000	0.001		
CaH	6385	band	CaH	6385.00	0.000	0.001
Ca	I	6439.075	Ca	I	6439.07	0.001
ZrO	ZrO	6475.00	0.001	0.001		
ZrO	ZrO	6494.00	0.001	0.001		
Ba	II	6496.897	Ba	II	6496.90	0.001
CN	CN	6502.00	0.001	0.001		
H	alpha	H	alpha	6563.00	0.000	0.001
TiO	bands	6651–6852	TiO	6651.00	0.000	0.001
CN	CN	6656.00	0.000	0.001		
CH4	CH4	6680.00	0.001	0.001		
He	II	He	II	6683.00	0.000	0.001
He	I	He	I	6687.00	0.001	0.001

Attendus pour Type G	22 raies/ranges
Correspondances mesurées	19 / 22
	Taux de correspondance ≈ 86%
	Tolérance de correspondance ±0.76 Å

Correspondances (attendu ↔ mesuré ; Δλ en Å)

nom_attendu	λ_ref [Å]	λ_to [Å]	λ_mes [Å]	Δλ [Å] id_raie
K	3934.00	—	3934.00	0.000 K
H	3968.00	—	3968.00	0.000 H
Ca I	4227.00	—	4227.00	0.000 Ca I
G band	4300.00	4313.00	4300.00	0.000 CH G band 43

nom_attendu	λ_ref [Å]	λ_to [Å]	λ_mes [Å]	Δλ [Å] id_raie
Mg	5167.00	—	5167.32	0.320 Mg I b 5167
Mg	5173.00	—	5173.00	0.000 Mg
Mg	5184.00	—	5184.00	0.000 Mg
Sr II	4077.00	—	4077.00	0.000 Sr II
Ba II	4554.00	—	4554.00	0.000 Ba II
CN 4215 band	4215.00	4225.00	4215.00	0.000 CN 4215 band
Hβ 4861	4861.33	—	4861.00	-0.330 H beta
Mg I b 5172	5172.68	—	5172.68	0.000 Mg I b 5172
Mg I b 5183	5183.60	—	5183.60	0.000 Mg I b 5183
Ca I 4226	4226.73	—	4226.73	0.000 Ca I 4226
Na I D (5889–5896)	5891.58	5897.56	5891.58	0.000 Na I D (5889
Na I D2 5889.95	5889.95	—	5890.00	0.050 NaI
Na I D1 5895.92	5895.92	—	5895.92	0.000 Na I D1 5895
Hγ (Balmer)	4340.47	—	4340.00	-0.470 He II + H ga
Hα (Balmer)	6562.80	—	6563.00	0.200 H alpha

Attendus non retrouvés (dans la tolérance)

nom_attendu	λ_ref [Å]	λ_to [Å]
Ca II K 3933	3933.66	—
Ca II H 3968	3968.47	—
Mg I b 5167	5167.32	—

Raies supplémentaires (non attendues) parmi les pics principaux

id_raie	Élément	λ0 [Å]
H epsilon	H epsilon	3970.00
N II	N II	3995.00
He I	He I	4027.00
N IV	N IV	4058.00
NH2	NH2	4056.00
Si IV 4089	Si IV	4088.86
Hδ 4101	H I	4101.74
H delta	H delta	4102.00
He II + H de He II + H de	4100.00	
Si IV 4116	Si IV	4116.10
He I 4121	He I	4120.99
He II	He II	4200.00
C II	C II	4267.00
H gamma	H gamma	4341.00

id_raie	Élément	λ0 [Å]
CN	CN	4380.00
He I 4388	He I	4387.93
He I	He I	4471.00
He I 4471	He I	4471.50
Mg II 4481	Mg II	4481.23
Fe II	III	M Fe II
He II	He II	4511.00
Ti II	Ti II	4534.00
He II	He II	4541.00
He II 4541	He II	4541.59
Ti II/Fe II	Ti II/Fe II	4550.00
Si III 4552	Si III	4552.62
Si III 4568	Si III	4567.84
Si III 4575	Si III	4574.76
Fe II/Cr II	Fe II/Cr II	4585.00
Swan - C2	Swan - C2	4600.00
N V	N V	4603.00
N V	N V	4619.00
N III	N III	4634.00
N III 4634 (N III	4634.14	
N III 4640 (N III	4640.64	
N III	N III	4641.00
C III 4647–5 C III	4647.42	
C III/IV	C III/IV	4650.00
Fe I	Fe I	4667.00
He II 4686	He II	4685.68
C2 Swan	C2 Swan	4737.00
SiC2	SiC2	4767.00
TiO	TiO	4775.00
SiC2	SiC2	4807.00
SiC2	SiC2	4832.00
SiC2	SiC2	4867.00
Fe II	III	S Fe II
SiC2	SiC2	4909.00
Fe I/II	Fe I/II	4919.00
He I	He I	4921.00
Fe II	Fe II	4924.00
N V	N V	4933.00

id_raie	Élément	λ0 [Å]
TiO bands 49 TiO	4950.00	
SiC2	SiC2	4957.00
[O III]	[O III]	4959.00
SiC2	SiC2	4977.00
TiO	TiO	4990.00
Swan - C2	Swan - C2	5000.00
[O III]	[O III]	5007.00
Fe I/II	Fe I/II	5012.00
Fe II	Fe II	5018.00
Si II	Si II	5100.00
C2 Swan	C2 Swan	5165.00
Fe II	Fe II	5169.00
TiO	TiO	5190.00
Fe II	Fe II	5198.00
Fe II	Fe II	5235.00
Fe I/Ca I	Fe I/Ca I	5270.00
Fe II	Fe II	5276.00
N III	N III	5314.00
Fe II	Fe II	5317.00
ZrO	ZrO	5404.00
He II	He II	5411.00
CH4	CH4	5430.00
TiO bands 54 TiO	5448.00	
TiO	TiO	5480.00
Si II	Si II	5500.00
Fe II	Fe II	5535.00
ZrO	ZrO	5545.00
O V	O V	5572.00
O I	O I	5577.00
ZrO	ZrO	5629.00
C2 Swan	C2 Swan	5636.00
TiO	TiO	5640.00
O VII	O VII	5670.00
N II	N II	5679.00
Na I 5682.63 Na I	5682.63	
Na I 5688.20 Na I	5688.20	
C III	C III	5696.00
ZrO	ZrO	5718.00

id_raie	Élément	λ0 [Å]
N II	N II	5755.00
CH4	CH4	5760.00
DIB	DIB	5780.00
DIB	DIB	5797.00
C IV	C IV	5801.00
He I	He I	5875.00
He I	He I	5876.00
NaI	NaI	5889.00
NaI	NaI	5896.00
TiO	TiO	5930.00
CH4	CH4	5960.00
Swan - C2	Swan - C2	6005.00
Swan - C2	Swan - C2	6059.00
O VIII	O VIII	6068.00
Swan - C2	Swan - C2	6122.00
Ba II 6141.7 Ba II	6141.71	
Si II	Si II	6150.00
ZrO	ZrO	6154.00
Na I 6154.22 Na I	6154.23	
Na I 6160.74 Na I	6160.75	
TiO bands 61 TiO	6159.00	
CH4	CH4	6190.00
CN	CN	6206.00
ZrO	ZrO	6229.00
TiO	TiO	6250.00
CN	CN	6259.00
ZrO	ZrO	6261.00
O2 a band (r O2	6277.00	
O2 a band 62 O2	6276.00	
O2 a band (r O2	6280.00	
O2 a band (r O2	6283.00	
O I	O I	6300.00
ZrO	ZrO	6350.00
CN	CN	6355.00
CN	CN	6358.00
O I	O I	6364.00
ZrO	ZrO	6378.00
CaH 6385 ban CaH	6385.00	

id_raie	Élément	λ0 [Å]
Ca I 6439.07 Ca I	6439.07	
ZrO	ZrO	6475.00
ZrO	ZrO	6494.00
Ba II 6496.8 Ba II	6496.90	
CN	CN	6502.00
TiO bands 66 TiO	6651.00	
CN	CN	6656.00
CH4	CH4	6680.00
He II	He II	6683.00
He I	He I	6687.00

Verdict	cohérent avec la classe de référence.

R (lambda/FWHM) — mediane=52105	min=3397	max=85875	n=177

Raies validées (OK=OUI) — Tableau complet

Elements	Élément	λ0	[Å]	λ_obs_rest	[Å]	σ_λ	[Å]	Δλ	[Å]	RV_indiv	[km/s]	Profondeur
SiC2	SiC2	4957.000	4957.914	0.008	0.914	55.27	0.001	1.168	0.001	OUI		
CH4	CH4	6190.000	6192.022	0.008	2.022	97.92	0.001	1.168	0.001	OUI		
O2	a	band	(repère)	O2	6283.000	6285.106	0.008	2.106	100.50	0.001	1.168	0.001
H	epsilon	H	epsilon	3970.000	3970.004	0.008	0.004	0.28	0.001	1.168	0.001	OUI
O	VII	O	VII	5670.000	5671.560	0.008	1.560	82.50	0.001	1.168	0.001	OUI
NaI	NaI	5890.000	5891.720	0.008	1.720	87.53	0.001	1.168	0.001	OUI		
Ba	II	6496.897	Ba	II	6496.897	6499.185	0.008	2.288	105.56	0.001	1.168	0.001
Fe	II	Fe	II	5535.000	5536.378	0.008	1.378	74.62	0.001	1.168	0.001	OUI
DIB	DIB	5797.000	5798.635	0.008	1.635	84.57	0.001	1.168	0.001	OUI		
Fe	II/Cr	II	Fe	II/Cr	II	4585.000	4585.576	0.008	0.576	37.69	0.001	1.168
Ba	II	6141.713	Ba	II	6141.713	6143.687	0.008	1.974	96.34	0.001	1.168	0.001
Na	I	6160.747	Na	I	6160.747	6162.709	0.008	1.962	95.47	0.001	1.168	0.001
Si	III	4552	Si	III	4552.620	4553.145	0.008	0.525	34.58	0.001	1.168	0.001
C	III/IV	C	III/IV	4650.000	4650.595	0.008	0.595	38.37	0.001	1.168	0.001	OUI
Si	II	Si	II	5100.000	5101.049	0.008	1.049	61.64	0.001	1.168	0.001	OUI
ZrO	ZrO	5718.000	5719.584	0.008	1.584	83.04	0.001	1.168	0.001	OUI		
Na	I	D	(5889–5896)	Na	I	5891.580	5893.279	0.008	1.699	86.45	0.001	1.168
He	I	4388	He	I	4387.930	4388.337	0.008	0.407	27.84	0.001	1.168	0.001
Na	I	D1	5895.92	Na	I	5895.920	5897.645	0.008	1.725	87.69	0.001	1.168
O	I	O	I	6300.000	6302.101	0.008	2.101	100.00	0.001	1.168	0.001	OUI
He	I	He	I	6687.000	6689.407	0.008	2.407	107.92	0.001	1.168	0.001	OUI

Elements	Élément	λ0	[Å]	λ_obs_rest	[Å]	σ_λ	[Å]	Δλ	[Å]	RV_indiv	[km/s]	Profondeur
ZrO	ZrO	6229.000	6231.002	0.008	2.002	96.35	0.001	1.168	0.001	OUI		
Ca	I	4226	Ca	I	4226.730	4226.960	0.008	0.230	16.32	0.001	1.168	0.001
N	III	4640	(em)	N	III	4640.640	4644.780	0.008	4.140	267.44	0.001	1.168
Fe	II	Fe	II	5198.000	5199.122	0.008	1.122	64.73	0.001	1.168	0.001	OUI
Fe	II	Fe	II	4924.000	4924.859	0.008	0.859	52.28	0.001	1.168	0.001	OUI
Si	IV	4089	Si	IV	4088.860	4088.971	0.008	0.111	8.12	0.001	1.168	0.001
Mg	Mg	5184.000	5185.089	0.008	1.089	63.01	0.001	1.168	0.001	OUI		
TiO	TiO	5930.000	5931.791	0.008	1.791	90.55	0.001	1.168	0.001	OUI		
Ca	I	Ca	I	4227.000	4227.272	0.008	0.272	19.29	0.001	1.168	0.001	OUI
He	I	He	I	4471.000	4471.443	0.008	0.443	29.70	0.001	1.168	0.001	OUI
[O	III]	[O	III]	5007.000	5007.964	0.008	0.964	57.73	0.001	1.168	0.001	OUI
Ba	II	Ba	II	4554.000	4554.548	0.008	0.548	36.10	0.001	1.168	0.001	OUI
Fe	I/Ca	I	Fe	I/Ca	I	5270.000	5271.157	0.008	1.157	65.84	0.001	1.168
TiO	TiO	5480.000	5481.338	0.008	1.338	73.19	0.001	1.168	0.001	OUI		
O2	a	band	(repère)	O2	6280.000	6282.144	0.007	2.144	102.34	0.001	1.090	0.001
N	II	N	II	5755.000	5756.693	0.007	1.693	88.18	0.001	1.090	0.001	OUI
He	II	He	II	4200.000	4200.298	0.007	0.298	21.26	0.001	1.090	0.001	OUI
TiO	TiO	5640.000	5641.624	0.007	1.624	86.31	0.001	1.090	0.001	OUI		
Na	I	D2	5889.95	Na	I	5889.950	5891.720	0.007	1.770	90.07	0.001	1.090
ZrO	ZrO	5545.000	5546.512	0.007	1.512	81.77	0.001	1.090	0.001	OUI		
O	V	O	V	5572.000	5573.487	0.007	1.487	79.98	0.001	1.090	0.001	OUI
TiO	bands	5448–5670	TiO	5448.000	5449.374	0.007	1.374	75.62	0.001	1.090	0.001	OUI
SiC2	SiC2	4832.000	4832.866	0.007	0.866	53.72	0.001	1.090	0.001	OUI		
Fe	I	Fe	I	4667.000	4667.746	0.007	0.746	47.95	0.001	1.090	0.001	OUI
CN	CN	6502.000	6504.330	0.007	2.330	107.43	0.001	1.090	0.001	OUI		
ZrO	ZrO	6494.000	6496.378	0.007	2.378	109.78	0.001	1.090	0.001	OUI		
ZrO	ZrO	6475.000	6477.356	0.007	2.356	109.07	0.001	1.090	0.001	OUI		
Na	I	5688.205	Na	I	5688.205	5689.803	0.007	1.598	84.22	0.001	1.090	0.001
Fe	II,III,	Mg	II	Fe	II,III,	Mg	II	4500.000	4500.600	0.007	0.600	39.97
Fe	II	Fe	II	5276.000	5277.238	0.007	1.238	70.36	0.001	1.090	0.001	OUI
Mg	Mg	5173.000	5174.175	0.007	1.175	68.10	0.001	1.090	0.001	OUI		
Fe	II	Fe	II	5235.000	5236.231	0.007	1.231	70.51	0.001	1.090	0.001	OUI
He	II	He	II	5411.000	5412.421	0.007	1.421	78.73	0.001	1.090	0.001	OUI
H	gamma	H	gamma	4341.000	4341.406	0.007	0.406	28.01	0.001	1.090	0.001	OUI
H	delta	H	delta	4102.000	4102.224	0.007	0.224	16.37	0.001	1.090	0.001	OUI
ZrO	ZrO	6261.000	6263.121	0.007	2.121	101.58	0.001	1.090	0.001	OUI		
CN	CN	6259.000	6261.094	0.007	2.094	100.32	0.001	1.090	0.001	OUI		
CH4	CH4	6680.000	6682.547	0.007	2.547	114.29	0.001	1.090	0.001	OUI		

Elements	Élément	λ0	[Å]	λ_obs_rest	[Å]	σ_λ	[Å]	Δλ	[Å]	RV_indiv	[km/s]	Profondeur
Ca	I	6439.075	Ca	I	6439.075	6441.338	0.007	2.263	105.37	0.001	1.090	0.001
He	I	4471	He	I	4471.500	4472.067	0.007	0.567	37.99	0.001	1.090	0.001
SiC2	SiC2	4767.000	4767.847	0.007	0.847	53.28	0.001	1.090	0.001	OUI		
Mg	I	b	5172	Mg	I	5172.680	5173.863	0.007	1.183	68.58	0.001	1.090
H	beta	H	beta	4861.000	4861.867	0.007	0.867	53.47	0.001	1.090	0.001	OUI
Mg	I	b	5183	Mg	I	5183.600	5184.778	0.007	1.178	68.11	0.001	1.090
C	III	4647–51	C	III	4647.420	4648.100	0.007	0.680	43.90	0.001	1.090	0.001
O	I	O	I	6364.000	6366.185	0.007	2.185	102.92	0.001	1.090	0.001	OUI
Si	III	4568	Si	III	4567.840	4568.425	0.007	0.585	38.41	0.001	1.090	0.001
NaI	NaI	5896.000	5897.801	0.007	1.801	91.55	0.001	1.090	0.001	OUI		
He	II	+	H	beta	He	II	+	H	beta	4861.000	4861.867	0.007
N	II	N	II	3995.000	3995.107	0.007	0.107	8.02	0.001	1.090	0.001	OUI
He	I	He	I	4921.000	4921.896	0.007	0.896	54.60	0.001	1.090	0.001	OUI
[O	III]	[O	III]	4959.000	4959.941	0.007	0.941	56.87	0.001	1.090	0.001	OUI
TiO	TiO	4775.000	4775.799	0.007	0.799	50.17	0.001	1.090	0.001	OUI		
C2	Swan	C2	Swan	4737.000	4737.755	0.007	0.755	47.75	0.001	1.090	0.001	OUI
N	V	N	V	4603.000	4603.663	0.007	0.663	43.20	0.001	1.090	0.001	OUI
Ti	II	Ti	II	4534.000	4534.591	0.007	0.591	39.05	0.001	1.090	0.001	OUI
O	VIII	O	VIII	6068.000	6069.936	0.007	1.936	95.67	0.001	1.090	0.001	OUI
Fe	II	Fe	II	5018.000	5019.035	0.007	1.035	61.81	0.001	1.090	0.001	OUI
Fe	II	Fe	II	5169.000	5170.121	0.007	1.121	65.02	0.001	1.090	0.001	OUI
CH4	CH4	5960.000	5961.884	0.007	1.884	94.75	0.001	1.090	0.001	OUI		
Swan	-	C2	Swan	-	C2	6122.000	6126.801	0.003	4.801	235.10	0.001	0.389
Mg	I	b	5167	Mg	I	5167.320	5169.186	0.001	1.866	108.24	0.001	0.078
Fe	I/II	Fe	I/II	5012.000	5016.338	0.001	4.338	259.45	0.001	0.078	0.000	OUI
Mg	Mg	5167.000	5169.186	0.001	2.186	126.81	0.001	0.078	0.000	OUI		
Swan	-	C2	Swan	-	C2	6059.000	6064.433	0.001	5.433	268.81	0.001	0.078
CaH	6385	band	CaH	6385.000	6390.618	0.001	5.618	263.77	0.001	0.078	0.000	OUI
H	H	3968.000	3969.068	0.001	1.068	80.70	0.001	0.078	0.000	OUI		
He	II	4686	He	II	4685.680	4689.529	0.001	3.849	246.26	0.001	0.078	0.000
Na	I	6154.226	Na	I	6154.226	6159.700	0.001	5.474	266.66	0.001	0.078	0.000
ZrO	ZrO	6154.000	6159.388	0.001	5.388	262.49	0.001	0.078	0.000	OUI		
CH	G	band	4300	CH	4300.000	4300.866	0.001	0.866	60.40	0.001	0.078	0.000
G	band	G	band	4300.000	4300.866	0.001	0.866	60.40	0.001	0.078	0.000	OUI
He	I	He	I	5875.000	5880.135	0.001	5.135	262.04	0.001	0.078	0.000	OUI
C	IV	C	IV	5801.000	5806.073	0.001	5.073	262.18	0.001	0.078	0.000	OUI
CH4	CH4	5760.000	5761.838	0.001	1.838	95.67	0.001	0.078	0.000	OUI		
C	III	C	III	5696.000	5700.983	0.001	4.983	262.27	0.001	0.078	0.000	OUI

Elements	Élément	λ0	[Å]	λ_obs_rest	[Å]	σ_λ	[Å]	Δλ	[Å]	RV_indiv	[km/s]	Profondeur
TiO	TiO	4990.000	4994.353	0.001	4.353	261.51	0.001	0.078	0.000	OUI		
TiO	bands	4950–5190	TiO	4950.000	4954.437	0.001	4.437	268.74	0.001	0.078	0.000	OUI
N	V	N	V	4933.000	4937.442	0.001	4.442	269.95	0.001	0.078	0.000	OUI
N	III	N	III	4641.000	4645.092	0.001	4.092	264.31	0.001	0.078	0.000	OUI
Hβ	(Balmer)	Hβ	(Balmer)	4861.330	4861.867	0.000	0.537	33.12	0.001	0.078	0.000	OUI
Hβ	4861	H	I	4861.330	4861.867	0.000	0.537	33.12	0.001	0.078	0.000	OUI
SiC2	SiC2	4867.000	4871.332	0.001	4.332	266.83	0.001	0.078	0.000	OUI		
Fe	II,III,	Si	II	Fe	II,III,	Si	II	4900.000	4904.387	0.001	4.387	268.40
Ca	II	H	3968	Ca	II	3968.470	3969.068	0.001	0.598	45.19	0.001	0.078
Swan	-	C2	Swan	-	C2	4600.000	4601.169	0.001	1.169	76.15	0.001	0.078
Si	III	4575	Si	III	4574.760	4578.826	0.001	4.066	266.43	0.001	0.078	0.000
N	III	4634	(em)	N	III	4634.140	4638.231	0.001	4.091	264.67	0.001	0.078
N	III	N	III	4634.000	4638.075	0.001	4.075	263.65	0.001	0.078	0.000	OUI
Swan	-	C2	Swan	-	C2	4900.000	4904.387	0.001	4.387	268.40	0.001	0.078
Fe	I/II	Fe	I/II	4919.000	4920.961	0.001	1.961	119.50	0.001	0.078	0.000	OUI
Ti	II/Fe	II	Ti	II/Fe	II	4550.000	4551.430	0.001	1.430	94.22	0.001	0.078
CN	CN	6358.000	6363.176	0.001	5.176	244.05	0.001	0.078	0.000	OUI		
Hα	(Balmer)	Hα	(Balmer)	6562.800	6562.800	0.000	-0.000	-0.00	0.001	0.078	0.000	OUI
He	II	He	II	6560.000	6562.800	0.001	2.800	127.96	0.001	0.078	0.000	OUI
Hα	6563	H	I	6562.800	6562.800	0.000	-0.000	-0.00	0.001	0.078	0.000	OUI
He	II	He	II	4686.000	4689.529	0.001	3.529	225.77	0.001	0.078	0.000	OUI
ZrO	ZrO	6378.000	6380.373	0.001	2.373	111.56	0.001	0.078	0.000	OUI		
SiC2	SiC2	4807.000	4808.698	0.001	1.698	105.91	0.001	0.078	0.000	OUI		
H	alpha	H	alpha	6563.000	6562.800	0.000	-0.200	-9.14	0.001	0.078	0.000	OUI
CH4	CH4	4860.000	4861.867	0.001	1.867	115.17	0.001	0.078	0.000	OUI		
SiC2	SiC2	4977.000	4981.411	0.001	4.411	265.73	0.001	0.078	0.000	OUI		
Fe	II	Fe	II	5317.000	5321.317	0.001	4.317	243.43	0.001	0.078	0.000	OUI
N	III	N	III	5314.000	5318.511	0.001	4.511	254.48	0.001	0.078	0.000	OUI
ZrO	ZrO	5404.000	5408.009	0.001	4.009	222.40	0.001	0.078	0.000	OUI		
TiO	TiO	5190.000	5193.931	0.001	3.931	227.05	0.001	0.078	0.000	OUI		
Mg	II	4481	Mg	II	4481.230	4481.890	0.001	0.660	44.13	0.001	0.078	0.000
He	II	He	II	4511.000	4515.054	0.001	4.054	269.44	0.001	0.078	0.000	OUI
He	II	He	II	4541.000	4544.991	0.001	3.991	263.48	0.001	0.078	0.000	OUI
He	II	4541	He	II	4541.590	4545.615	0.001	4.025	265.67	0.001	0.078	0.000
CH4	CH4	5430.000	5434.360	0.001	4.360	240.69	0.001	0.078	0.000	OUI		
C2	Swan	C2	Swan	5165.000	5169.607	0.001	4.607	267.41	0.001	0.078	0.000	OUI
Swan	-	C2	Swan	-	C2	5000.000	5004.488	0.001	4.488	269.07	0.001	0.078
TiO	TiO	6250.000	6255.591	0.001	5.591	268.18	0.001	0.078	0.000	OUI		

Elements	Élément	λ0	[Å]	λ_obs_rest	[Å]	σ_λ	[Å]	Δλ	[Å]	RV_indiv	[km/s]	Profondeur
Si	II	Si	II	6150.000	6155.490	0.001	5.490	267.63	0.001	0.078	0.000	OUI
Swan	-	C2	Swan	-	C2	6005.000	6010.329	0.001	5.329	266.02	0.001	0.078
CN	4215	band	CN	4215.000	4215.890	0.001	0.890	63.29	0.001	0.078	0.000	OUI
C	II	C	II	4267.000	4270.727	0.001	3.727	261.88	0.001	0.078	0.000	OUI
N	IV	N	IV	4058.000	4058.566	0.001	0.566	41.84	0.001	0.078	0.000	OUI
He	II	+	H	delta	He	II	+	H	delta	4100.000	4102.801	0.001
Sr	II	Sr	II	4077.000	4077.589	0.001	0.589	43.28	0.001	0.078	0.000	OUI
Na	I	5682.633	Na	I	5682.633	5686.638	0.001	4.005	211.31	0.001	0.078	0.000
C2	Swan	C2	Swan	5636.000	5639.862	0.001	3.862	205.45	0.001	0.078	0.000	OUI
N	II	N	II	5679.000	5683.988	0.001	4.988	263.30	0.001	0.078	0.000	OUI
ZrO	ZrO	5629.000	5633.937	0.001	4.937	262.96	0.001	0.078	0.000	OUI		
CN	CN	4380.000	4383.925	0.001	3.925	268.68	0.001	0.078	0.000	OUI		
Si	II	Si	II	5500.000	5504.835	0.001	4.835	263.57	0.001	0.078	0.000	OUI
Swan	-	C2	Swan	-	C2	5500.000	5504.835	0.001	4.835	263.57	0.001	0.078
NaI	NaI	5889.000	5891.408	0.001	2.408	122.57	0.001	0.078	0.000	OUI		
He	II	+	H	gamma	He	II	+	H	gamma	4340.000	4340.470	0.001
Hγ	(Balmer)	Hγ	(Balmer)	4340.470	4340.470	0.000	-0.000	-0.00	0.001	0.078	0.000	OUI
He	I	4121	He	I	4120.990	4122.182	0.001	1.192	86.70	0.001	0.078	0.000
Si	IV	4116	Si	IV	4116.100	4119.797	0.001	3.697	269.24	0.001	0.078	0.000
He	I	He	I	5876.000	5881.227	0.001	5.227	266.67	0.001	0.078	0.000	OUI
Hγ	4340	H	I	4340.470	4340.470	0.000	-0.000	-0.00	0.001	0.078	0.000	OUI
Fe	II,III,	Mg	II	Fe	II,III,	Mg	II	4300.000	4300.866	0.001	0.866	60.40
O2	a	band	6276–6287	O2	6276.000	6281.318	0.001	5.318	254.02	0.001	0.078	0.000
O2	a	band	(repère)	O2	6277.000	6280.117	0.001	3.117	148.86	0.001	0.078	0.000
ZrO	ZrO	6350.000	6355.692	0.001	5.692	268.72	0.001	0.078	0.000	OUI		
O2	a	band	~6277	O2	6277.000	6280.117	0.001	3.117	148.86	0.001	0.078	0.000
TiO	bands	6651–6852	TiO	6651.000	6653.701	0.001	2.701	121.77	0.001	0.078	0.000	OUI
CN	CN	6656.000	6661.919	0.001	5.919	266.59	0.001	0.078	0.000	OUI		
Hδ	4101	H	I	4101.740	4101.600	0.000	-0.140	-10.21	0.001	0.078	0.000	OUI
CN	CN	6206.000	6211.466	0.001	5.466	264.03	0.001	0.078	0.000	OUI		
TiO	bands	6159–6395	TiO	6159.000	6163.910	0.001	4.910	238.99	0.001	0.078	0.000	OUI
He	I	He	I	4027.000	4030.610	0.001	3.610	268.78	0.001	0.078	0.000	OUI
NH2	NH2	4056.000	4059.612	0.001	3.612	266.94	0.001	0.078	0.000	OUI		
K	K	3934.000	3936.591	0.001	2.591	197.41	0.001	0.078	0.000	OUI		
Ca	II	K	3933	Ca	II	3933.660	3936.591	0.001	2.931	223.34	0.001	0.078
Ca	II	-	K	line	Ca	II	-	K	line	3934.000	3936.591	0.001
CN	CN	6355.000	6360.681	0.001	5.681	268.01	0.001	0.078	0.000	OUI		

Elements	Élément	λ0	[Å]	λ_obs_rest	[Å]	σ_λ	[Å]	Δλ	[Å]	RV_indiv	[km/s]	Profondeur
SiC2	SiC2	4909.000	4912.495	0.001	3.495	213.43	0.001	0.078	0.000	OUI		
N	V	N	V	4619.000	4619.723	0.001	0.723	46.93	0.001	0.078	0.000	OUI
O	I	O	I	5577.000	5581.704	0.001	4.704	252.87	0.001	0.078	0.000	OUI
DIB	DIB	5780.000	5784.556	0.001	4.556	236.32	0.001	0.078	0.000	OUI		
He	II	He	II	6683.000	6688.893	0.001	5.893	264.36	0.001	0.078	0.000	OUI

Total OK	177