Un setup remote dans l'hémisphère sud pour la spectro

2SPOT

Southern Spectroscopic Project Observatory Team

Photo : © Deep Sky Chili

Rencontres du Ciel et de l'Espace 2022

par Olivier GARDE & l'équipe 2SPOT

Qui sommes nous ?

2SPOT

Southern Spectroscopic Project Observatory Team

- Une équipe de 5 astronomes amateurs Français
- Nous avons créé une association loi 1901
- Notre association est reconnue d'intérêt général à caractère scientifique
- Nous avons le soutien de plusieurs sociétés, instituts de recherches
- Nous participons à des projets de collaboration Pro/Am en spectroscopie

Nos soutiens

2SPOT
Southern Spectroscopic Project Observatory Team

- Plusieurs sociétés, instituts de recherche, revues scientifiques, écoles d'ingénieurs.
- Conventions avec divers observatoires professionnels
- Revendeurs et fabricants de matériel astronomiques
- Particuliers et astronomes amateurs

2SPOT
Southern Spectroscopic Project Observatory Team

L'équipe

Thomas Petit

Olivier Garde

Stéphane Charbonnel

Pascal Le Dû

Lionel Mulato

Logiciels utilisés

ISIS

AnyDesk

Spec INTI

ARP

Observations **100%** automatiques

Fichier texte des divers cibles

Objects.txt

```
AT_2022mnp 13 24 31.3000 -72 10 30.300 9.0 NONE NONE GUIDE NO_FOCUS Nova
CD-37__4480 08 16 12.0675 -37 47 04.222 10.89 NONE NONE GUIDE NO_FOCUS Be
U_Sco 16 22 30.7791 -17 52 43.166 10.0 NONE NONE GUIDE NO_FOCUS Nova
V644_Cen 11 43 06.5274 -60 44 04.490 10.427 NONE NONE GUIDE NO_FOCUS Be
CSI-62-12087 12 11 18.5515 -62 29 43.613 11.35 NONE NONE GUIDE NO_FOCUS Be
WRAY_15-1119 13 33 46.0353 -63 32 04.680 12.0 NONE NONE GUIDE NO_FOCUS Be
SS433 19 11 49.5647 +04 58 57.827 13.0 1200 6 GUIDE NO_FOCUS Symbiotic
HD141689 15 53 45.8361 -61 39 50.261 10.05 NONE NONE GUIDE NO_FOCUS Be
HBHA_703-05 19 12 26.9353 +06 37 44.213 11.174 NONE NONE GUIDE NO_FOCUS Be
HD_355402 20 19 21.4416 +14 54 51.455 10.87 NONE NONE GUIDE NO_FOCUS Be
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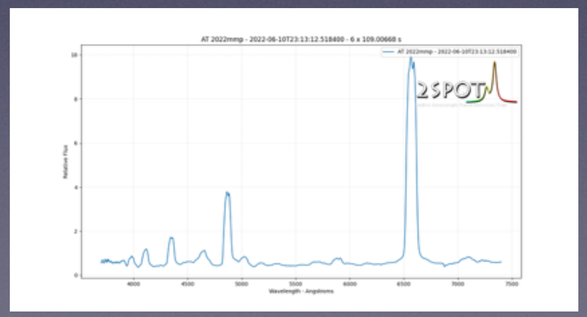
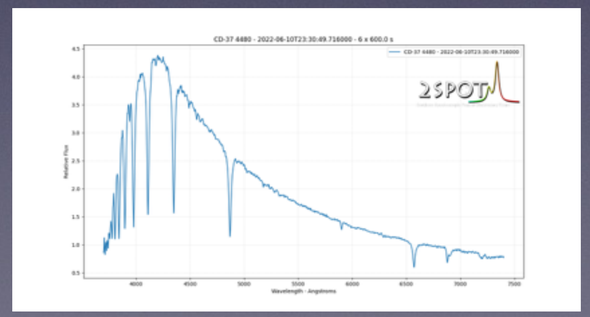
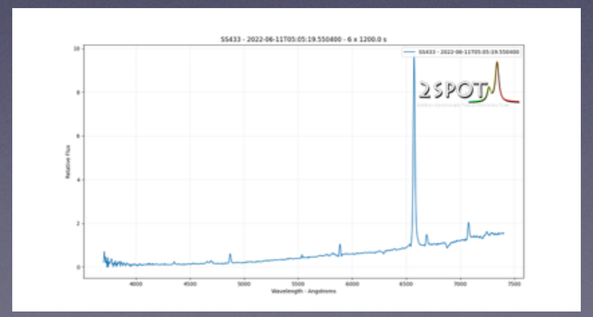
Script Prism pour les acquisitions (**Stéphane Charbonnel**)

Process ARP (**Matthieu Le Lain** avec Spec INTI **Christian Buil**)

Résultats disponibles 1 à 2h après la fin des observations



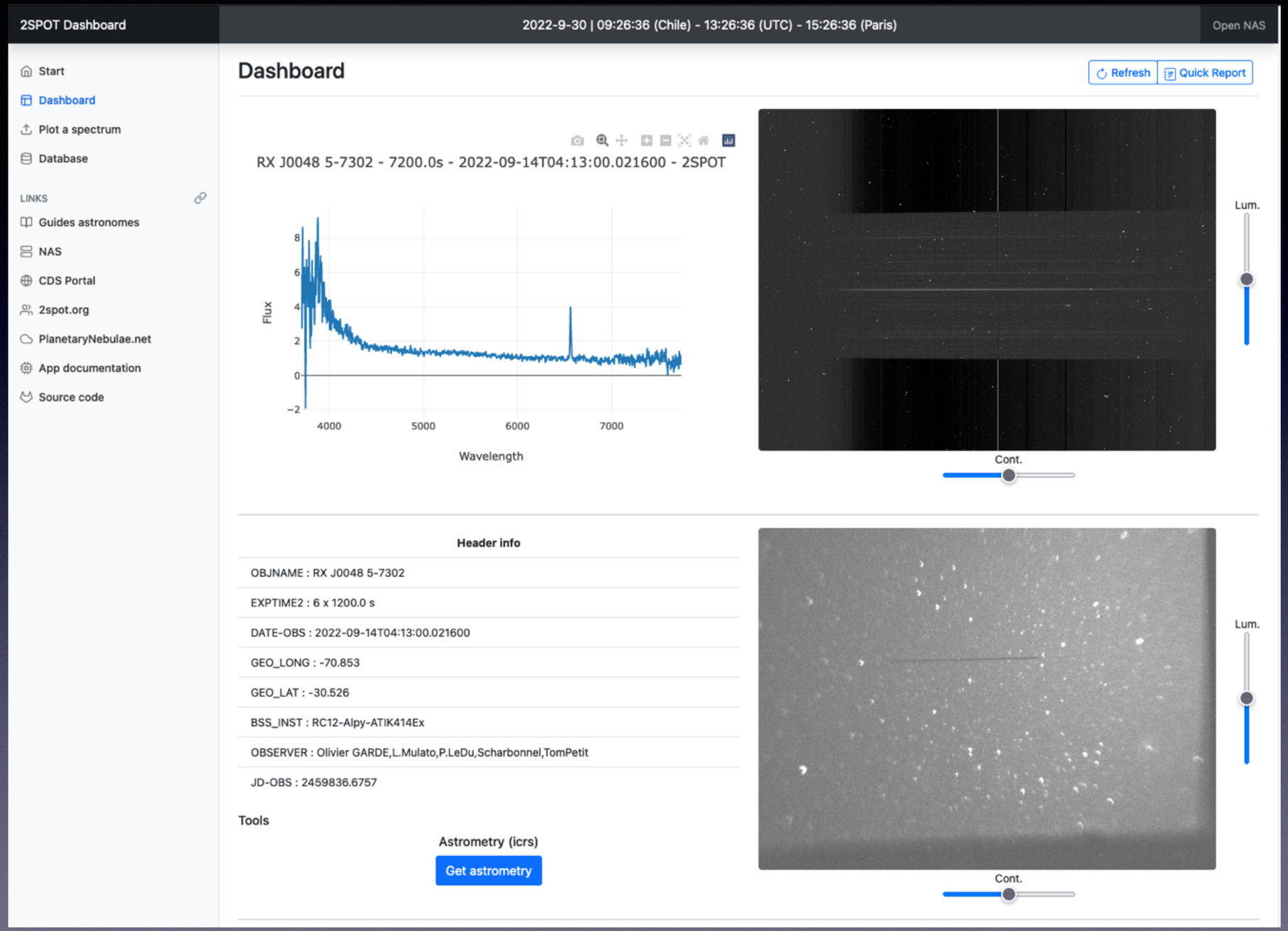




Dashboard
(web interface)

Interface pour :

- Valider les spectres
- Générer un rapport d'observation



Choix du site au Chili

DeepSkyChile
RENT CHILEAN SKY

- **320** nuits de ciel dégagé par an
- 1700m d'altitude
- Fond de ciel noir à Mag. 21-22
- Seeing trés souvent < 1''

Lat : 30° 31' S
Lon : 70° 51' W

www.deepskychile.com

Photo : © Google Map

Nos voisins au Chili

Cerro Tololo

Cerro Pachon

Photo : © Deep Sky Chili

Cerro Tololo Inter-American Observatory

Large Synoptic Survey Telescope

Photo : © Google Map

Southern Astrophysical Research Telescope

Gemini South

L’observatoire Deep Sky Chile

- 5 hangars collectifs
- Panneaux solaires
- Internet avec de la 4G
- Ouverture/fermeture automatique
- Pas de pollution lumineuse

Photo : © Deep Sky Chile

- Chaque hangar abrite plusieurs télescopes

Photo : © Deep Sky Chile

Notre 1er setup

- Télescope Ritchey-Chretien 305mm
- Monture GM3000 HPS 10Micron
- Spectrographe ALPY 600 R=600
- ATIK 414 Ex (camera spectrale)
- ATIK 314L+ (autoguidage)
- Chercheur EV Bony 60mm
- ASI 178 MM (pour le chercheur)

Chercheur électronique

Spectrographe Alpy 600

Test de notre setup à l'OHP en 2020

Armoire électrique du 1er setup

Alimentation 24V pour la monture

Relais

Alimentation 12V pour les CCD
et autres périphériques

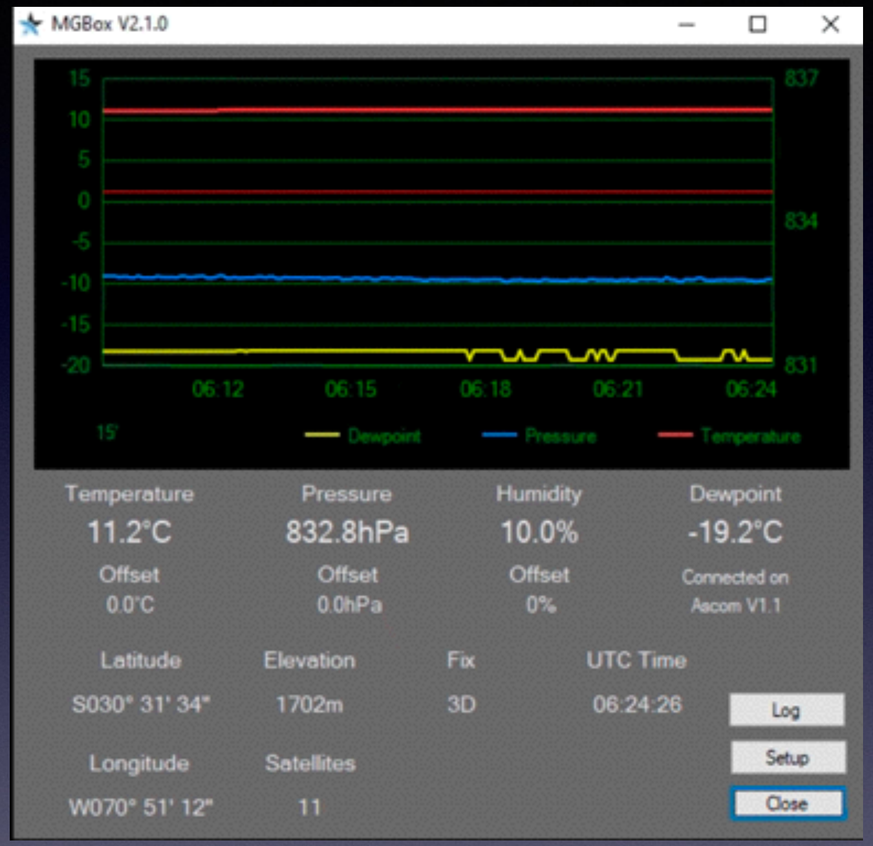
IPX 800 (intérupteurs sous IP)

Switch Ethernet

PC local et écran

Controle à distance des alimentations

Interface web
IPX 800



Pression & Temperature
MG BOX V2

Expédition du matériel

Départ : France
15 mars 2021

- 2 caisses en bois
- Poids: 334 Kg
- Expédition par bateau
- 45 jours de voyage
- 15000 km parcourus

Arrivé : Chile
1er mai 2021

Photo : © Deep Sky Chile

Vidéo du voyage

www.youtube.com/watch?v=SGwaHtYerNY

L’assemblage du setup au Chili

La crise sanitaire du COVID-19 ne nous a par permis de nous déplacer au Chili.

Photo : © Deep Sky Chile

Photo : © Deep Sky Chile

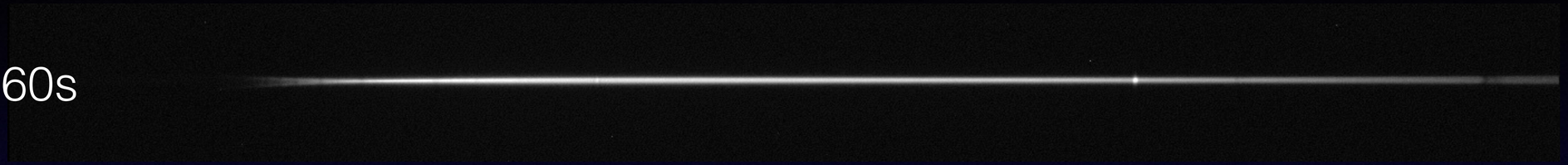
Photo : © Deep Sky Chile

Le montage a été réalisé par l’équipe locale de Deep Sky Chile

Premier spectre : L'étoile Be V 1078 Sco

24 mai 2021

Spectre brut : 60s



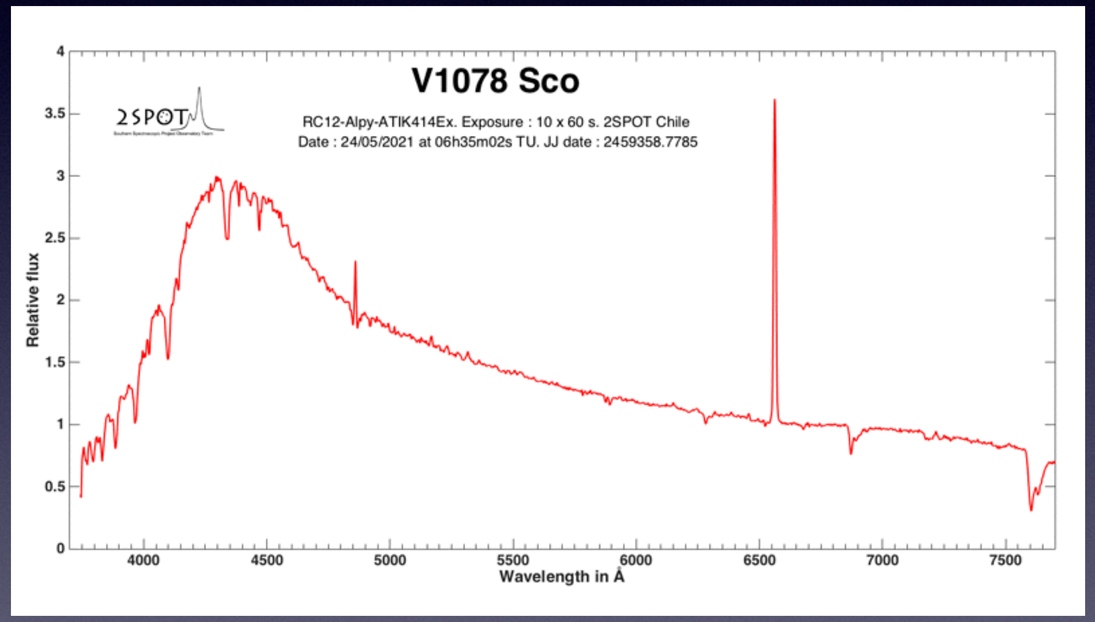


Photo : © Deep Sky Chile

Vidéo du 1er spectre

www.youtube.com/watch?v=1c3lSntV80g

Notre programme d’observation

- Confirmation de candidates NP
- Etoiles Be
- Etoiles symbiotiques et cataclysmiques
- Confirmation d’étoiles symbiotiques
- Novae
- Supernovae
- Comètes
- Autres évènement dans le ciel ?

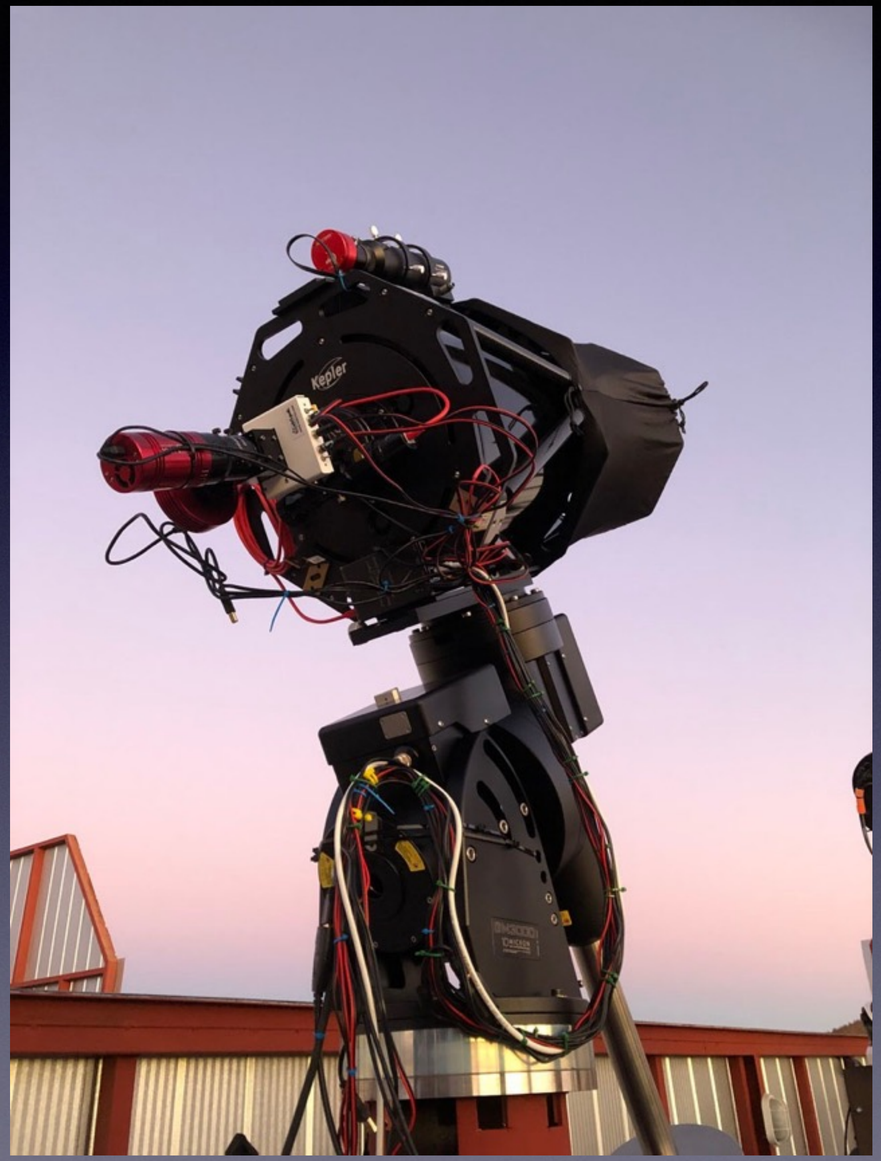
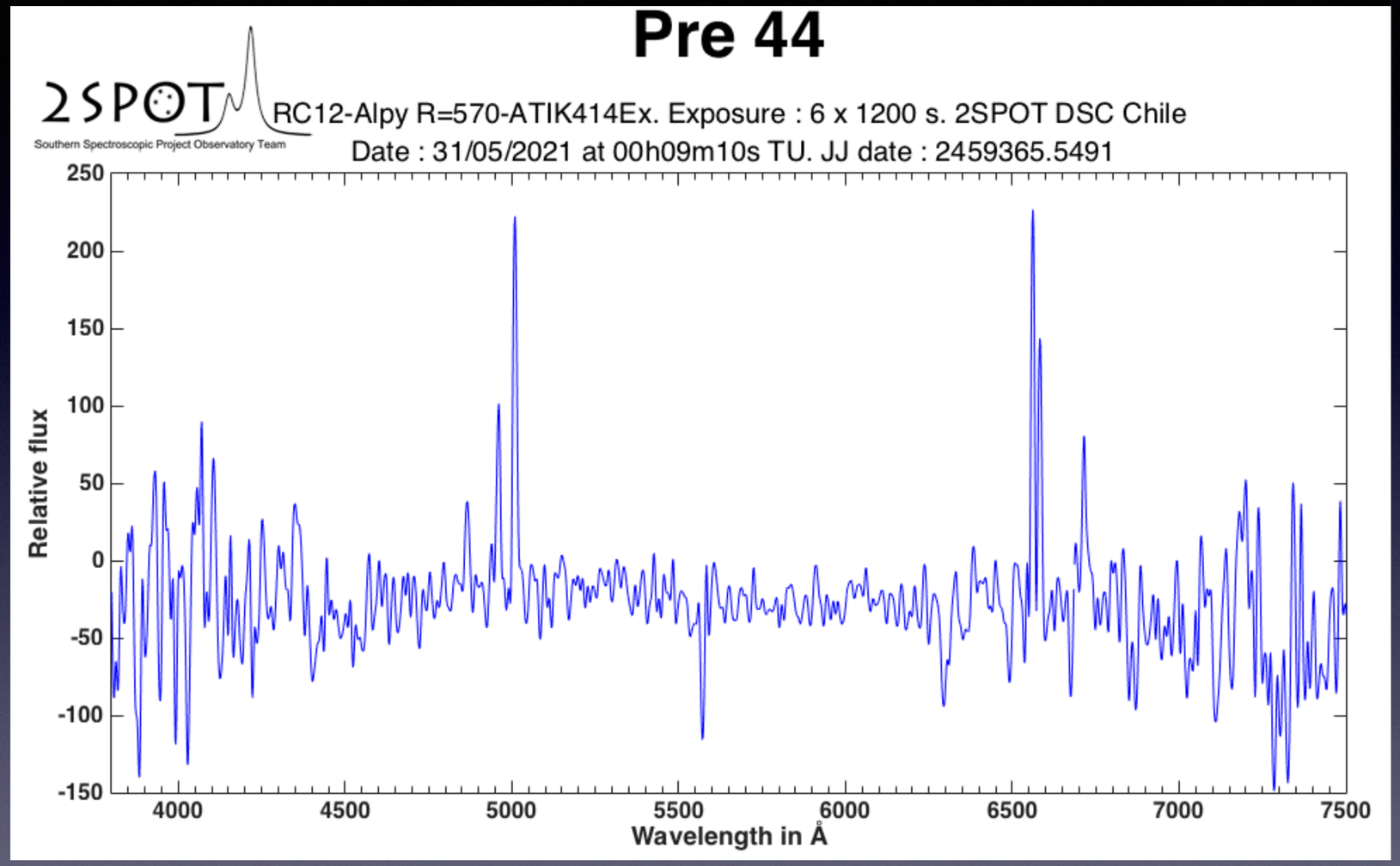


Photo : © Deep Sky Chile

Quelques résultats

Images prisent
avec notre chercheur
de 60mm pour le fun

Quelques résultats



NP candidate Pre 44 : une cible très faible

Quelques résultats : la Sn 2021 pit

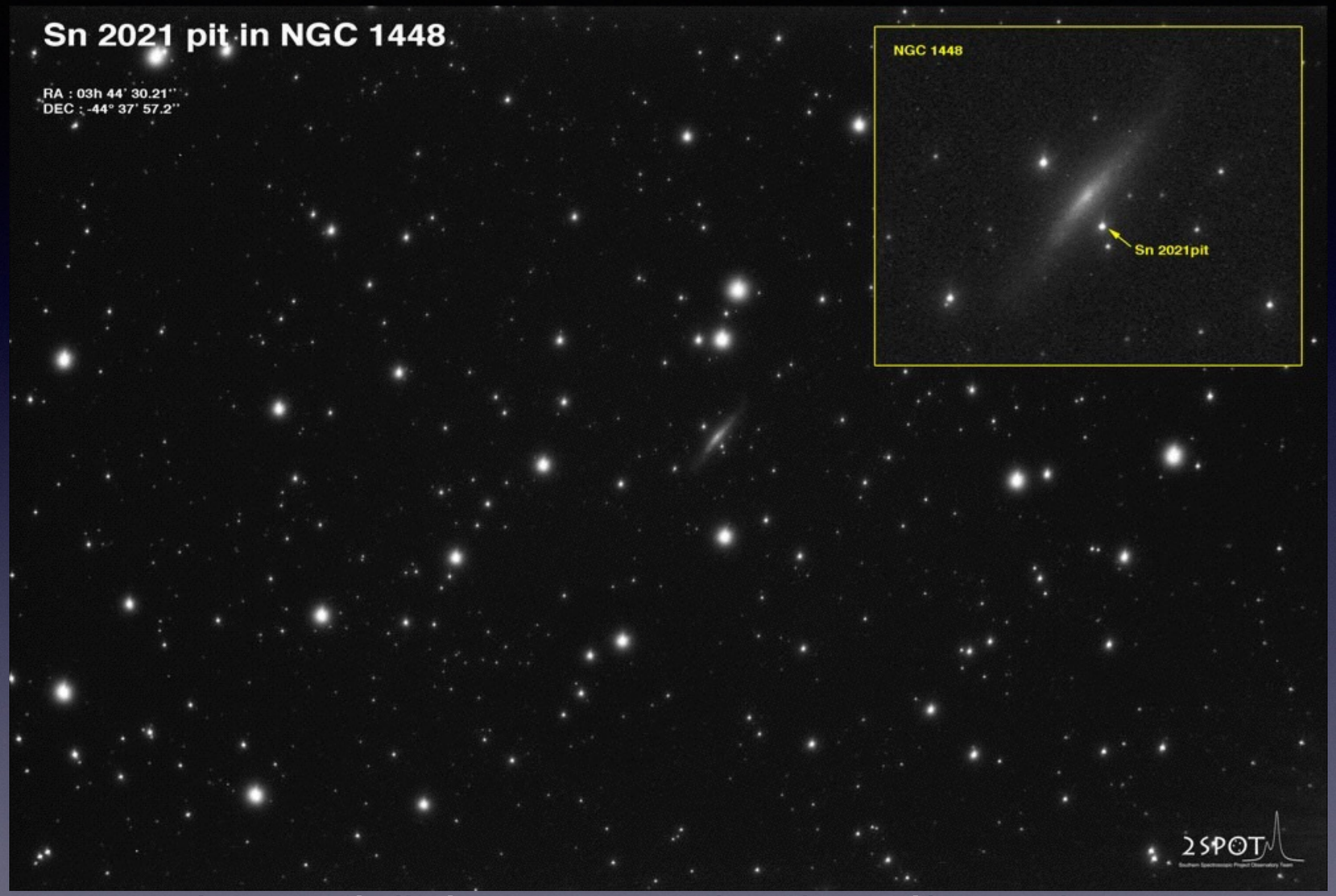
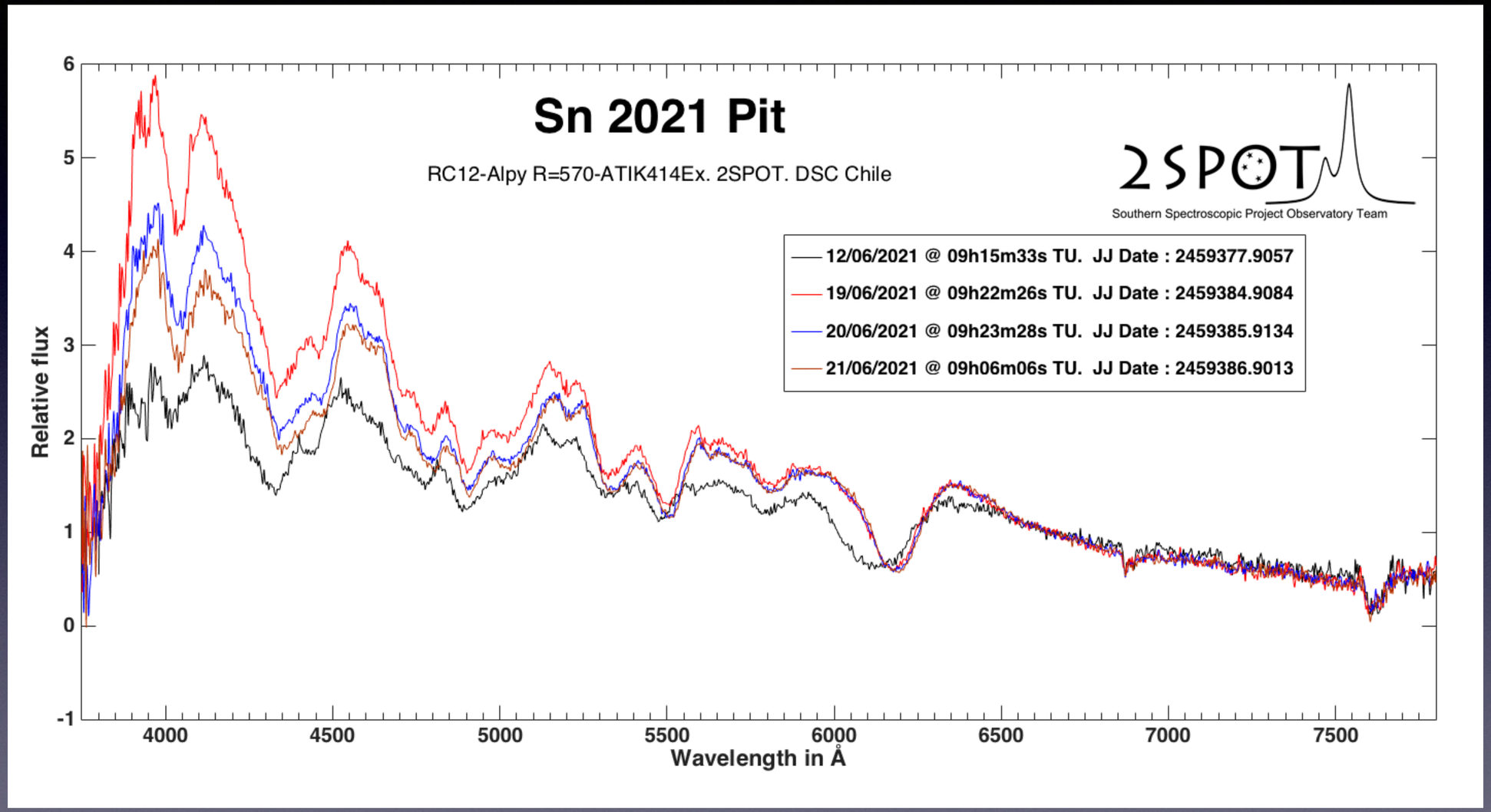


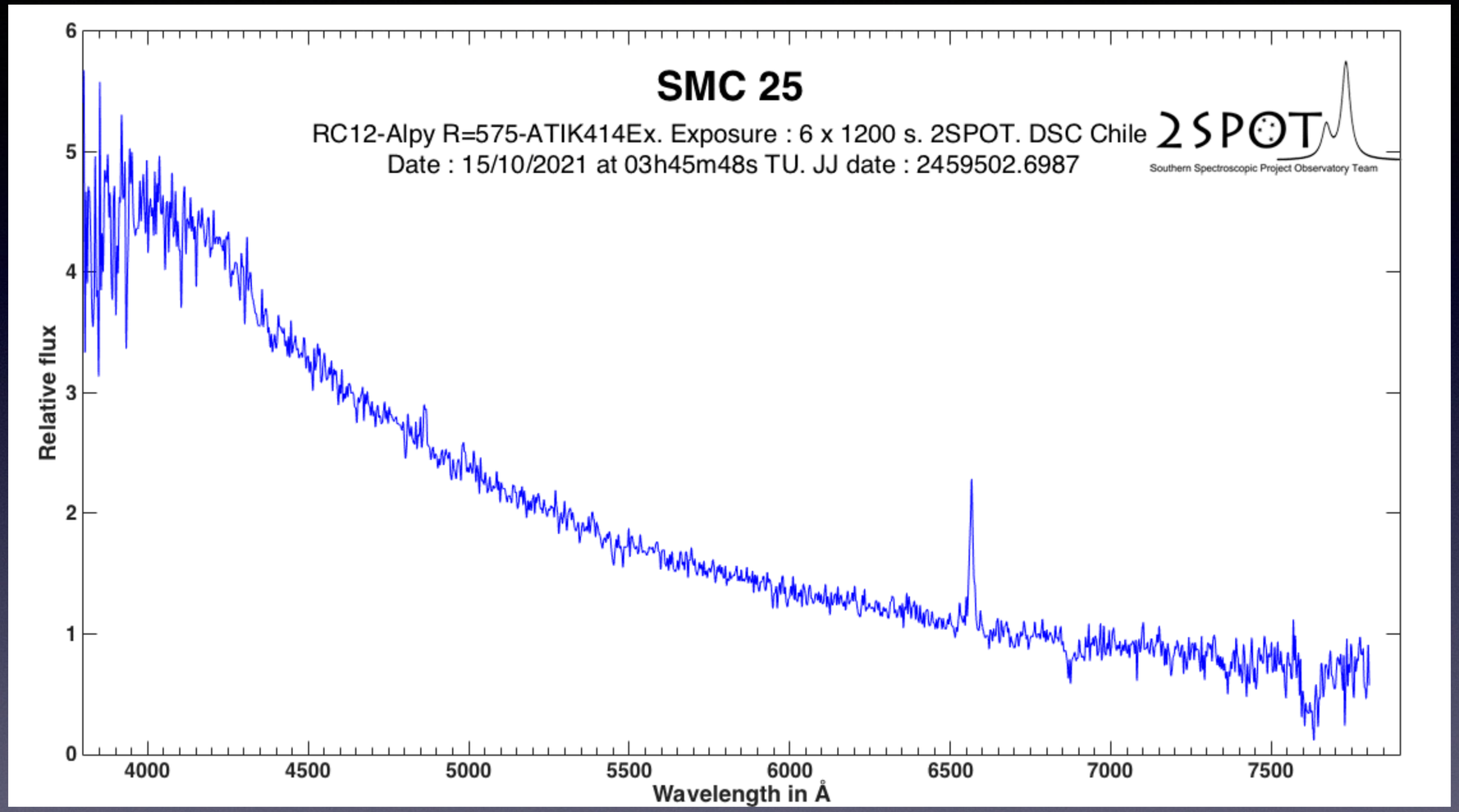
Image réalisé avec notre chercheur électronique

Quelques résultats : la Sn 2021 pit



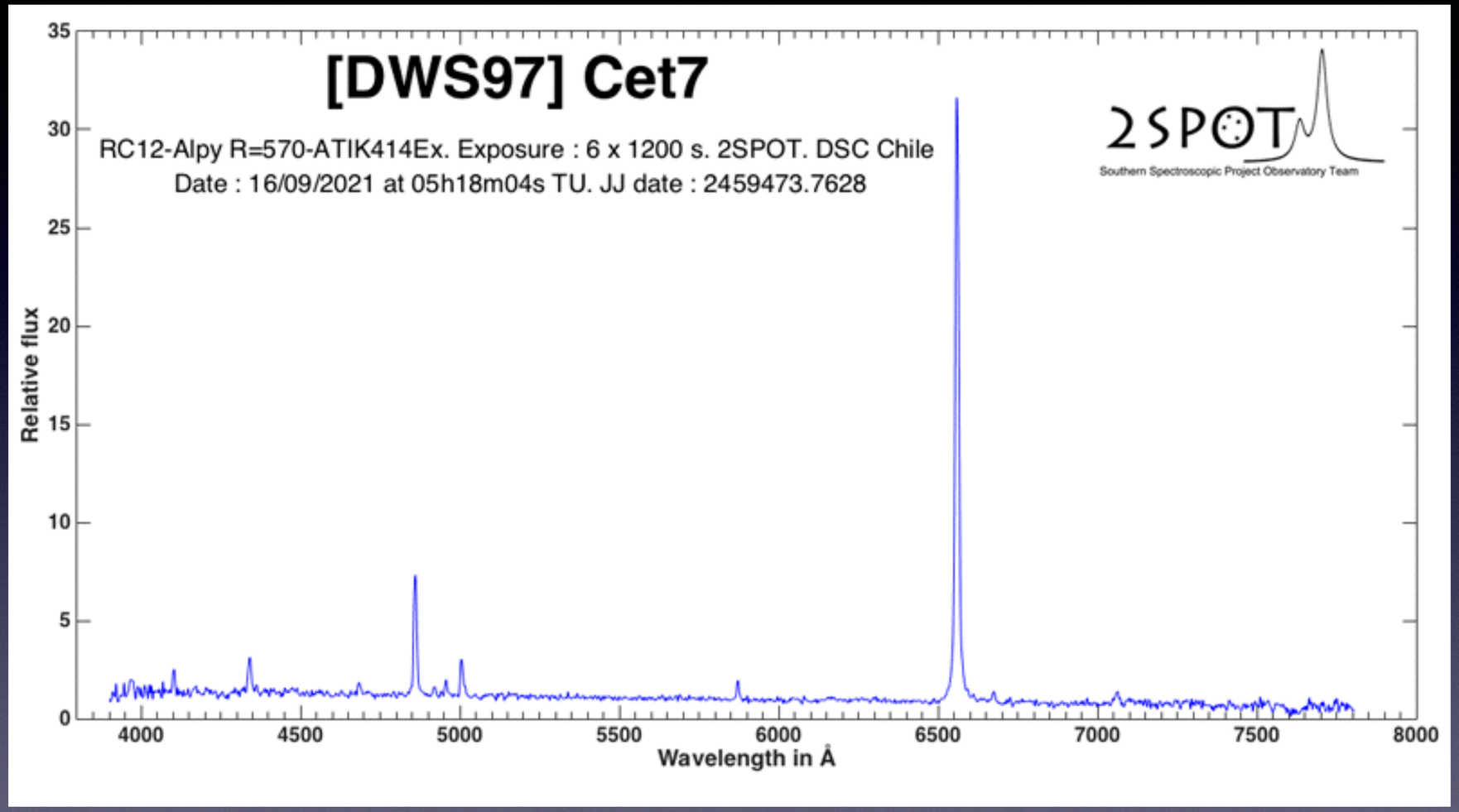
Evolution du spectre sur 4 nuits

Quelques résultats



SMC 25 : une étoile Be dans le Grand Nuage de Magellan (Mag. V=14,45)

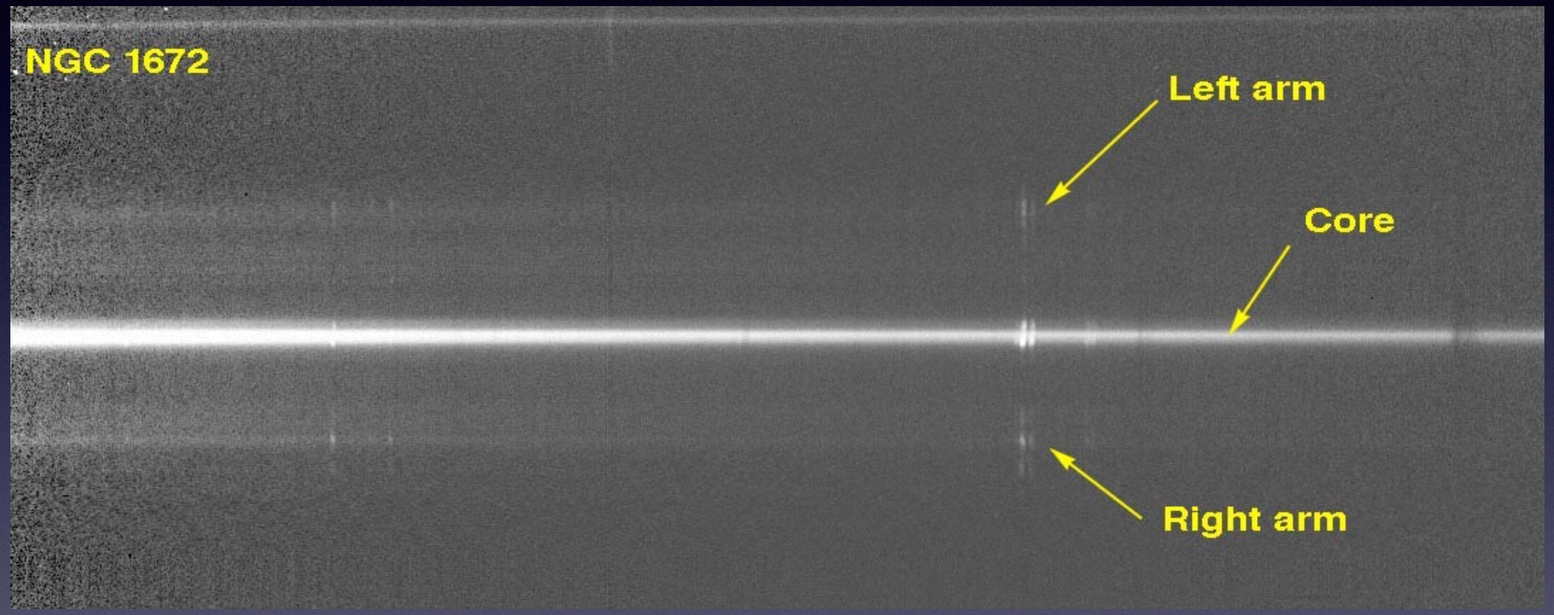
Quelques résultats



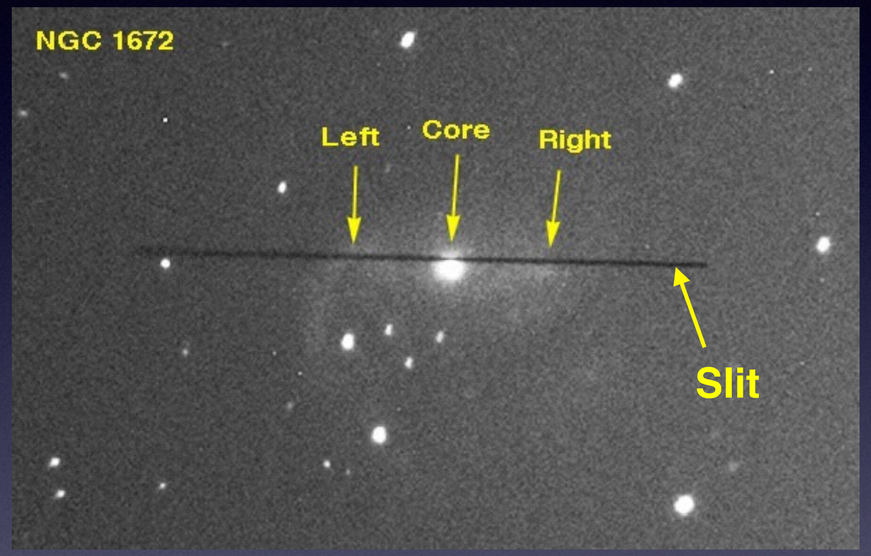
Etoile symbiotique [DWS97] Cet7 (Magnitude V=15,14)

Quelques résultats

Galaxie de Seyfert : NGC 1672



Spectre brut unitaire de 1200s

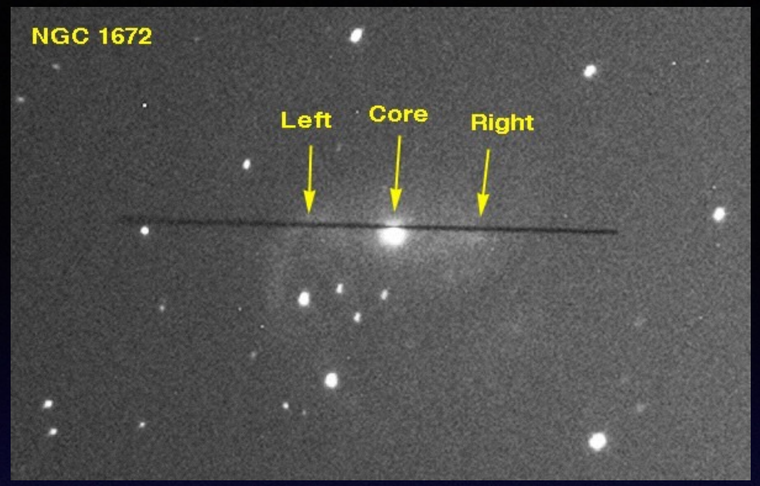


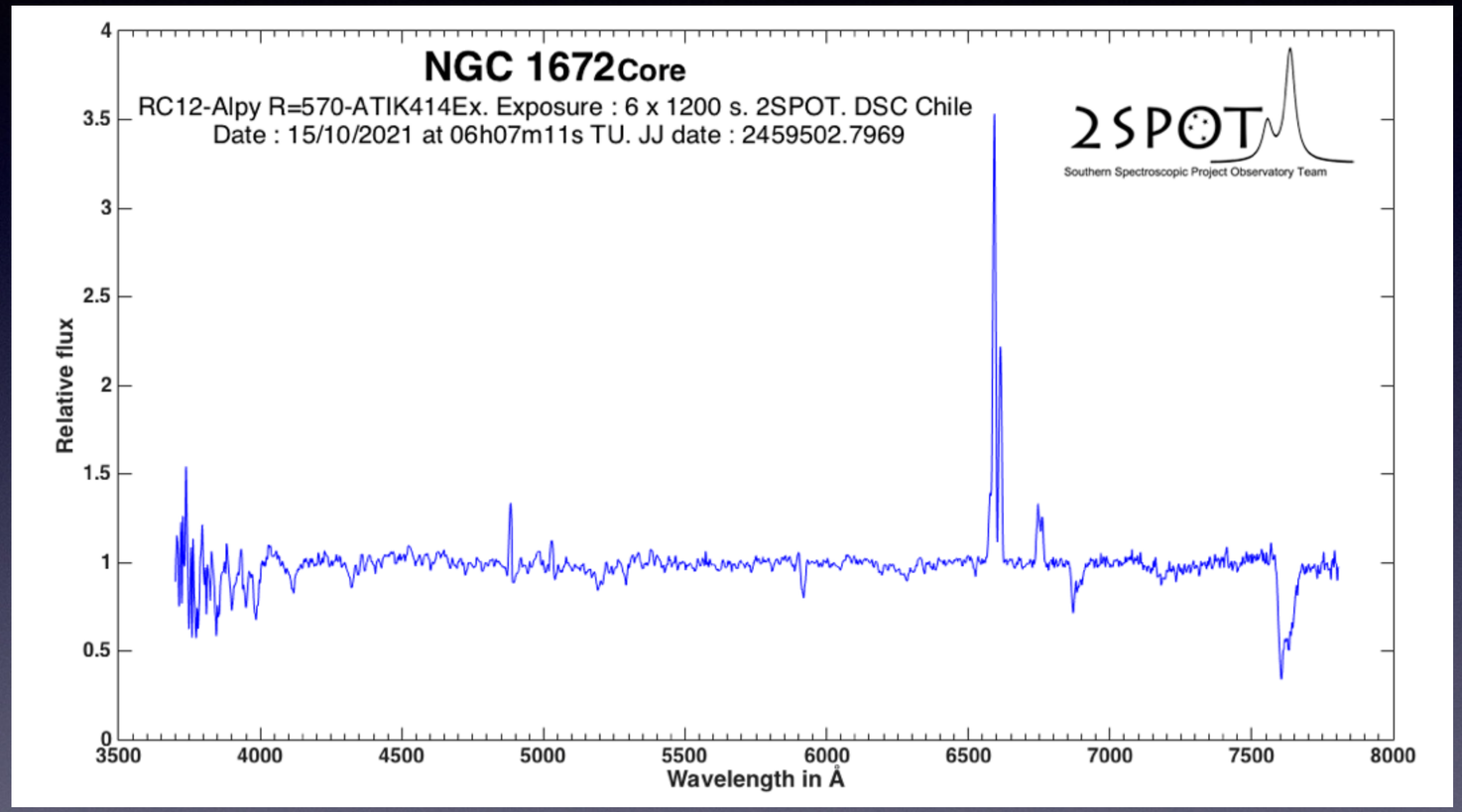
champ d'autoguidage

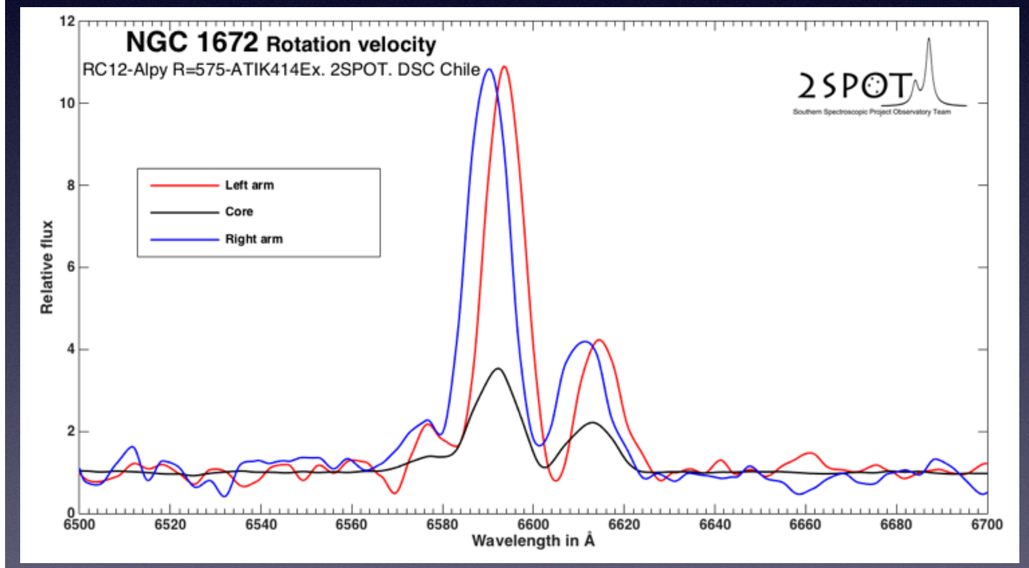
Position de la galaxie dans la fente

Quelques résultats

Galaxie deSeyfert : NGC 1672



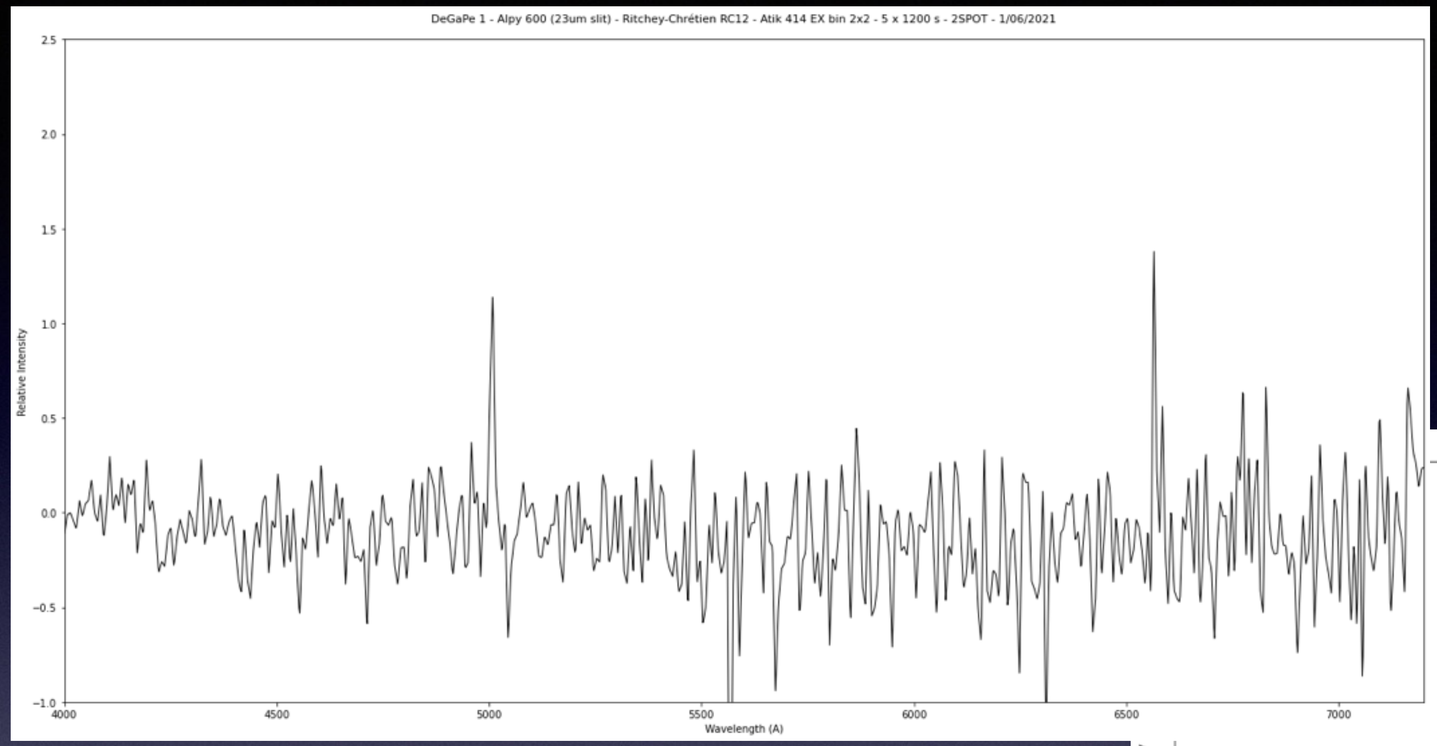




Vitesse radiale de1335 km/s (z=0,004464)

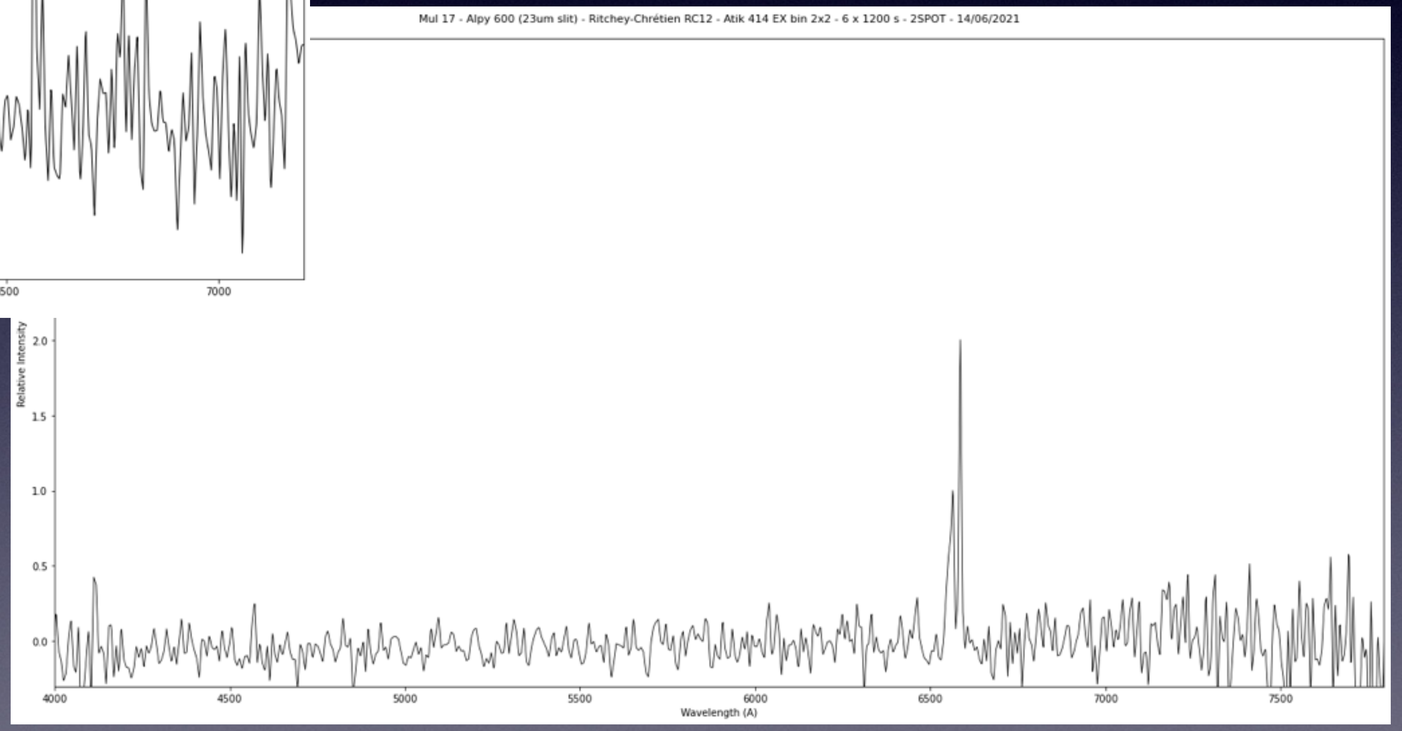
Vitesse de rotation de la galaxie
Bras gauche en bleu
Bras droit en rouge

Confirmation de candidates NP



DeGaPe 1

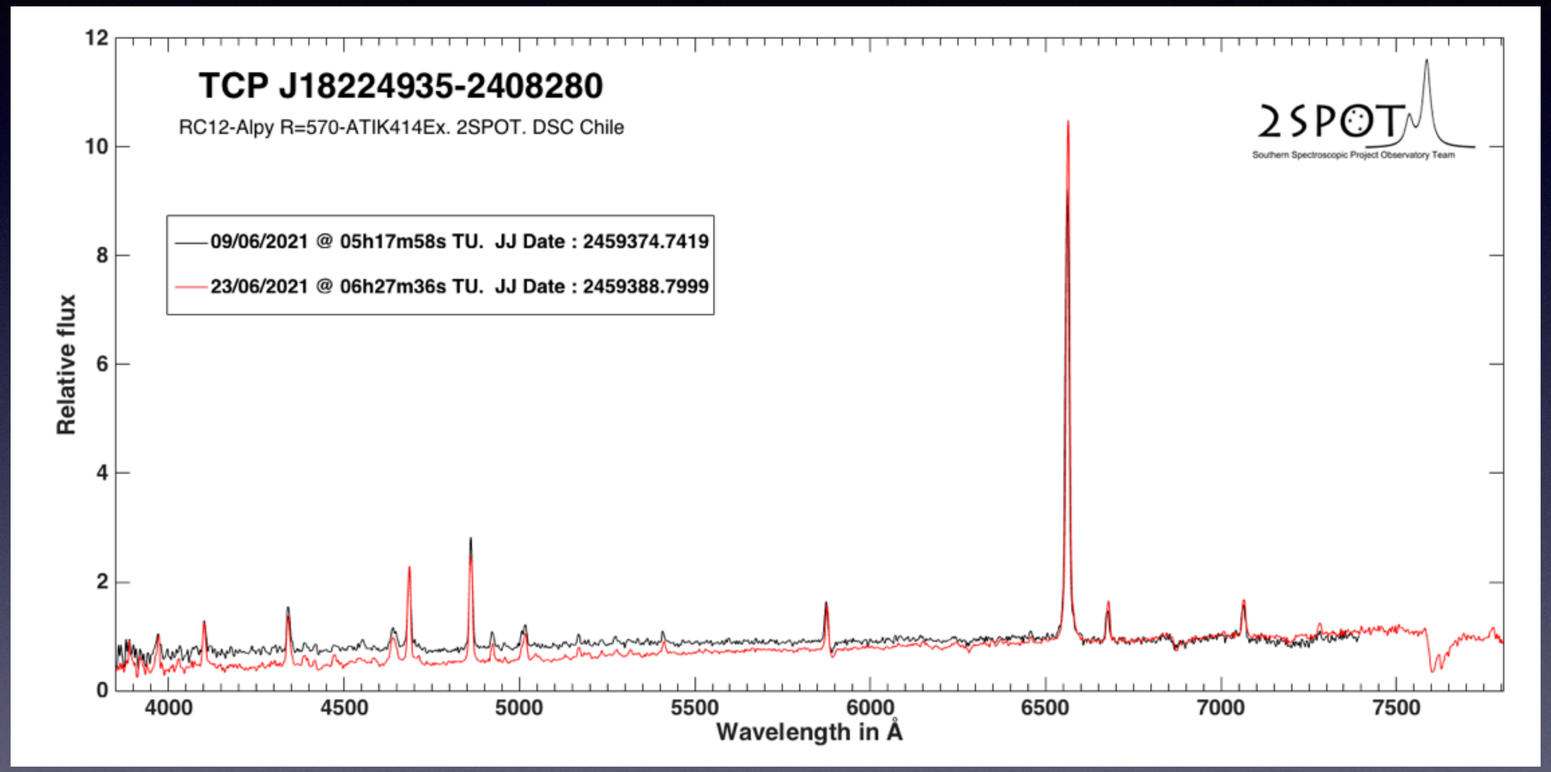
Cibles très faibles



Mul 17

Publications
(depuis le 24 Mai 2021)

UAI ATel #14691 (9 juin 2021)



TCP J18224935-2408280 is an outburst of a symbiotic star

ATel #14691; *J. Merc (UPJS in Kosice, Charles University), R. Galis (UPJS in Kosice), S. Charbonnel, O. Garde, P. L. Du, L. Mulato, T. Petit (2SPOT team)*
on 9 Jun 2021; 16:19 UT
Credential Certification: Jaroslav Merc (jaroslav.merc@student.upjs.sk)

Subjects: Infra-Red, Optical, Binary, Cataclysmic Variable, Transient, Variables

Referred to by ATel #: 14692, 14699

Tweet

The transient TCP J18224935-2408280 was discovered by Tadashi Kojima (CBAT "Transient Object Followup Reports"). Possible symbiotic nature was later suggested by Patrick Schmeer as he noticed that there is a Gaia DR2 LPV with a reported period of roughly 800 days 2" away from the announced position (Gaia DR2 4089297564356878720). The star is also included in the catalog of large-amplitude variables of Mowlavi et al. (2021, A&A 648, A44).

The light curve of TCP J18224935-2408280 from the ASAS-SN survey (Shappee et al., 2014, ApJ 788, 48; Kochanek et al., 2017, PASP, 129, 104502) shows 2.2 mag brightening which started between May 13, 2021 (JD 2 459 348.4) and May 16, 2021 (JD 2 459 351.4). The brightness reached the first maximum in about 5 days followed by a 10-day-long slight decrease of brightness by 0.5 mag. Since the beginning of June, the brightness is gradually rising again. No other brightenings are seen in the ASAS-SN light curve since March 14, 2016 (JD 2 457 461.8).

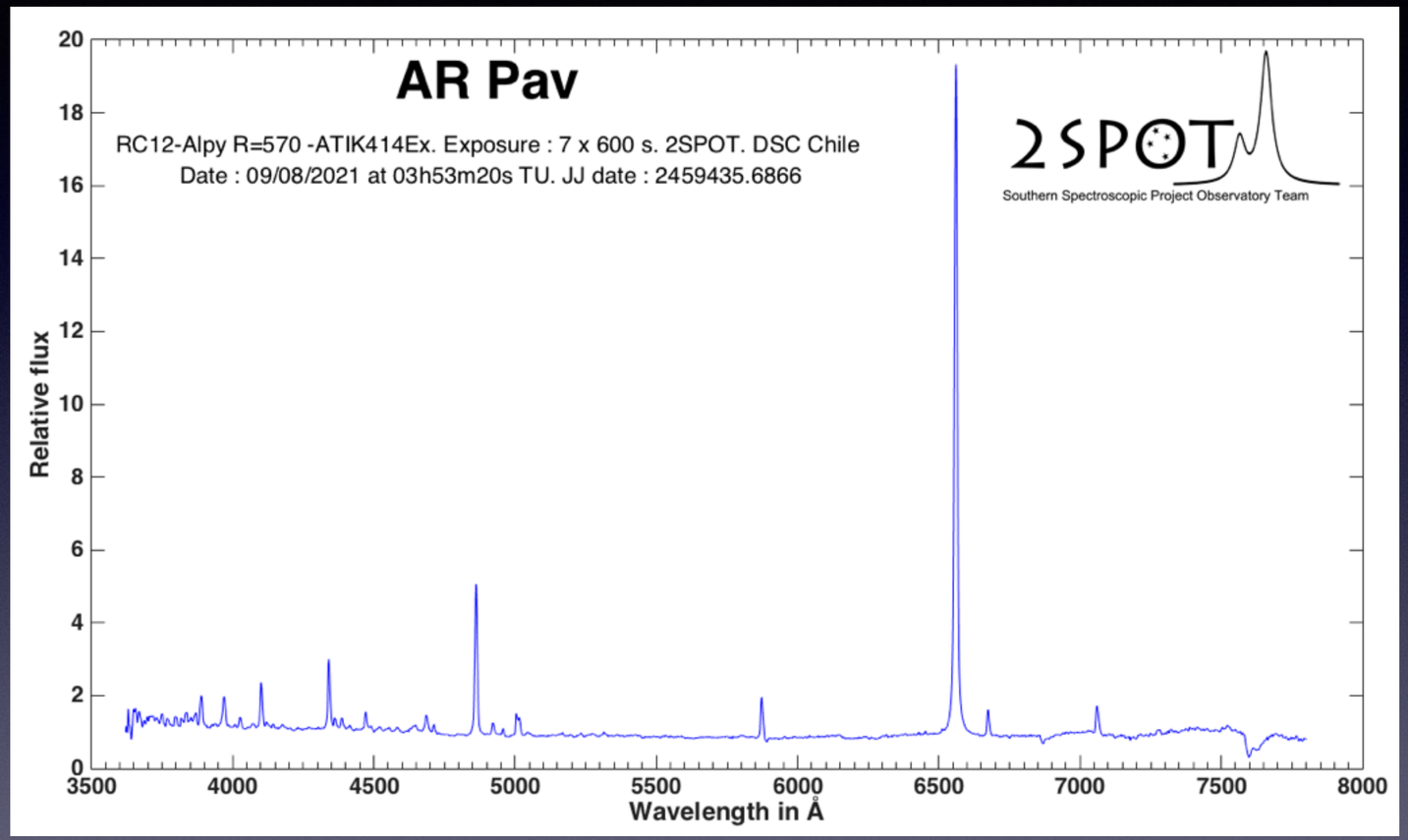
We obtained an optical spectrum of TCP J18224935-2408280 on June 9, 2021 (JD 2 459 374.7) using an Alpy600 spectrograph mounted at a remotely controlled 35-cm Ritchey-Chretien telescope located in Chile. The spectrum shows strong emission lines of H I, He I, [O III], and He II in addition to the K5-M0 continuum. The measured equivalent widths are 114, 30, 12, and 19 Ang for H alpha, H beta, H gamma, and He II 4686 emission lines, respectively.

The map of Schlafly & Finkbeiner (2011, ApJ 737, 103) gives total galactic extinction in the direction of TCP J18224935-2408280 E(B-V) = 0.55 corresponding to visual extinction of AV = 1.71 mag. The parallax of the object in Gaia DR3 (Gaia Collaboration, 2021, A&A, 649, A1) is unreliable (0.0571 +- 0.0242 mas). Bailer-Jones et al. (2021, AJ, 161, 147) obtained a distance of around 8 kpc for the source. At such a distance, the apparent magnitude of TCP J18224935-2408280 is roughly consistent with class III stars.

Together with the ongoing outburst of the object and the long-term variability, these results very strongly indicate the symbiotic nature of TCP J18224935-2408280. The infrared colors of the object are consistent with an S-type symbiotic star.

Southern Spectroscopic Project Observatory Team (2SPOT)

Publications
(depuis le 24 Mai 2021)



UAI ATel #14837 (9 Août 2021)

Ongoing brightening of the eclipsing symbiotic star AR Pav

ATel #14837; *J. Merc (UPJS in Kosice, Charles University), R. Galis (UPJS in Kosice), O. Garde, L. Mulato, P. Le Du, S. Charbonnel, T. Petit (2SPOT team)*
*on **9 Aug 2021; 13:13 UT***
Credential Certification: Jaroslav Merc (jaroslav.merc@student.upjs.sk)

Subjects: Infra-Red, Optical, Binary, Transient, Variables

Tweet

AR Pav is an eclipsing symbiotic star with an orbital period of around 605 days (e.g., Sekeráš et al., 2019, CAOSP, 49, 19, and references therein). Its photometric activity has been monitored since 1889 (see Fig. 1 in Skopal et al., 2001, IBVS, 5195 and Fig. 23 in Sekeráš et al., 2019, CAOSP, 49, 19). Its long-term photographic/B-band light curve is characterized by ~2 mag eclipses and an out-of-eclipse variability between 10 – 12 mag. Several brightenings of the system have been detected in past, with the most prominent outbursts observed in 1900 and 1935, when the star reached ~9 mag. In the recent decade, the star experienced only smaller brightenings in 2013 and 2014 during which the star was always fainter than 10.5 mag.

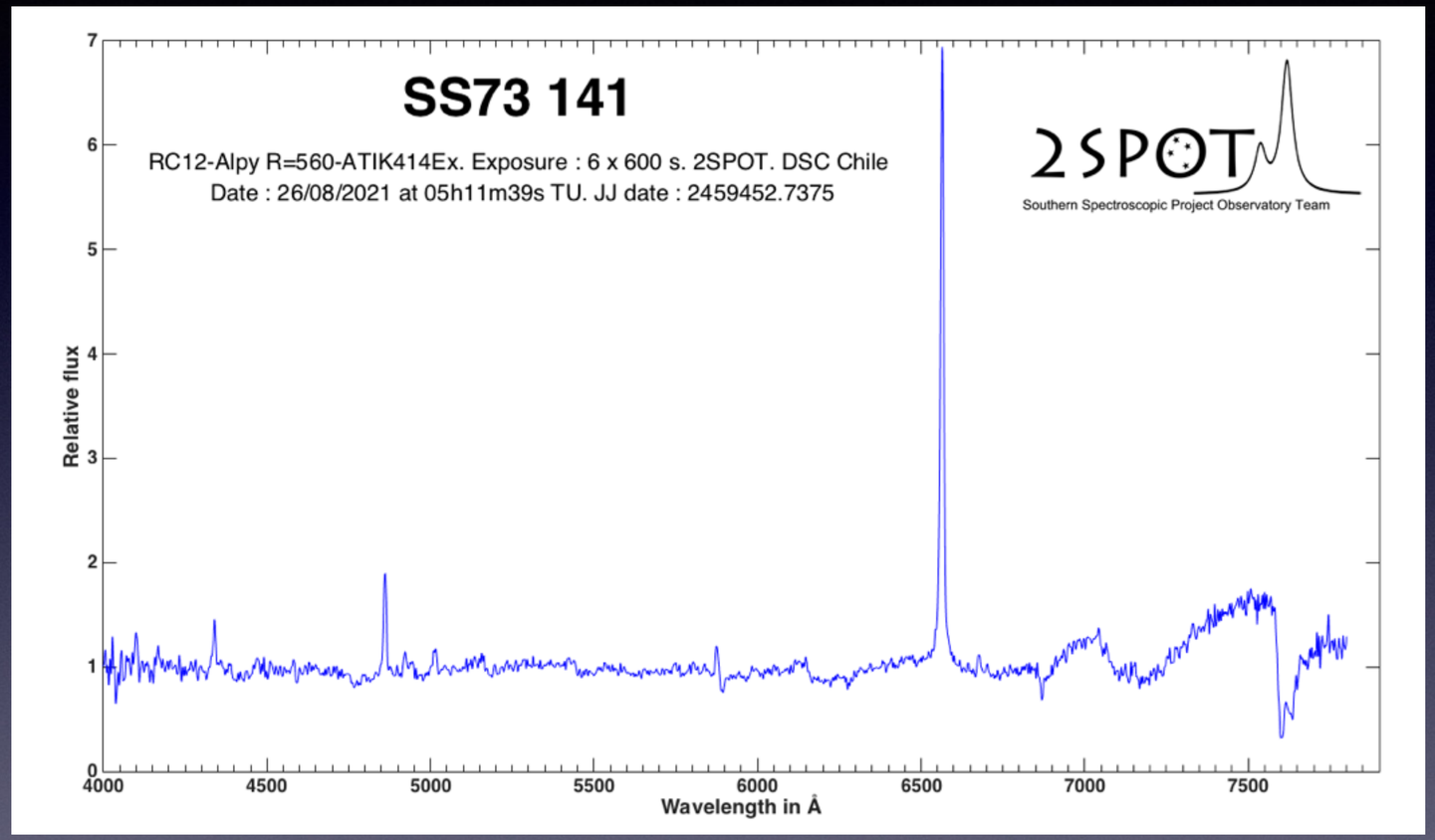
The photometric observations of AR Pav by the ASAS-SN survey (Shappee et al., 2014, ApJ 788, 48; Kochanek et al., 2017, PASP, 129, 104502) revealed an ongoing brightening by about 1.2 mag (with a peak brightness around 10 mag in the g filter). A slight rise towards the maximum started in April 2021 and accelerated in May 2021, reaching the maximal brightness at the beginning of June. Since then, according to the recent ASAS-SN light curve of AR Pav, brightness seems to fluctuate in a pattern similar to superhumps observed in cataclysmic variables (although some additional unexplained scatter seems to be present in the light curve). Such behavior is not detected during the rise to the maximum nor during the previous orbital cycles observed by ASAS-SN.

We obtained an optical spectrum of AR Pav on August 9, 2021 (JD 2 459 435.7) using an Alpy600 spectrograph mounted at a remotely controlled 35-cm Ritchey-Chretien telescope located in Chile. The spectrum shows a weak continuum of an M giant in addition to strong emission lines of H I, He I, [O III], relatively faint He II, and several emission lines of Fe II. Emission lines with a higher ionization potential (e.g., [Fe VII]) are not detected in our spectrum. The overall appearance of the spectrum is consistent with a Z And-type symbiotic star in an outburst.

Further multi-band photometric and spectroscopic observations are encouraged.

Southern Spectroscopic Project Observatory Team (2SPOT)

Publications
(depuis le 24 Mai 2021)



UAI ATel #14874 (26 Août 2021)

Brightening of SS73 141: Outburst of Z And-type?

ATel #14874; *J. Merc (UPJS in Kosice, Charles University), R. Galis (UPJS in Kosice), P. Velez (ARAS Group), S. Charbonnel, O. Garde, P. Le Du, L. Mulato, T. Petit (2SPOT team, ARAS Group)*
*on **26 Aug 2021; 17:58 UT***
Credential Certification: Jaroslav Merc (jaroslav.merc@student.upjs.sk)

Subjects: Infra-Red, Optical, Binary, Transient, Variables

Tweet

SS73 141 (=WRAY 16-384) is a poorly studied symbiotic star. The optical spectrum of the object, obtained on June 17, 1978, and presented by Allen (1984, PASA, 5, 369) showed prominent TiO bands of late-type giant (later classified as M5 by Murset & Schmid, 1999, A&AS, 137, 473) together with strong emission lines of H I and He II, and relatively faint emission lines of neutral helium.

Recently, Tadashi Kojima (Gunma, Japan) reported a brightening of SS73 141 (see vsnet-alert 26105). In vsnet-alert 26109, Taichi Kato hypothesized, that the ongoing brightening of SS73 141 might be an outburst of a slow symbiotic nova, as opposed to an outburst of classical symbiotic star (Z And-type). For a description of individual types of outbursts observed in symbiotic stars, see, e.g., recent review of symbiotic stars by Munari (2019, arXiv:1909.01389).

According to recent ASAS-SN light curve (Shappee et al., 2014, ApJ 788, 48; Kochanek et al., 2017, PASP, 129, 104502), the outburst started at the beginning of May 2021 and the brightness reached the maximum in the middle of July (around g = 13.4). The median magnitude of the object before the outburst was g ~ 15 resulting in the amplitude of the outburst of 1.6 mag (in g). Since the middle of July, the brightness has remained more or less constant. No previous brightenings are seen in the ASAS-SN light curve nor are reported in the literature (up to our knowledge), making the ongoing brightening the first recorded outburst of SS73 141.

We obtained two low-resolution optical spectra of the object at JD 2 459 451.47 (August 25, 2021) and JD 2 459 452.24 (August 26, 2021). They cover the wavelength range of 4000-5639 A and 3900-7802 A, respectively. The spectra revealed the Balmer lines in emission, together with several faint emission lines of neutral helium. Emission lines with higher ionization potential (e.g., He II) are not detected in our spectra. TiO bands are rather weak, especially when compared with the spectrum presented by Allen (1984).

Publications

(depuis le 24 Mai 2021)

RNAAS (Mars 2022)

RNAAS RESEARCH NOTES OF THE AAS

OPEN ACCESS

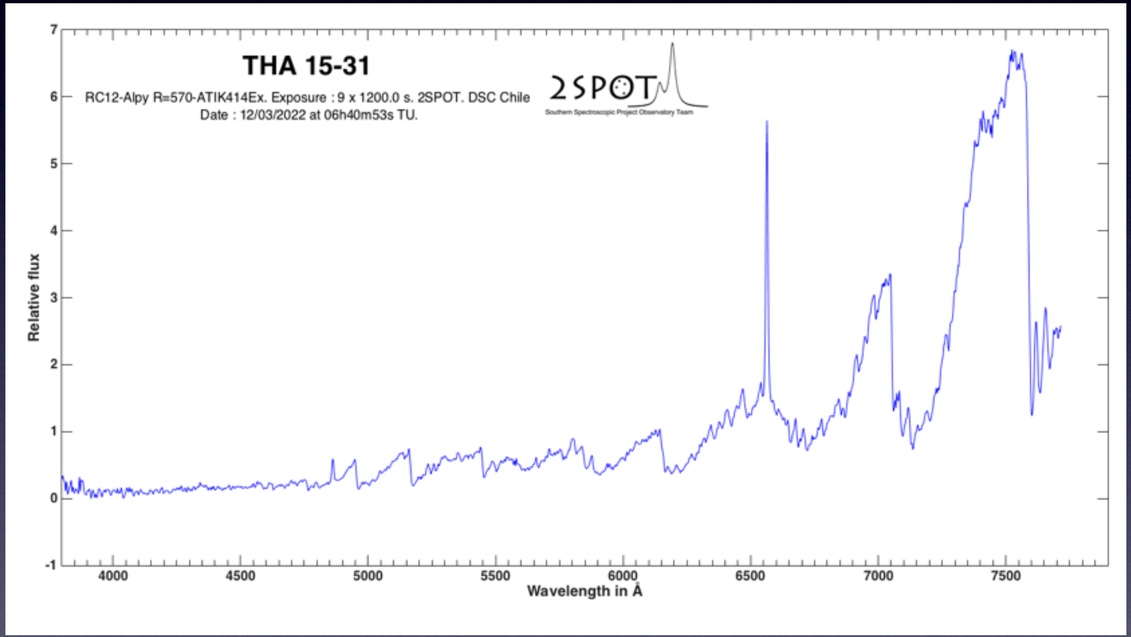
Low-resolution Optical Spectroscopy of Recently Discovered Accreting-only Symbiotic Star THA 15–31

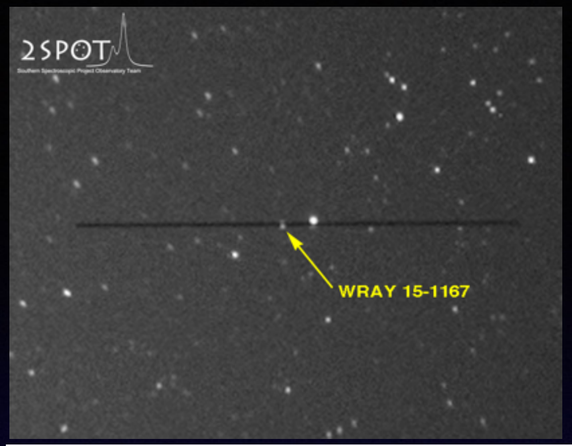
Jaroslav Merc[1,2], Stéphane Charbonnel[3,4], Olivier Garde[3,4], Pascal Le Dû[3,4], Lionel Mulato[3,4], Thomas Petit[3,4], and Rudolf Gális[2]

Published March 2022 • © 2022. The Author(s). Published by the American Astronomical Society.

Research Notes of the AAS, Volume 6, Number 3

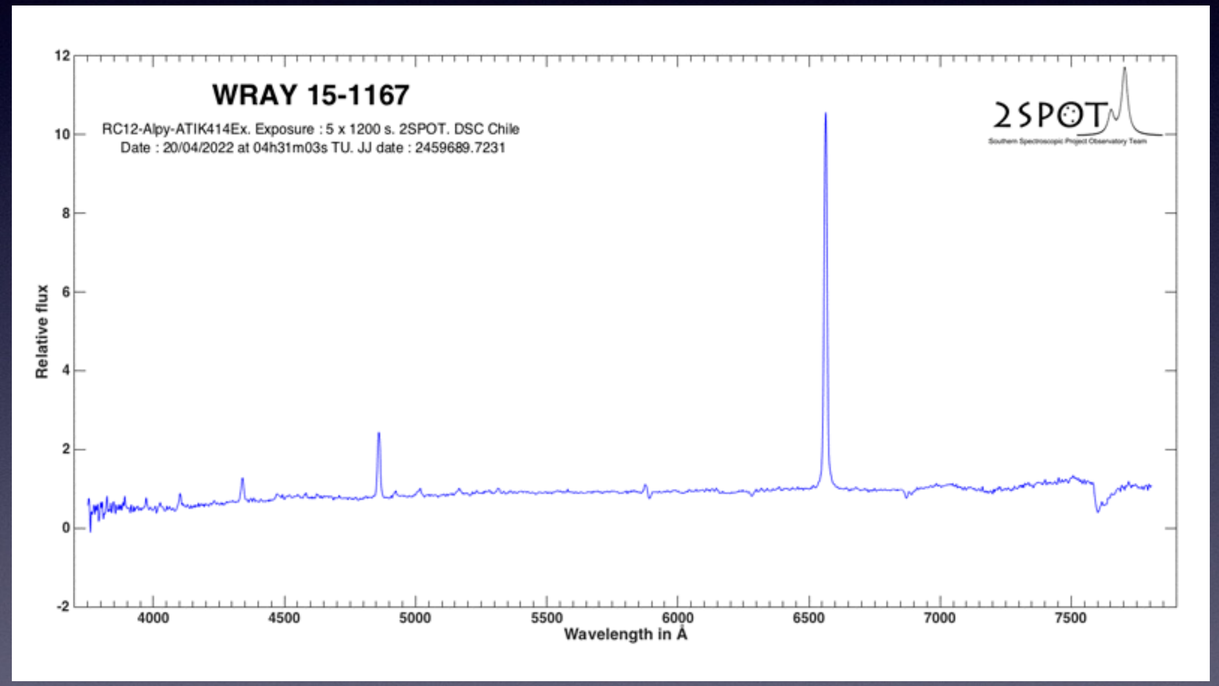
Citation Jaroslav Merc *et al* 2022 *Res. Notes AAS* **6** 54





Publications

(depuis le 24 Mai 2021)



Gaia22bou: First recorded outburst of symbiotic star WRAY 15-1167

ATel #15340; *J. Merc (UPJS in Kosice, Charles University), P. Velez, H. Barker (ARAS Group), S. Charbonnel, O. Garde, P. Le Du, L. Mulato, T. Petit (2SPOT team, ARAS Group), R. Galis (UPJS in Kosice)*
on 20 Apr 2022; 12:56 UT
Credential Certification: Jaroslav Merc (jaroslav.merc@student.upjs.sk)

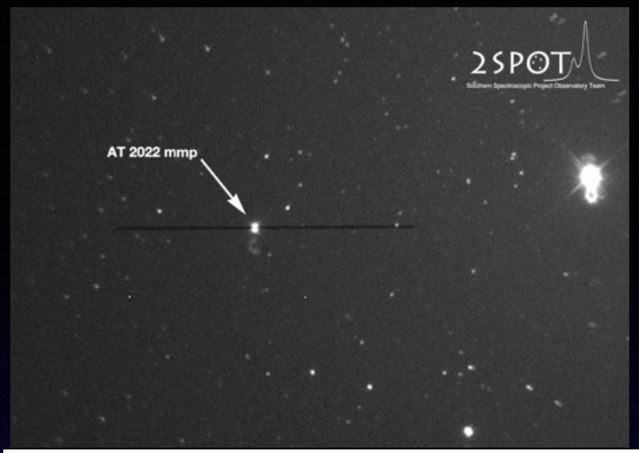
Subjects: Optical, Binary, Transient, Variables

Tweet

WRAY 15-1167 is a symbiotic star discovered by Miszalski & Mikolajewska (2014, MNRAS, 440, 1410) in a sample of emission-line objects selected from the AAO/UKST SuperCOSMOS Halpha Survey. This target was classified as a symbiotic star based on the spectrum obtained on June 18, 2013, with the Southern African Large Telescope (SALT) that showed the continuum of M4 giant together with strong Balmer lines, He I, He II, and possibly also [Fe VII] in emission.

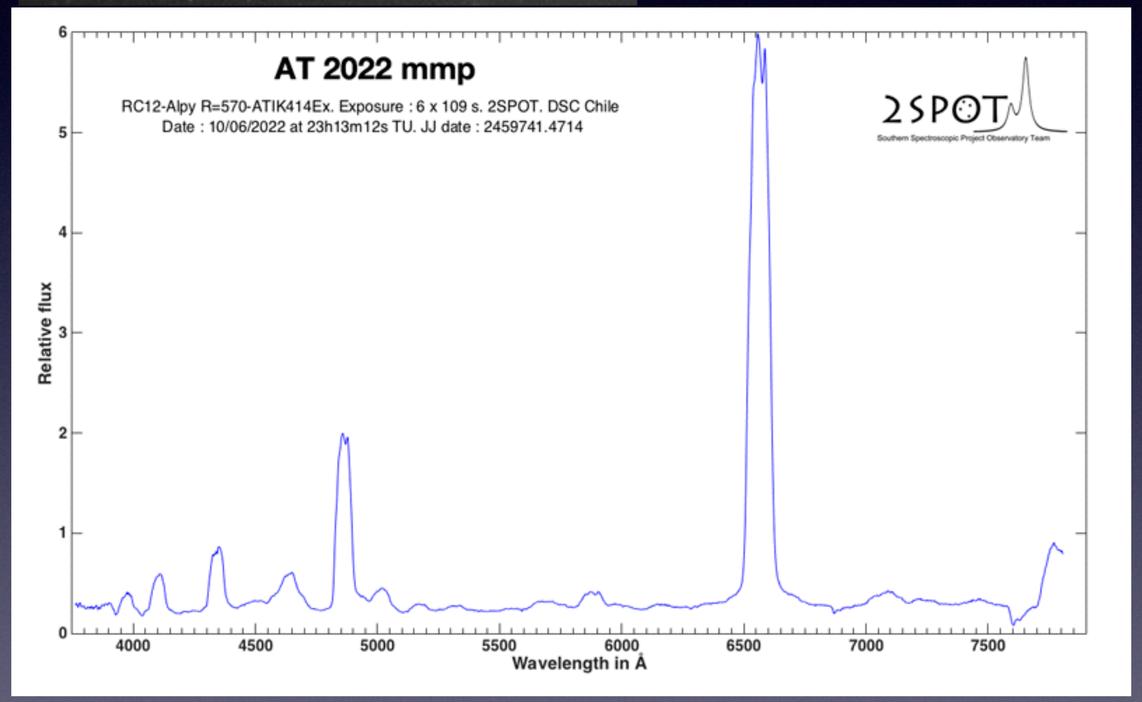
The brightening of WRAY 15-1167 was detected by the Gaia satellite and announced as a Gaia Science Alert (Hodgkin et al., 2021, A&A, 652, A76) on April 16, 2022 (Gaia22bou), when the star had the magnitude G = 12.66. The Gaia G light curve showed that the outburst probably started much earlier (at the turn of years 2021 and 2022). The measurement from the end of February revealed the system to be even brighter (G = 12.58) than at the time of alert publication. The pre-outburst magnitude of WRAY 15-1167 was around G = 14. This suggests the outburst amplitude of around 1.4 mag in the Gaia G filter.

UAI ATel #15340 (20 avril 2022)



Publications

(depuis le 24 Mai 2021)



Spectroscopic monitoring of bright Galactic nova ASASSN-22hw

ATel #15435; *J. Merc (UPJS in Kosice, Charles University), H. Barker, P. Velez (ARAS Group), S. Charbonnel, O. Garde, P. Le Du, L. Mulato, T. Petit (2SPOT Team, ARAS Group), T. Love (ARAS Group), R. Galis (UPJS in Kosice)*
on 15 Jun 2022; 09:12 UT
Credential Certification: Jaroslav Merc (jaroslav.merc@student.upjs.sk)

Subjects: Optical, Nova, Transient

Tweet

The discovery of ASASSN-22hw (now also AT 2022mmp and Nova Mus 2022) was reported to the Transient Name Server by K. Z. Stanek on the behalf of the ASAS-SN team on June 10, 2022. The object was proposed to be a 'likely galactic nova' already in the decline. The first spectroscopic observations of one of us (H.B.), that were already reported to TNS on June 11, confirmed the nova nature of the transient. The request for subsequent observations was made through the AAVSO Alert Notice 781.

The recent ASAS-SN light curve of the source (Shappee et al., 2014, ApJ 788, 48; Kochanek et al., 2017, PASP, 129, 104502) shows the maximum brightness of g = 8.7 mag that occurred on June 8, 2022. In the five days after the first detection, the brightness declined by about 1.7 mag already. The minimum pre-outburst magnitude derived from the Gaia EDR3 data by Patrick Schmeer and reported to the International Variable Star Index was about V = 19.8 mag. The photometric follow-up is also available in the AAVSO database.

UAI ATel #15435 (15 juin 2021)

Publication sur la découverte d'une nouvelle étoile symbiotique

Cornell University

We gratefully acknowledge support from the Simons Foundation and member institutions.

arXiv > astro-ph > arXiv:2209.14629

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[Submitted on 29 Sep 2022]

DeGaPe 35: Amateur discovery of a new southern symbiotic star

Thomas Petit, Jaroslav Merc, Rudolf Gális, Stéphane Charbonnel, Thierry Demange, Richard Galli, Olivier Garde, Pascal Le Dû, Lionel Mulato

In this work, we present the discovery and characterization of a new southern S-type symbiotic star, DeGaPe 35. We have obtained the low-resolution spectroscopic observations and supplemented them with photometry from Gaia DR3 and other surveys. The optical spectra of this target show prominent emission lines, including highly ionized [Fe VII] and O VI lines. The cool component of this symbiotic binary is an M4-5 giant with effective temperature ~ 3 380 – 3 470 K and luminosity ~ 3 000 $L_\odot$ (for the adopted distance of 3 kpc). The hot component is a shell-burning white dwarf. The photometric observations of the Gaia satellite, published recently in the Gaia DR3 suggested the variability with the period of about 700 – 800 days that we tentatively attributed to the orbital motion of the binary.

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2. Observational data

We have obtained two low-resolution spectra of DeGaPe 35 using the Southern Spectroscopic Project Observatory[3] remotely-operated Ritchey-Chrétien 12" telescope located at the Deep Sky Chile facilities, equipped with an Alpy600 spectrograph (23 μm slit, providing a resolving power ~ 550) and Atik 414EX cooled camera. The first spectroscopic data were obtained on June 11, 2021 (JD

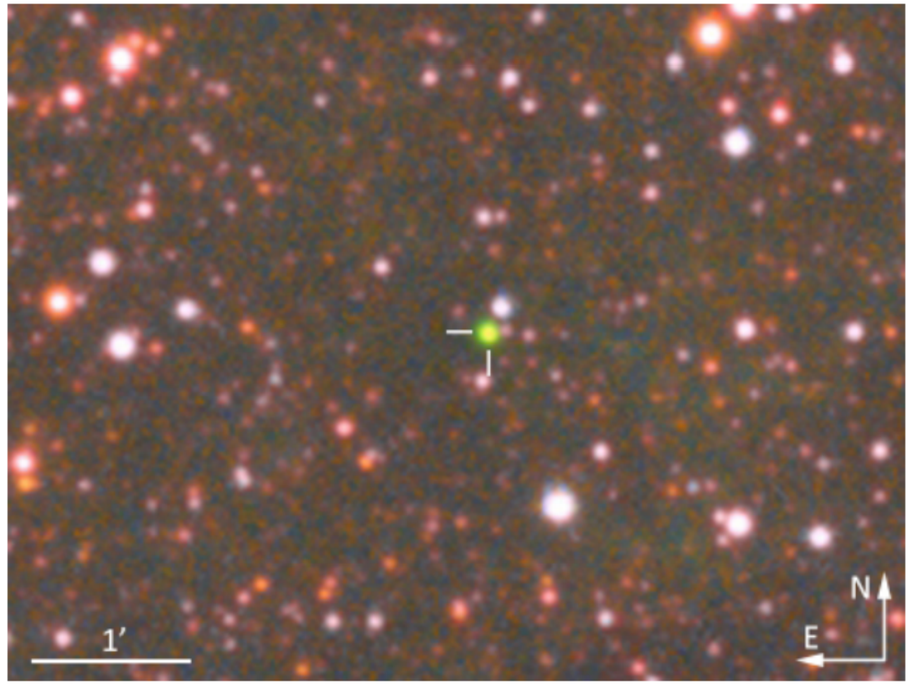

Figure 1: Discovery image of DeGaPe 35. The target is the conspicuous green object in the middle. See the text for more details.

Une collaboration imagerie et spectro

Participation à l'obtention du Prix Gemini 2022 de la SAF-SF2A pour nos travaux dans le cadre d'une collaboration pro/am de recherche et de confirmation de NP

Rencontres du Ciel et de l'Espace 2022

Crédit photo : Ciel & Espace / G. Langin

Notre 2ème setup

Novembre 2022

Un 2ème spectrographe : eShel

- Spectrographe Echelle
- Fibre optique
- Couverture spectrale : 3900 Å to 7300 Å
- Resolution R=11000
- ATIK 460ex CCD camera

Notre 2ème setup
Novembre 2022

- Télescope Newton 300mm
  pour la spectro basse résolution avec l'ALPY 600

- Télescope RC 305mm
  pour la spectro haute résolution avec un eShel

Notre 2ème setup

Novembre 2022

Départ France : 5 Aôut 2022

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Photo : © Deep Sky Chile

Merci pour votre attention

Des questions ?