

EXOPLANÈTE HAT-P-19b

Observation d'un transit
Spectroscopie de l'étoile
et
Estimation des paramètres

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Ciel d'Aunis
Spetembre 2019

Principe de l'Observation

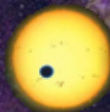
- **Observation de la luminosité avant / pendant / après le transit de la planète devant le disque de l'étoile**
- **Observation du spectre de l'étoile**
- **Diagramme HR de Gaia**
- **Déduction des paramètres principaux du système**

Transit

Matériel & Logiciel

- Schmidt-Cassegrain 200 mm f/10
- Réducteur de focale → f/6,3
- Caméra ZWO ASI 1600 MM Pro
- 207 poses de 90 secondes
- Prédiction : <http://var2.astro.cz/EN/index.php>
- ImageJ





ETD - Exoplanet Transit Database

[Observers community](#) | [How to contribute to ETD](#) | [Model-fit your data](#) | [Transit predictions](#) | [KEPLER predictions](#) | [TESS Predictions](#)

Your ELONGITUDE (in deg): 0° - 360°Your LATITUDE (in deg): 90° - 0° - -90°Available predictions: (UT evening date)

2019-09- 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30,

2019-10- 01, 02, 03, 04, 05, 06, 07, 08, 09, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21,

User defined time span: From: Till:

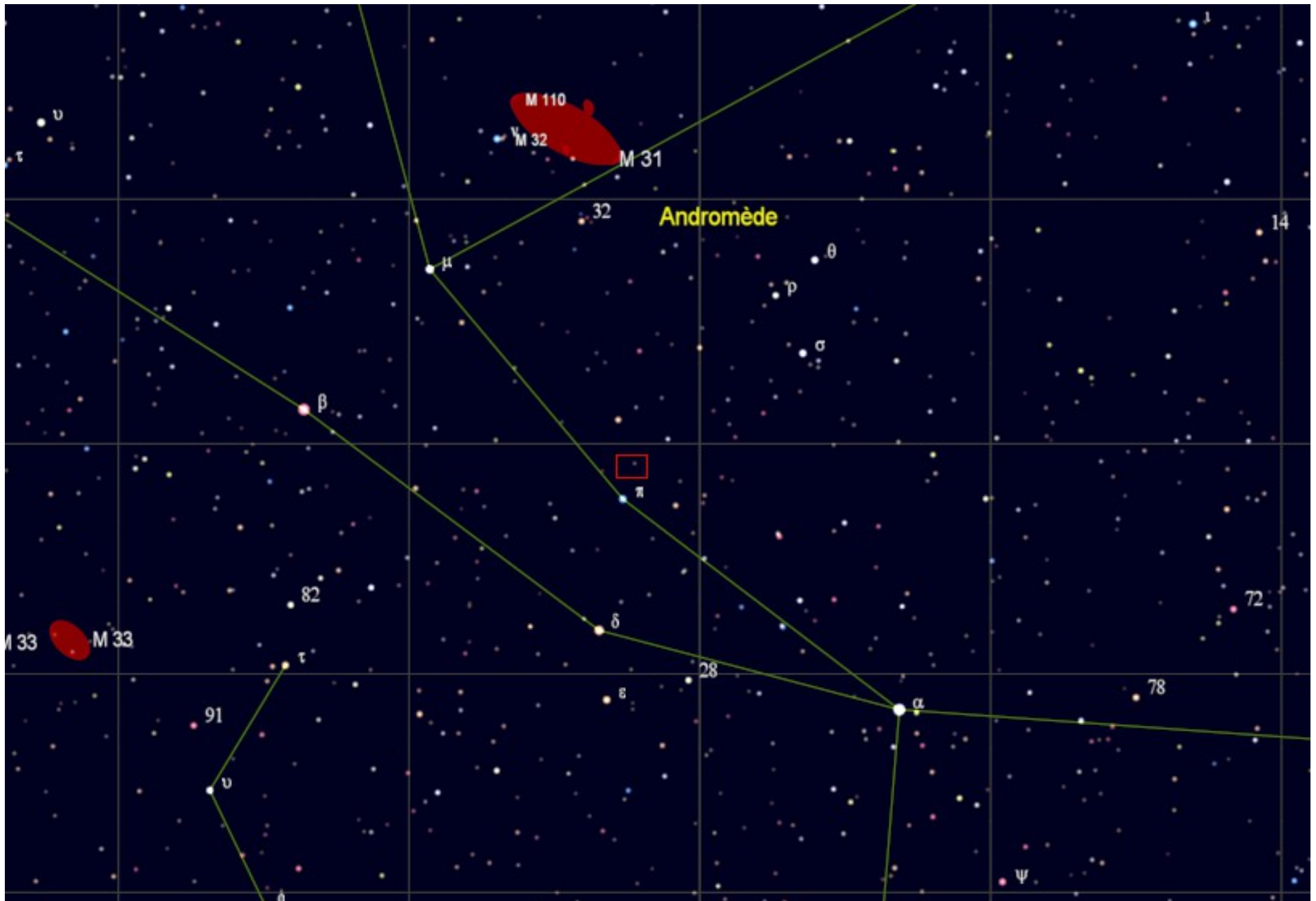
Transits predictions for ELONGITUDE: -1° and LATITUDE: 46°

OBJECT		BEGIN (UT/h,A)	CENTER (DD.MM. UT/h,A)	END (UT/h,A)	D (min)	V (MAG)	DEPTH (MAG)	Elements Coords
HAT-P-55 b	Her	18:25 68°,SW	22.09. 19:53 56°,SW	21:21 41°,W	176.1	13.207	0.0156	56730.83468+3.5852467*E RA: 17 37 05.5 DE: 25 43 52.3
HAT-P-49 b	Vul	18:14 59°,SE	22.09. 20:17 71°,S	22:20 59°,SW	246.53	10.326	0.0075	56399.62406+2.691548*E RA: 20 21 46.08 DE: +26 41 33.5
WASP-48 b	Cyg	18:46 80°,NE	22.09. 20:21 77°,NW	21:57 64°,NW	191.08	11.66	0.0108	55364.55043+2.143634*E RA: 19 24 38.97 DE: +55 28 23.8
WASP-68 b	Cap	18:22 21°,SE	22.09. 20:56 25°,S	23:31 12°,SW	308.16	10.7	0.0062	56064.86356+5.084298*E RA: 20 20 22.98 DE: -19 18 52.9
WASP-74 b	Aql	20:15 44°,S	22.09. 21:23 41°,SW	22:32 34°,SW	137.52	9.7	0.0104	56506.8918+2.13775*E RA: 20 18 10 DE: -01 04 32.6
CoRoT-8 b	Aql	20:26 44°,SW	22.09. 21:48 35°,SW	23:11 23°,SW	164.4	14.8	0.0071	54238.9743+6.21272*E RA: 19 26 21.245 DE: +01 25 35.55
HAT-P-38 b	Tri	20:58 30°,E	22.09. 22:29 45°,E	0:00 61°,E	182.45	12.56	0.0097	55863.11957+4.640382*E RA: 02 21 31.93 DE: +32 14 47.1
WASP-92 b		22:42	23.09. 0:05	1:28	166	13.18	0.0135	56381.2834+2.1746742*E RA: 19 26 16.60 DE: +32 14 47.1

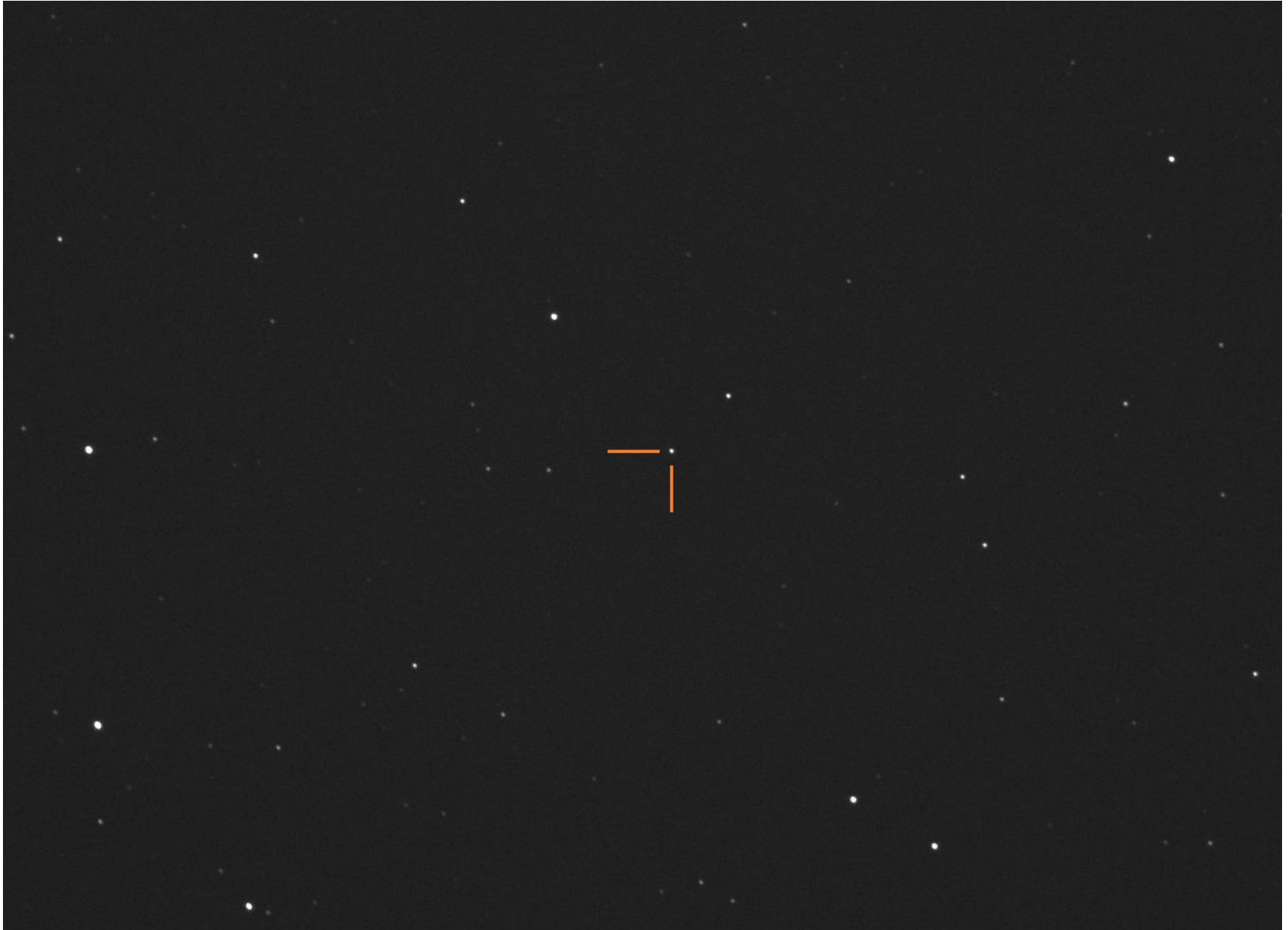
#	HJD mid (2400000 +)	Epoch	O-C (d)	D (min)	Depth (mmag)	band	DQ	LC	Author & REFERENCE	changed *
58	57765.39165 +/- 0.00106	667	0.0026	166.8 +/- 3.9	30 +/- 1.2	Clear	3		Alfonso Carreno TRESCA	* 2018-12-11
57	57753.36729 +/- 0.00104	664	0.0045	160.1 +/- 3.8	31.2 +/- 1.4	Clear	3		Manfred Raetz TRESCA	2018-12-11
56	57753.36655 +/- 0.00056	664	0.0038	162.9 +/- 2	26.5 +/- 0.7	Clear	2		Matthieu BACHSCHMIDT TRESCA	* 2017-01-12
55	57753.36585 +/- 0.00113	664	0.0031	169.9 +/-	18.6 +/- 0.9	Clear	3		Marc Bretton TRESCA	* 2017-01-12
54	57753.36535 +/- 0.00085	664	0.0026	179.8 +/- 3.1	30.3 +/- 1.1	Clear	3		František Lomoz TRESCA	2017-01-12
53	57745.34923 +/- 0.00026	662	0.0040	165.7 +/- 0.9	26.1 +/- 0.3	Clear	1		Marc Bretton TRESCA	* 2017-01-12
52	57733.32386 +/- 0.00076	659	0.0050	171.8 +/- 2.7	24.9 +/- 0.8	Clear	3		Eric Girardin TRESCA	* 2018-12-11
51	57733.32374 +/- 0.00056	659	0.0049	159.1 +/- 2	24.5 +/- 0.6	Clear	2		Marc Bretton TRESCA	* 2017-01-12
50	57729.3139 +/- 0.00067	658	0.0038	162.5 +/- 2.6	26.3 +/- 1.9	Clear	2		Marc Bretton TRESCA	* 2017-01-12
49	57729.31269 +/- 0.00049	658	0.0026	164.1 +/- 1.8	26.7 +/- 0.6	Clear	2		Marc Bretton TRESCA	* 2017-01-12
48	57725.30693	657	0.0056	165.9 +/- 1.7	27.2 +/- 1.5	Clear	1		Marc Bretton	* 2016-12-28

[Help](#)☐ 2MASS ☒ DSS ☐ SDSS

Position HAT-P-19



Le Champ de HAT-P-19



Multi-plot Main

File Preferences Table X-axis Y-axis Help

Data (Measurements)

Default X-data Y-datasets Detrend Vars Rel. Mag. Reference V. Marker 1 A Copy V. Marker 2 A

J.D. -2400000 8 sets 3 10 samples 0.472 0.575

Title Subtitle Legend

None Custom HAT-P-19 C8 + Reducteur 0.63x + Filtre CLS + ZWO ASI 1600 MM F

Align: Left Center Right Position

X-Axis Label Y-Axis Label Trim Data Samples

None Column Label Custom Label Head 0 Tail 0

X-Axis Scaling

Auto X-range First X-value as min Custom X-range

X-width 0.3 X-max X-min

Meridian Flip

Show Flip Time 0.6

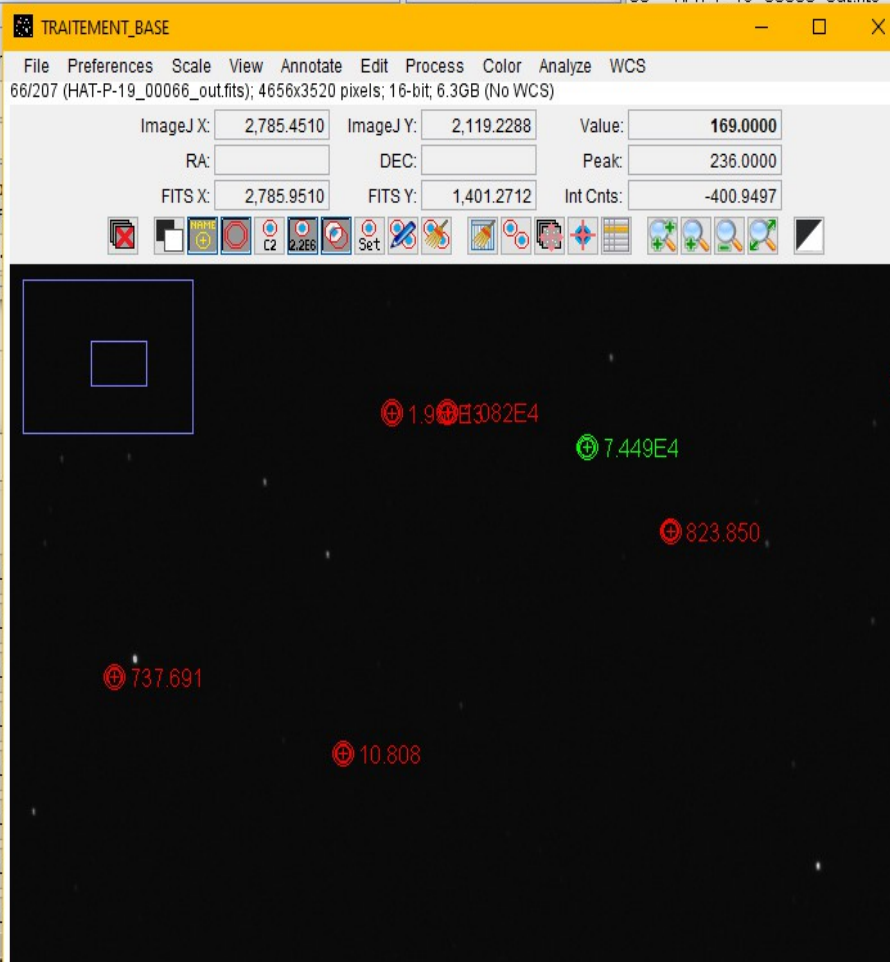
Fit and No

Show Left Trim 0.03

Measurements

File Edit Font Options

	Label	slice	Saturated	J.D.-2400000	JD.UTC	JD_SOBS	HJD
47	HAT-P-19_00047_out.fits	47.000000	0.000000	58739.445832	2458739.445832	2458739.445312	245
48	HAT-P-19_00048_out.fits	48.000000	0.000000	58739.446900	2458739.446900	2458739.446379	245
49	HAT-P-19_00049_out.fits	49.000000	0.000000	58739.447967	2458739.447967	2458739.447446	245
50	HAT-P-19_00050_out.fits	50.000000	0.000000	58739.449035	2458739.449035	2458739.448514	245
51	HAT-P-19_00051_out.fits	51.000000	0.000000	58739.450103	2458739.450103	2458739.449582	245
52	HAT-P-19_00052_out.fits	52.000000	0.000000	58739.451170	2458739.451170	2458739.450649	245
53	HAT-P-19_00053_out.fits	53.000000	0.000000	58739.452238	2458739.452238	2458739.451717	245
54	HAT-P-19_00054_out.fits	54.000000	0.000000	58739.453305	2458739.453305	2458739.452784	245
55	HAT-P-19_00055_out.fits	55.000000	0.000000	58739.454373	2458739.454373	2458739.453853	245
56	HAT-P-19_00056_out.fits	56.000000	0.000000	58739.455441	2458739.455441	2458739.454920	245
57	HAT-P-19_00057_out.fits	57.000000	0.000000	58739.456508	2458739.456508	2458739.455988	245
58	HAT-P-19_00058_out.fits	58.000000	0.000000	58739.457576	2458739.457576	2458739.457055	245
59	HAT-P-19_00059_out.fits	59.000000	0.000000	58739.458645	2458739.458645	2458739.458124	245
60	HAT-P-19_00060_out.fits	60.000000	0.000000	58739.459713	2458739.459713	2458739.459192	245



Multi-plot Reference Star Settings

Select reference stars to include in tot_C_cnts and rel_flux calculations

Show Magnitudes Hide Magnitudes

Reference Star Selection

None All Set Cycle Enabled Stars Less One Cycle Individual Stars

T1 C2 C3 C4 C5 C6 C7 C8 C9 C10 C11 C12 C13 C14 C15 C16

[All stars are checked]

Multi-plot Y-data

end	Trend	Trend	No
lect	Coefficient	Dataset	Mag
0	-23465.872		
0	0		
0	0		
0	0		
0	0		
0	0		
0	0		
0	0		
0	0		
0	0		

Multi-aperture Show Apertures

gins Window Help

res\2019-09-12\SCIENCE H

Log

File Edit Font

Measurements are ref

Multi-plot Y-data

Data	New	Plot	Auto	X-data	Input
Set	Col		Scale		in Mag
1				default	rel_fit
2				default	rel_fit
3				default	rel_fit
4				default	rel_fit
5				default	rel_fit
6				default	rel_fit
7				default	rel_fit
8				default	rel_fit

***ERROR: No signal for centr

ImageJ X: 1,547.1766

ImageJ Y: 2,177.4892

Value: 166.0000

RA:

DEC:

Peak:

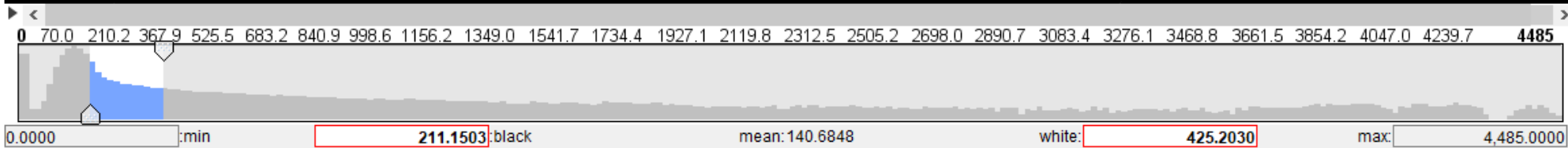
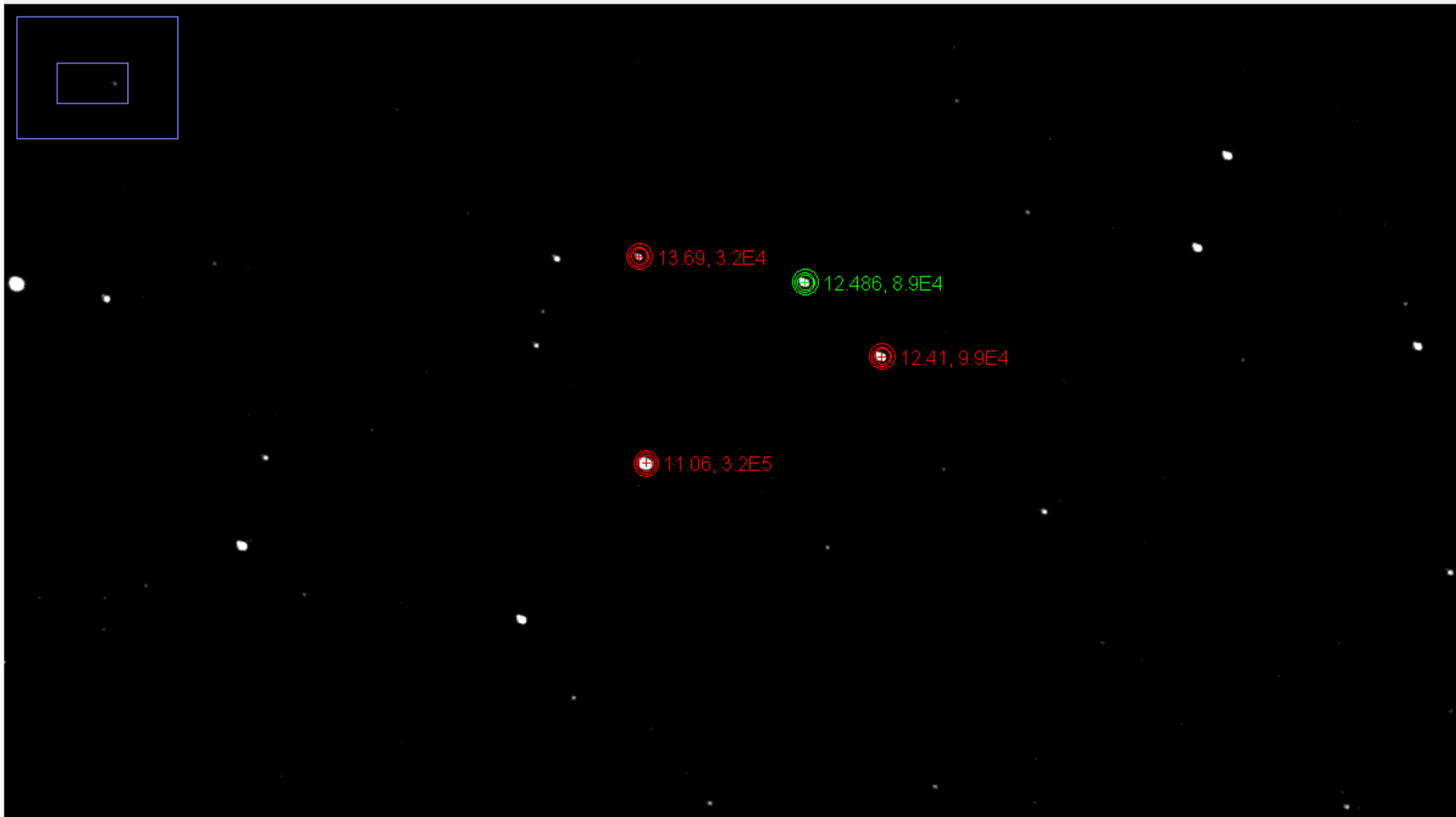
198.0000

FITS X: 1,547.6766

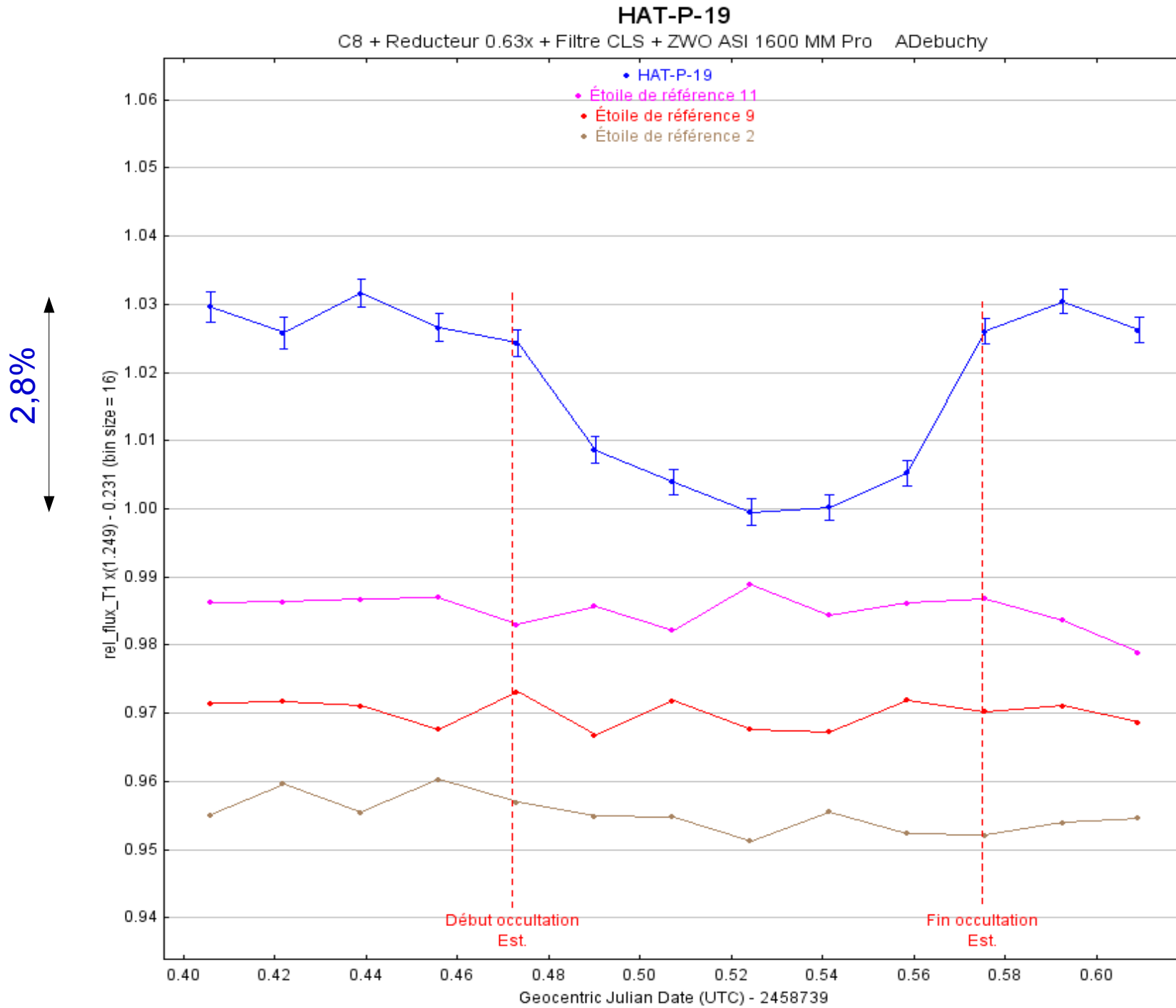
FITS Y: 1,343.0108

Int Cnts:

199.9425



Observation du Transit



Spectre

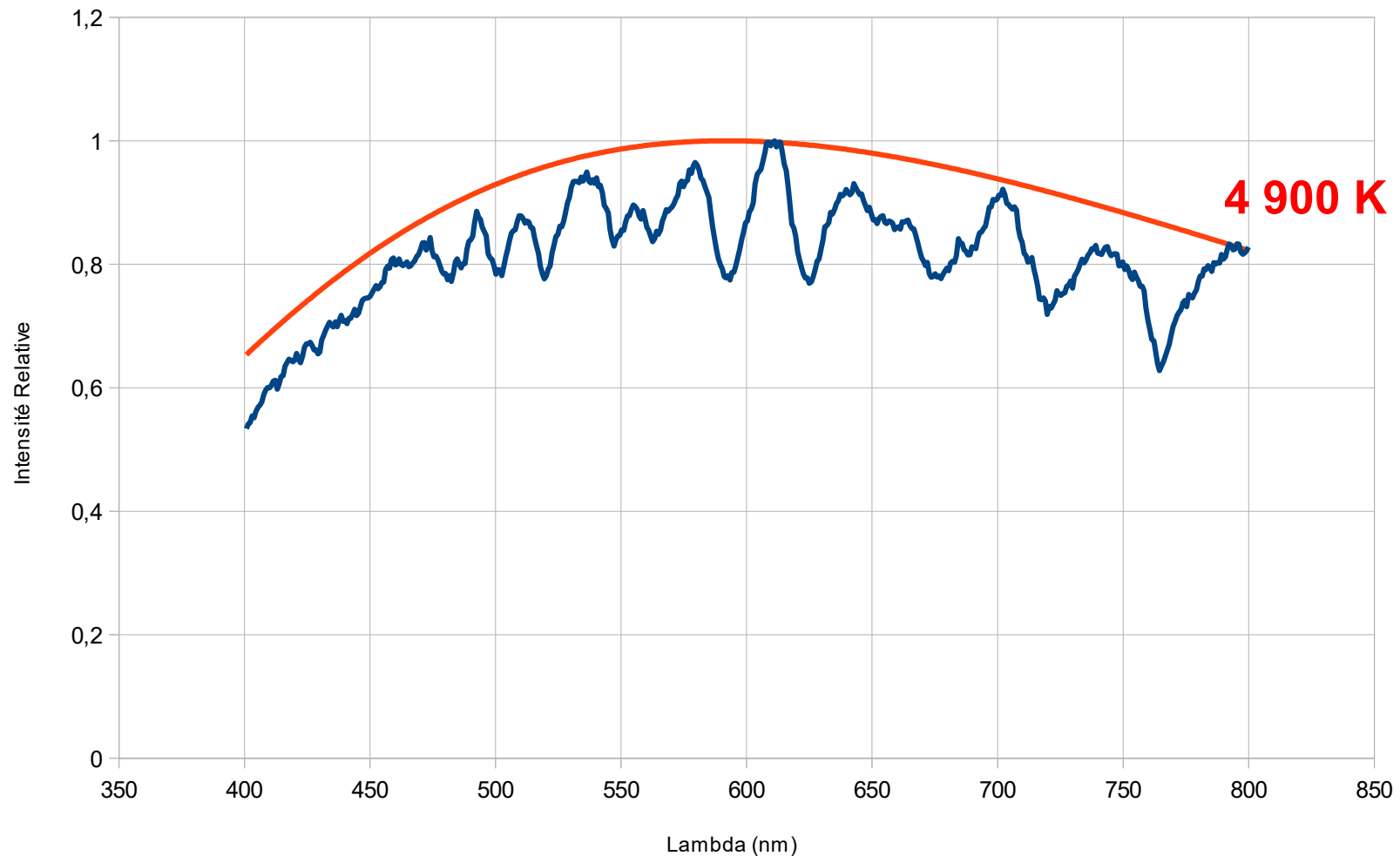
Matériel & Logiciel

- **Schmidt-Cassegrain 200 mm f/10**
- **Réducteur de focale → f/6,3**
- **Réseau de diffraction Star Analyser**
- **Caméra ZWO ASI 1600 MM Pro**
- **12 poses de 12 secondes**
- **Iris**
- **Tableur « maison »**

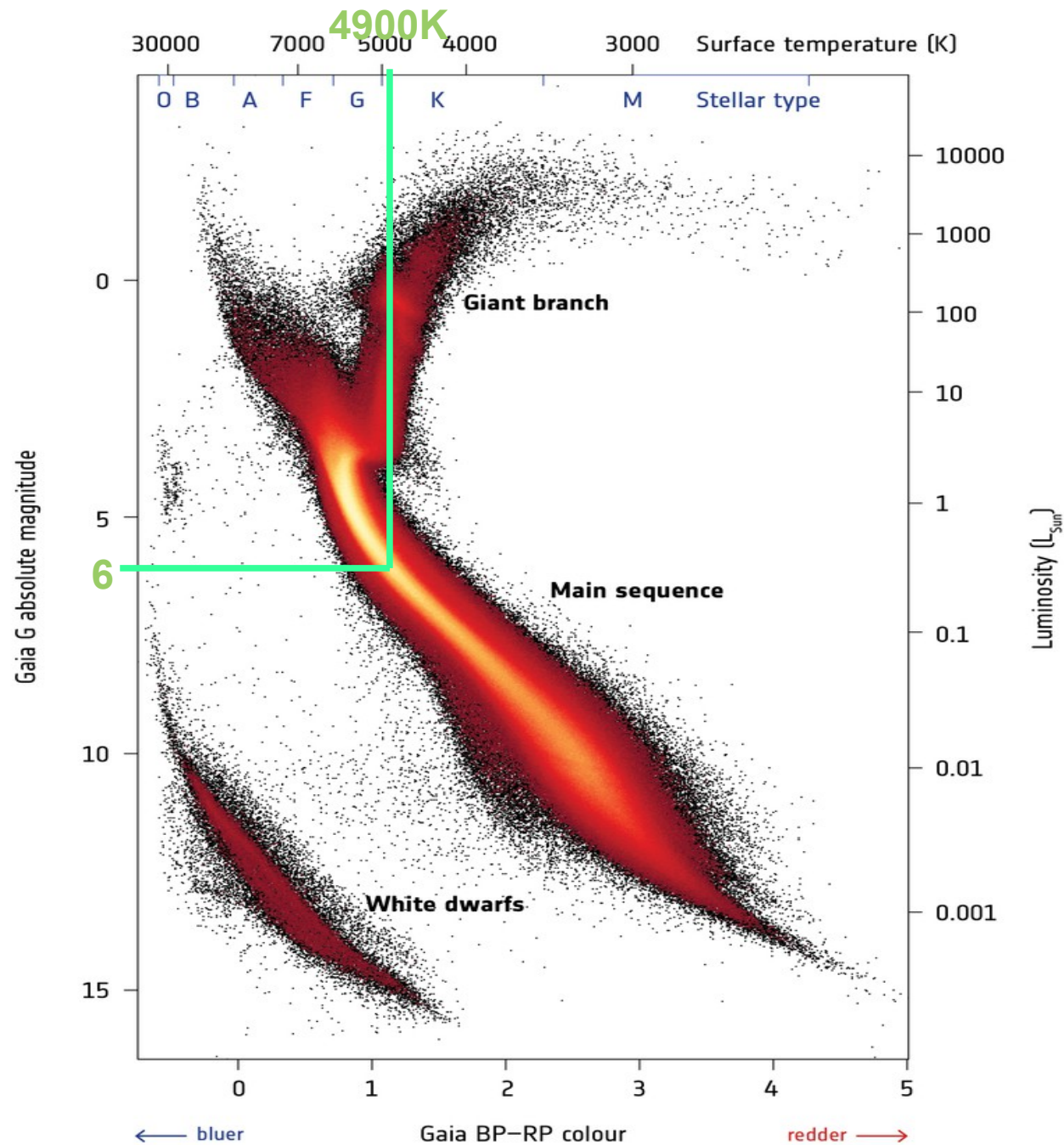
Observation du Spectre

Mesure de la Température

SPECTRE CALIBRÉ ET CORPS NOIR



→ GAIA'S HERTZSPRUNG-RUSSELL DIAGRAM



Caractéristiques Étoile

Séquence Principale

- Température → éclat intrinsèque

4 900 K

Mag abs = 6 ↔ 34% du Soleil

- Éclat + température → taille rapport au Soleil : 81%

34%

4 900 K

→ masse rapport au Soleil : 80%

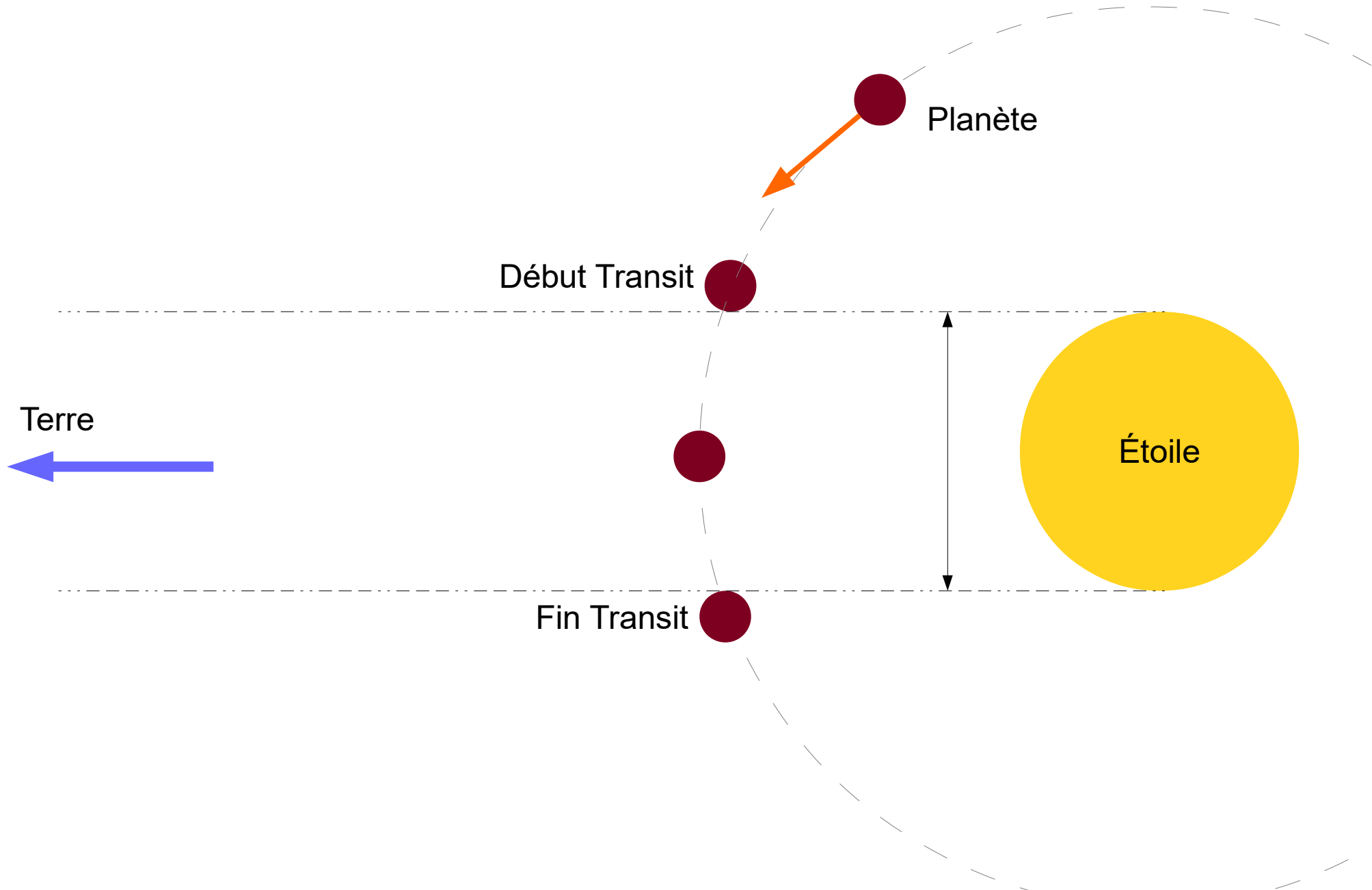
Éclat intrinsèque + mag. visuelle → distance

Mag 6

Mag 12,49

646 al

Orbite Planète

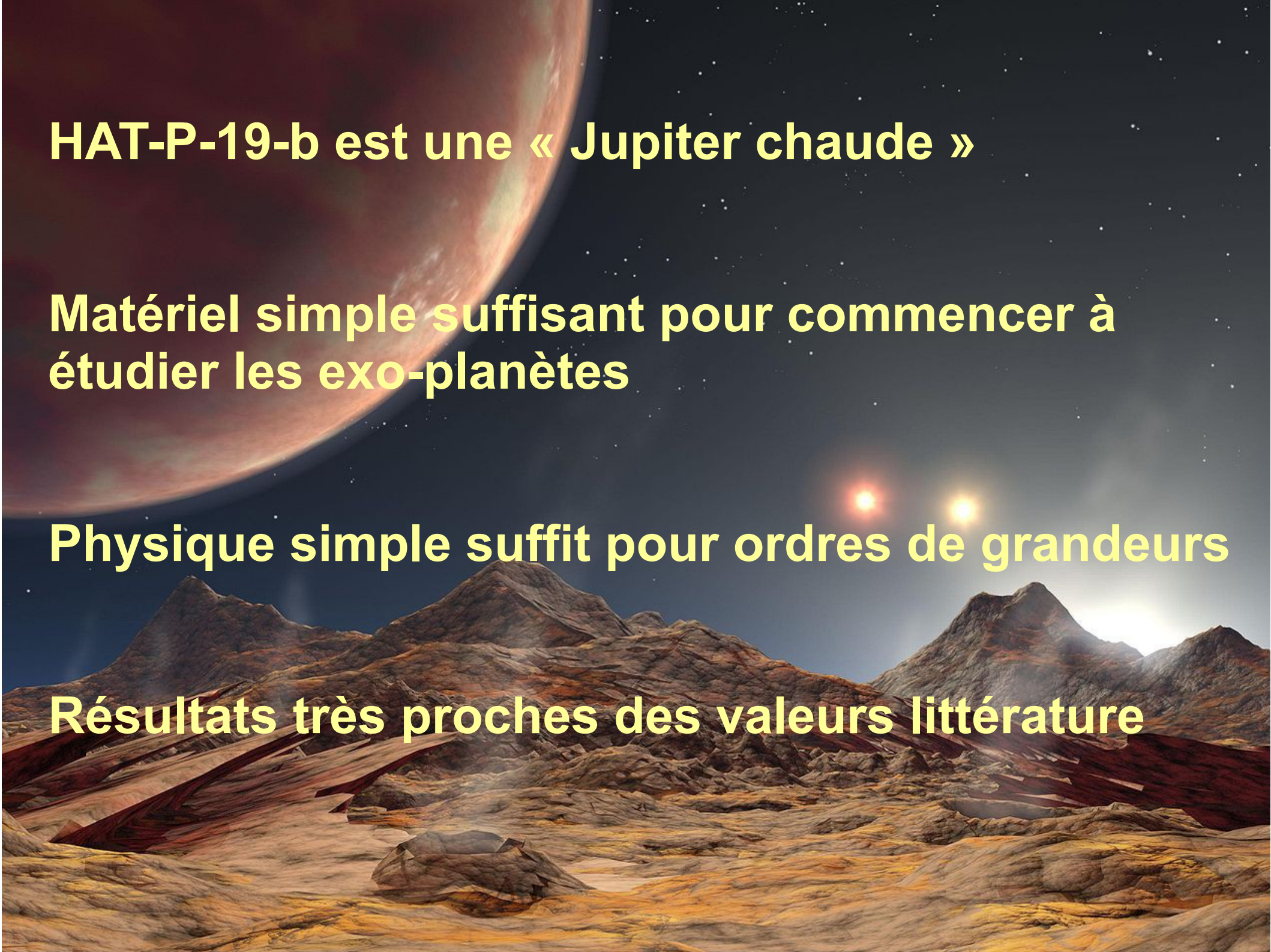


Paramètres Planète

- Baisse lumière transit + taille étoile → taille planète
2,8% **1 127 000km** **189 000km**
- Durée transit + diamètre étoile → vitesse planète
2,4 h **1 127 000km** **130 km/s**
- Vitesse planète + masse étoile → rayon orbite
130 km/s **80% soleil** **0,041 UA**
- Rayon orbite + param. étoile → température planète
0,041 UA **4 900 K** **780°C**

Estimation des Paramètres

	A	B	C	D	E	F
	MESURE DES PARAMÈTRES D'UN EXO-SYSTÈME					
Température de surface du Soleil		5772 K				
Rayon du Soleil		696 342 km				
Magnitude absolue du Soleil en bande V		4,83				
Masse du Soleil		1,99E+030 kg				
Constante gravitation		6,67E-011 SI				
Température de surface de l'étoile		4900 K			4 990 K	
Magnitude absolue étoile		6				
Rapport des énergies émises (Ee/Es)		0,3404081897				
Rapport des températures (Ts/Te)		1,1779591837				
Rapport des surfaces (Se / Ss)		0,6554219316				
Diamètre de l'étoile		1 127 491 km			1 142 001 km	
		0,81 diamètre solaire			0,82 diamètre solaire	
Masse de l'étoile		0,80 masse solaire			0,84 masse solaire	
Diminution de luminosité durant le transit		0,028				
Diamètre de la planète		188 665 km			158 712 km	
Diamètre de la Terre		12 756 km				
Diamètre de Neptune		49 244 km				
Diamètre de Jupiter		142 984 km				
Durée du transit		2,4 heures				
Vitesse sur l'orbite (max)		130 km/s				
Rayon orbite planète		0,041 UA			0,046 UA	
Période orbitale		3,457 Jour			4,0088 Jour	
Magnitude apparente de l'étoile		12,486				
Mapp – Mabs		6,486				
Distance du système		646 al			701 al	
Surface étoile		4,097158356E+018 m2				
Rayon orbite planète		0,0413613449 UA				
Coefficient		0,0021175861 SI				
Température planète		1 051 K			1010 K	
		778 °C				

The background of the slide is a composite image. In the upper left, a large, reddish-orange planet with some cloud-like features is partially visible. The sky is dark blue with many small white stars. In the lower half, there is a rocky, mountainous landscape with reddish-brown and yellowish-orange hues. Two bright, glowing stars are visible in the sky above the mountains.

HAT-P-19-b est une « Jupiter chaude »

Matériel simple suffisant pour commencer à étudier les exo-planètes

Physique simple suffit pour ordres de grandeurs

Résultats très proches des valeurs littérature

A surreal alien landscape. In the upper left, a massive, reddish-brown planet with swirling clouds dominates the sky. The sky is dark blue with numerous small white stars. In the center-right, two bright, glowing suns are visible. The foreground and middle ground consist of jagged, rocky mountains and hills with a mix of brown, tan, and reddish hues. The overall scene has a dreamlike, otherworldly quality.

MERCI !!!