MINISTÉRIO DA CIÊNCIA E TECNOLOGIA
INSTITUTO NACIONAL DE PESQUISAS ESPACIAIS

VOLATILES AND REFRACTORIES IN PAIRS OF SIMILAR SOLAR LIKE STARS: CANDIDATES FOR HOSTING PLANETS

RAFAEL BUENO BOTELHO
ANDRÉ MILONE
MARÍLIA CARLOS
JORGE MELÉNDEZ

STAR SAMPLE

- 7 Stars
- 4 pairs
- Spectral range 3300Å - 9160Å
- R ~ 65000

Star	Planets	T_{eff} [K]	$logg$ [dex]	v_t $[km.s^{-1}]$	[Fe/H] [dex]
HD021019	0	5438±10	3.92±0.04	1.01±0.02	-0.48±0.01
HD037124	3	5534±34	4.49±0.08	0.67±-	-0.46±0.01
HD181720	1	5722±18	4.04±0.12	1.03±0.04	-0.59±0.01
HD040865	0	5703±16	4.39±0.03	0.94±-	-0.43±0.01
HD059984	0	5920±20	3.93±0.06	1.14±0.04	-0.73±0.01
HD126793	0	5838±49	4.18±0.19	1.04±-	-0.79±0.01
HD078747	0	5777±20	4.35±0.04	0.90±0.05	-0.70±0.01
HD126793	0	5838±49	4.18±0.19	1.04±-	-0.79±0.01

Mirror Magellan telescope 6.5 m in diameter at the Observatory of Las Campanas, Chile, with the use of the spectrograph echelle MIKE

STAR SAMPLE

- Star solar-type
- With and without giantplanets detected
- Metal poor
- To derive the abundance of carbon and nitrogen we use the spectral synthesis of molecular lines in the blue region.
- Transitions of molecular systems
  - CH A-X
  - C_2 D-A
  - CN B-X
  - NH A-X
- The refractories are supposed to be deficient in relation to the volatiles ones when comparing stars that host rocky planets with those that do not have planets detected

METHODOLOGY

- First I search for the best molecular lines in the reference solar spectrum
- Preferably isolated lines and if possible strong

- For Carbon:

Tabela 4.1 - Best isolated lines of the CH A-X system.

Line (Å)	Vibrational band (v',v")	Spectral range (Å)	Blue Continuum point (Å)	Red Continuum point (Å)
4192.58	(0,0)	4180-4210	4185.91	4197.50
4212.65	(0,0)	4200-4230	4205.70	4221.85
4213.87	(1,1)	4200-4230	4205.70	4221.85
4217.24	(0,0)	4200-4230	4205.70	4221.85
4218.74	(1,1)	4200-4230	4205.70	4221.85
4263.61	(2,2)	4256-4286	4257.85	4283.28
4263.97	(2,2)	4256-4286	4257.85	4283.28
4292.80	(0,0)	4276-4307	4287.25	4295.52

- C_2 D-A
  - 5165 Å (0,0)
  - 5635 Å (0,1)

METHODOLOGY

- First I search for the best molecular lines in the reference solar spectrum
- Preferably isolated lines and if possible strong

- For Nitrogen:

Tabela 4.2 - Best isolated lines of the CN B-X system.

Line (Å)	Vibrational band (v',v")	Spectral range (Å)	Blue Continuum point (Å)	Red Continuum point (Å)
3841,72	(5,5)	3839-3869	——	3866,63
3851,26	(2,2)	3839-3869	——	3866,64
3880,35	(0,0)	3874-3904	——	3883,92
3880,70	(0,0)	3874-3904	——	3883,92
3881,01	(0,0)	3874-3904	——	3883,92
3881,60	(0,0)	3874-3904	——	3883,92
4195,92	(1,2)	4180-4210	4192,74	4197,49

- NH A-X
  - 3360 Å (0,0)

RESULTS

- Applying **our spectral synthesis automated code** for each one of the molecular lines
- Exclusion criterion of the lines: 2 sigma of standard deviation on average
  - Example: The line 4195 was excluded

Tabela 6.1 - Carbon and nitrogen abundance for the star HD021019.

CH A-X	[C/H] (dex)	CN B-X	[N/H] (dex)	C_2 D-A	[C/H] (dex)	NH A-X	[N/H] (dex)
4192	-0.53±0.03	3841	-0.69±0.03	5165	-0.58±0.03	3360	-0.51±0.04
4212	-0.56±0.03	3851	-0.70±0.03	5635	-0.54±0.03		
4213	-0.54±0.03	3880	-0.64±0.03				
4217	-0.51±0.03	3881	-0.61±0.03				
4218	-0.49±0.03	3882	-0.62±0.03				
4263	-0.55±0.03	3883	-0.62±0.03				
4264	-0.55±0.03	4195	*-0.75±0.03*				
4293	-0.47±0.03						
Mean	**-0.52±0.03**		**-0.65±0.03**		**-0.56±0.03**		**-0.51±0.04**

RESULTS

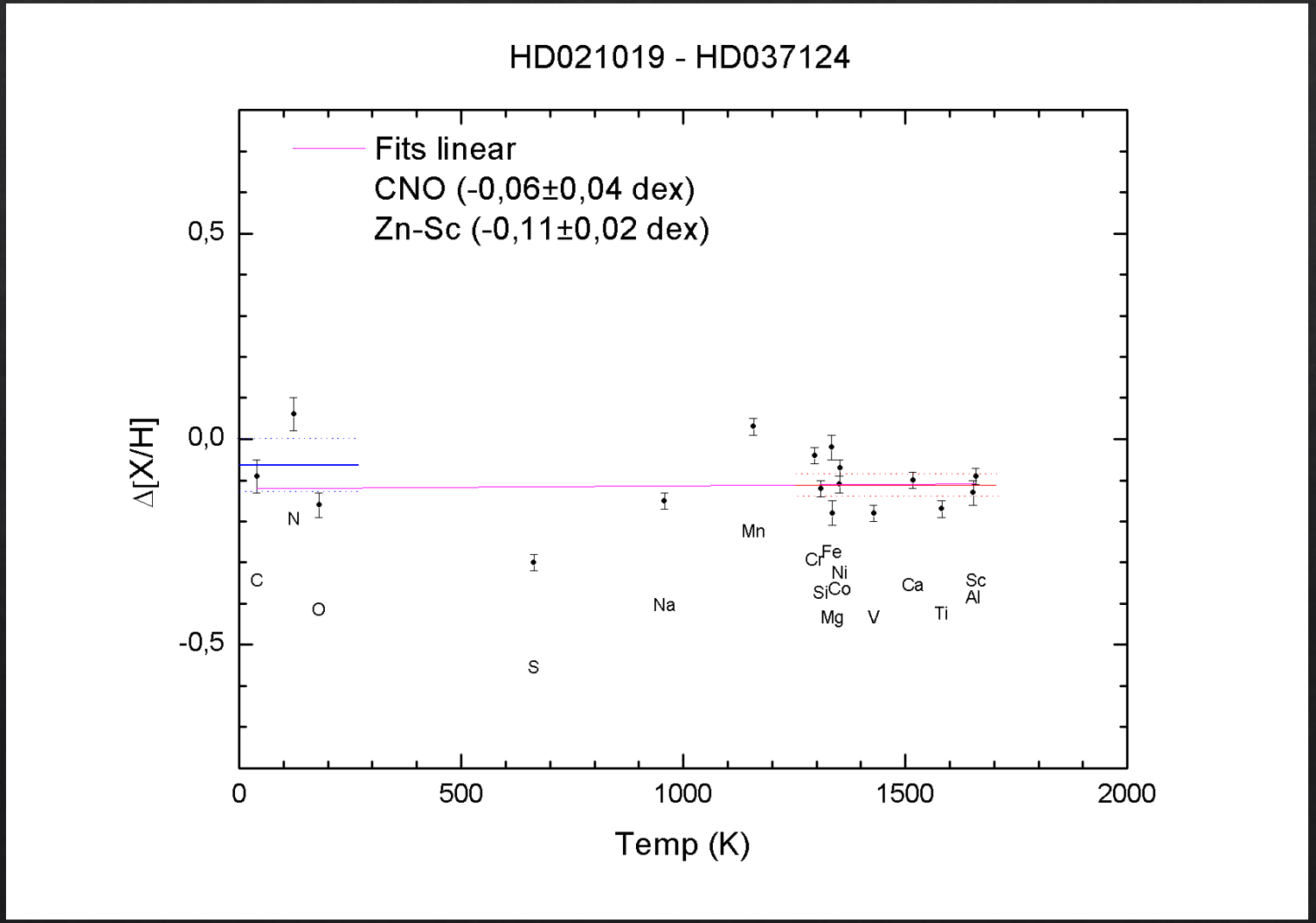
Abundance of carbon and nitrogen using the lines of molecular systems CH A-X, C_2 D-A, NH A-X e CN B-X.

Star	[C/H] (dex)	[N/H] (dex)
HD021019	-0.54 ± 0.02	-0.61 ± 0.02
HD037124	-0.46 ± 0.02	-0.60 ± 0.01
HD040865	-0.39 ± 0.02	-0.44 ± 0.02
HD059984	-0.63 ± 0.02	-0.77 ± 0.03
HD078747	-0.63 ± 0.02	-0.82 ± 0.02
HD126793	-0.72 ± 0.02	-0.78 ± 0.03
HD181720	-0.52 ± 0.02	-0.58 ± 0.02

RESULTS

- $\Delta[X/H] = [X/H]_{star} - [X/H]_{reference} = \log(\varepsilon(X))_{star} - \log(\varepsilon(X))_{reference}$

Star	Giants Planets
HD021019	0
HD037124	3
HD181720	1
HD040865	0
HD059984	0
HD126793	0
HD078747	0



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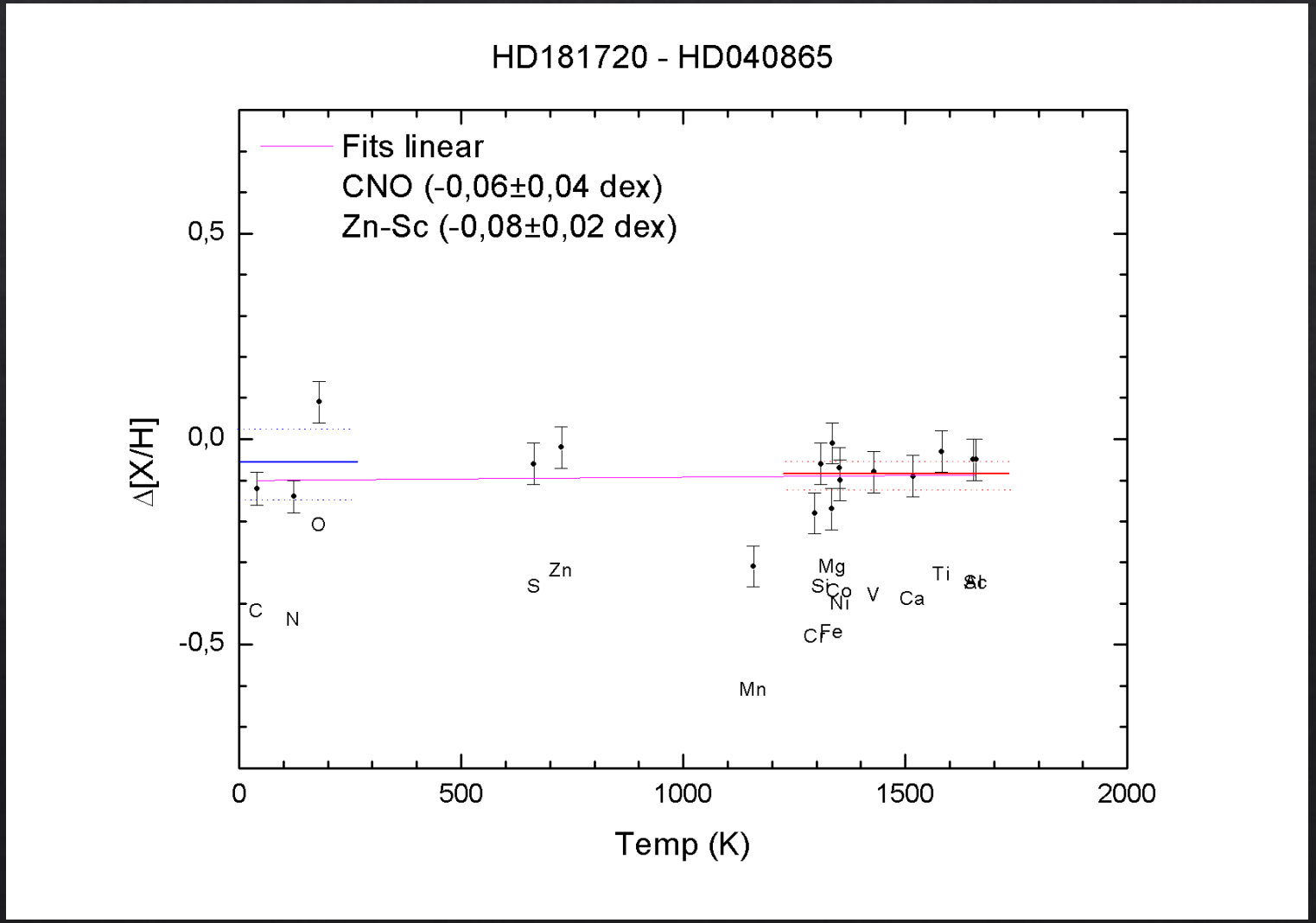

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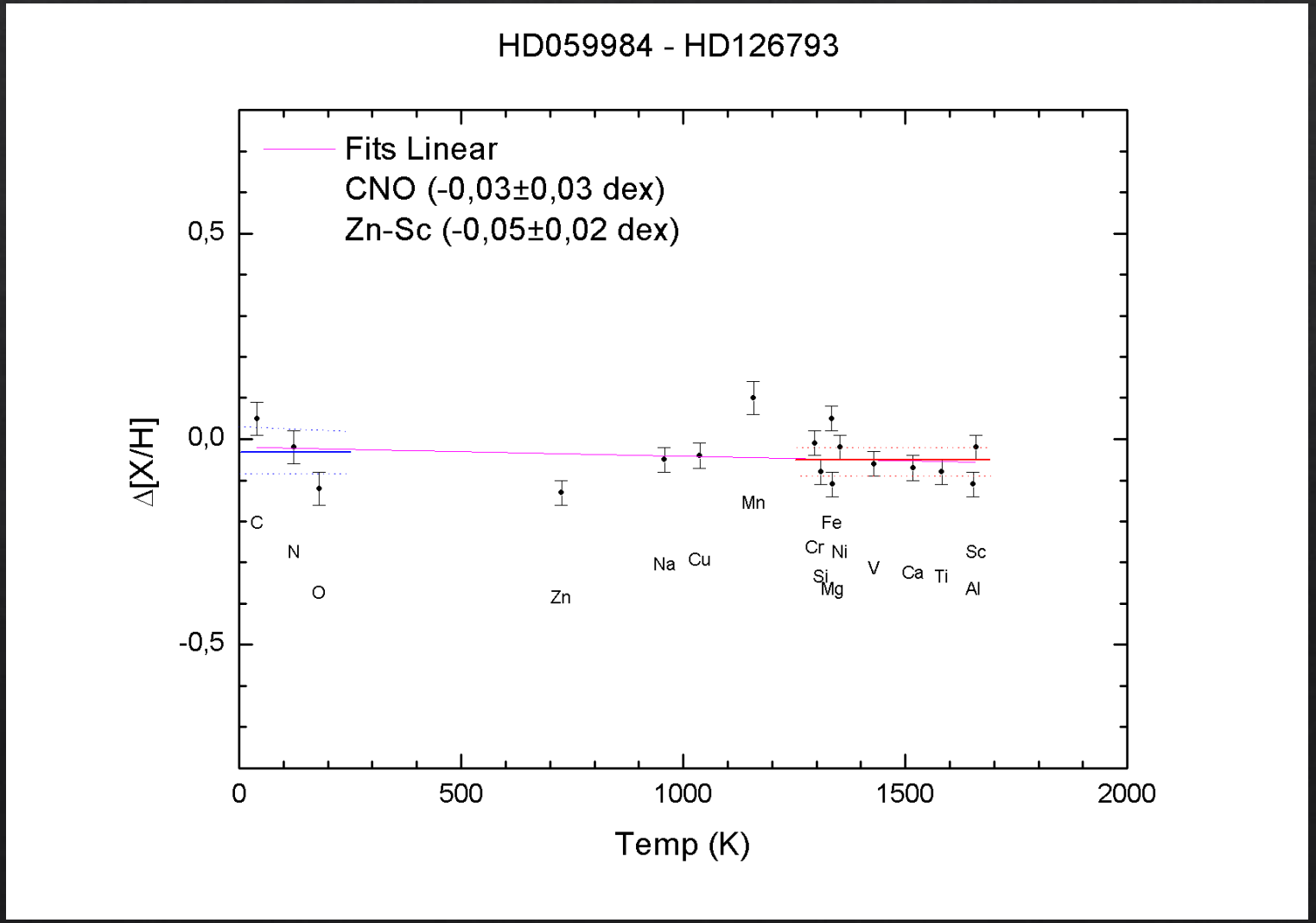

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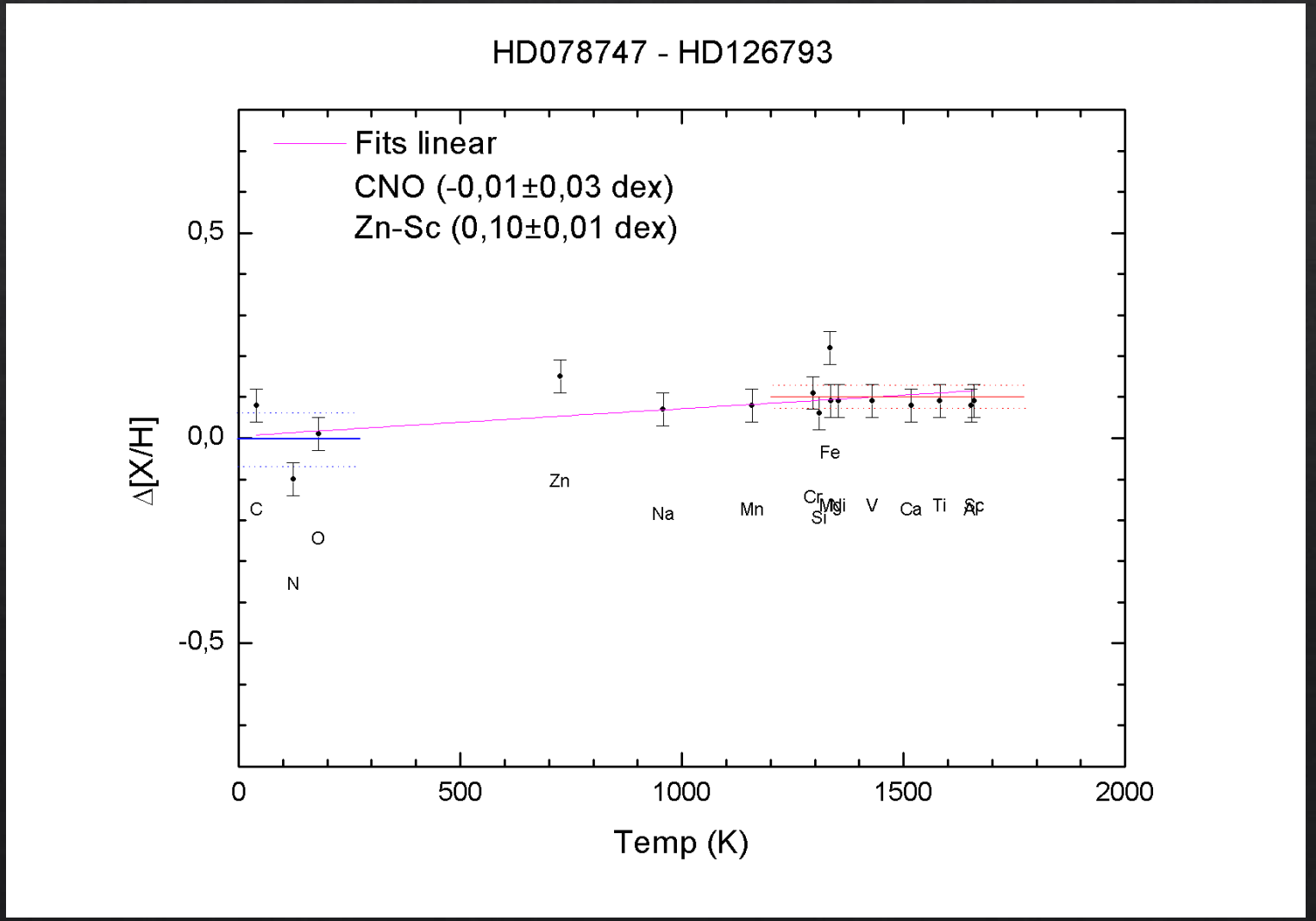

THANKS