

**NOM, Prénom :** EL MELLAH, Ileyk

**Date de naissance :** 5 Avril 1989

**Nombre de candidatures antérieures :** 0

**Interruption(s) d'activité(s) :** -

**Établissement et équipe d'accueil demandés :**

Observatoire de Paris | Laboratoire de l'Univers et des ses Théories

Equipe *Phénomènes aux Hautes Energies*



**Post-doctorats et situation actuelle :**

Mai 2017 - Juin 2020 | Bourse FWO [Pegasus]<sup>2</sup> Marie Skłodowska-Curie | 3 ans | KU Leuven

Octobre 2016 - Mai 2017 | Contrat postdoctoral | 8 mois | KU Leuven

**Thèse :** *Wind accretion onto compact objects*, supervisé par Fabien Casse & Andrea Goldwurm au laboratoire AstroParticule & Cosmologie de Paris 7 (équipe *Astrophysique des hautes énergies*). Soutenance le 7 Septembre 2016 (après 3 ans).

**Thèmes des recherches effectuées :** Stellar remnant : neutron star (NS), black hole (BH), white dwarf (WD) - Accretion : Roche lobe overflow, wind accretion - Binary system : X-ray binary (XB), Cataclysmic variable (CV) - Stellar outflow : line-driven wind

**Méthodologies :** Théorie – Modélisation – Simulations

**Tâches de service effectuées et/ou envisagées :**

ANO5 - Eric Slezak - With Franck Le Petit and Jacques Le Bourlot at the LERMA, reduction of maps of the Interstellar Medium using the Meudon PDR code. With the MIS and Jets platform, confront observations to models with optimization and inverse problems techniques.

**Enseignements effectués :**

2016-17	Computational methods for Astrophysics	60h TD	5 <sup>th</sup> year	KU Leuven
2014-16	Classical Mechanics	128h TD	1 <sup>st</sup> year	Paris 7
2013	Physics for Medical studies	32h TD	1 <sup>st</sup> year	Paris 7
2013	Deterministic systems and signals	32h TP	4 <sup>th</sup> year	Paris 7
2009-10	Teaching assistant	16h CM-TP	high school	Gustave Eiffel

**Résultats principaux :**

2017: impact of inhomogeneities in the wind of Supergiant (Sg) stars on the time-variability of accretion and absorption in SgXB. Confrontation to observations of Vela X-1 with Chandra.

2016: orbital shearing of the stellar wind in SgXB and formation of wind-capture discs. 2015: accretion of a supersonic planar uniform flow by a compact object (structure of the bow shock, quantification of the mass accretion rate, topology of the inner sonic surface).

**Programme de recherche :** 1. Evaluation of the impact of the magnetic field of the NS or WD on the innermost regions of the accreted flow in SgXB and CV. Synthetic observations and confrontation to observations of Vela X-1 and to the intermediate polar CV V4743 Sgr. 2. Accretion of a low angular momentum flow onto a BH to determine whether there might be a disc-like structure lying near the last stable orbit. Comparisons to observations of Sgr A\* by GRAVITY and the EHT, using the ray-tracing code GYOTO to produce synthetic observations.

**Compétences acquises et points forts de votre candidature :** Wide expertise in Computational Astrophysics. Improvements of **MPI-AMRVAC**, a finite volume code to numerically solve the equations of MHD, on an adaptive grid whose geometry can be adapted to the needs of a physical problem. I also gained experience in adjacent domains such as visualization, high performance computing, hardware, cluster and data management, profiling and code optimization.

## Publications

Nombre de publications de rang A publiées et sous presse: 8

Nombre de publications de rang A soumises: 0

Nombre de communications et/ou de posters présentés à des conférences: 11

Autres (participation à des ouvrages, rapports techniques, codes, logiciels, sites web, etc...) :

2017 Radio show [Faconde](#) on scientific outreach (Radio Campus, Bruxelles)

2016 [PhD manuscript](#)

2015 Festival of Sciences (Paris 7) and 3D-printing of Roche potentials

2015 [Personal webpage](#)

2015 [Website of the Rencontres des Jeunes Physiciens 2015](#)

2015 Community manager of the *Rencontres des Jeunes Physiciens 2015*

2015 Wolfram demonstration [Trajectory of a Test Mass in a Roche Potential](#)

Liste des 5 publications de rang A, par ordre d'importance, qui illustrent le mieux votre travail et vos compétences (avec liens) :

[1] **El Mellah I.**, Sundqvist J. O. & Keppens R.  
*Accretion from a clumpy massive-star wind in Supergiant X-ray binaries* (2017) - MNRAS

[2] **El Mellah I.** & Casse F.  
*A numerical simulations of axisymmetric hydrodynamical Bondi-Hoyle accretion on to a compact object* (2015) - MNRAS

[3] **El Mellah I.** & Casse F.  
*A numerical investigation of wind accretion in persistent Supergiant X-ray Binaries I - Structure of the flow at the orbital scale* (2016) - MNRAS

[4] Grinberg V., Hell N., **El Mellah I.**, Neilsen J., Sander A. A. C., Leutenegger M. A., Fürst F., Huenemoerder D. P., Kretschmar P., Kühnel M., Martínez-Núñez S., Niu S., Pottschmidt K., Schulz N. S., Wilms J. & Nowak M. A.  
*The clumpy absorber in the high mass X-ray binary Vela X-1* (2017) - A&A

[5] Xia C., Teunissen J., **El Mellah I.**, Chané E. & Keppens R.  
*MPI-AMRVAC 2.0 for solar and astrophysical applications* (2017) - ApJS