

Alejandro Cruz Osorio

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Nationality: Mexican Date of birth: April 17 of 1984

Research Interests

Relativistic Astrophysics : Extragalactic Relativistic Jets – Shadows – Multiwavelength Emission – Accretion onto Compact Objects – General Relativistic Magnetohydrodynamics. General Relativity: Gravitational waves – Neutron and Quark Stars. Nonthermal Particle Acceleration.

Experience

Investigador Asociado C <i>Instituto de Astronomía, Universidad Nacional Autónoma de México, México.</i>	Aug.2023–Jul.2025
Postdoctoral Fellow in Relativistic Astrophysics <i>Institut für Theoretische Physik, Goethe Universität Frankfurt, Germany. MENTOR: Luciano Rezzolla</i>	2019–2023
Postdoctoral Fellow in Numerical Relativity <i>Departament d'Astronomia i Astrofísica, Universitat de València, Spain. MENTOR: José A. Font Roda.</i>	2017–2019
Postdoctoral Fellow in Relativistic Astrophysics <i>Institut Für Theoretische Physik, Goethe Universität Frankfurt, Germany. MENTOR: Luciano Rezzolla</i>	2016–2017
Postdoctoral Fellow in Astronomy <i>Instituto de Astronomía, Universidad Nacional Autónoma de México, México. MENTOR: F. Sánchez.</i>	2015–2016
Full time interim professor <i>Dep. of Computational Systems, Instituto Tecnológico Superior de los Ríos, México</i>	Aug.2014–Feb.2015

Education

Ph.D. in Physics <i>Institute of Physics and Mathematics, UMSNH, México</i> Numerical implementation of the relativistic magnetohydrodynamics	2010-2014
M.Sc. in Physics <i>Institute of Physics and Mathematics, UMSNH, México</i> Numerical solution of the wave equation in Minkowski and Schwarzschild space-times in a domain containing the future infinite null	2008-2010
B.Sc in Physics-Mathematics <i>Faculty of Physical-Mathematical Sciences, UMSNH, México</i> Tracking null radial geodesics of spherically symmetric space-times.	2002-2008

Languages

Nahuatl: Native	Spanish: Native
English: Full professional proficiency	German: Basic

Awards and Recognitions

EHT Early Career Award 2022: For the outstanding contribution of Theoretical Modeling of Sagittarius A*. The Event Horizon Telescope collaboration. Dec. 2022

Wissenschaftspreis der Frankfurter Physik 2022 (Science Award of Frankfurt Physics 2022): Department of Physics Goethe University Frankfurt and Walter Greiner Gesellschaft zur Förderung der physikalischen Grundlagenforschung, Frankfurt, Germany. Jul. 2022

2016–2022 SNI I: National Researchers System Recognition by the National Council of Science and Technology (CONACYT ¹), México. First period: Jan 2016 – Dec 2018. Second period: Jan 2019 – Dec 2022. Third period: Jan 2023 –

Research Grants

2024–2026: Project CBF2023-2024-1102 – Sombras de Agujeros Negros y Jets Relativistas como laboratorios para probar teorías de la gravedad, propiedades del plasma en discos de acreción y la aceleración de partículas Ciencia Básica y de Frontera 2023-2024 (CONAHCYT)

2022–2025 Marie Curie Horizon Europe Staff Exchange action 2022 (NewFunFiCO): Fundamental Fields and Compact Objects: new opportunities, funding 276 000 Euros, **Before:co-PI of Germany branch. Now: Co-PI of Mexican branches.**

2021–2023 JETSET-ERC Fellowship: Institut Für Theoretische Physik, Goethe Universität.

2019–2021 Black Hole Cam-EHT Fellowship: Institut Für Theoretische Physik, Goethe Universität.

2017–2019 CONACYT Postdoc abroad Fellowship: at Universitat de València.

2016–2017 ExaHyPE-Horizon 2020 EU Fellowship: Institut Für Theoretische Physik, Goethe Universität.

2015–2017 DGAPA postdoc Fellowship: at Institute of Astronomy, UNAM

2008–2010 Fellowship for Ph.D. studies: at the Institute of Physics and Mathematics, UMSNH ², granted by the Mexican Council of Science CONACyT.

2010–2014 Fellowship for M.Sc studies: at the Institute of Physics and Mathematics, UMSNH, granted by the Mexican Council of Science CONACyT.

Grants of computational time allocation

Co-PI Estudio de la emisión electromagnética en multifrecuencias de Blazares: Comparación teórica-observacional LAMOD-UNAM cluster. 1 Million CPU-hours. 2023-2024.

PI Evolución de discos magnetizados alrededor de agujero negro LAMOD-UNAM cluster. 0.5 Million CPU-hours. 2023-2024.

PI of the project Long-term simulations of magnetized disks and jets around supermassive black-hole binaries in General Relativity HAWK cluster, High-Performance Computing Center Stuttgart, Stuttgart, Germany. 100 Millions CPU-hours. 2023-2024.

PI of the project Large-scale numerical-relativity simulations of tilted black hole-torus system, project-ID: FI-2019-2-0043, 3 Millions CPU-hours, Estimated cost: 2959 euros, Cluster: Barcelona Supercomputing center-MareNostrum 4.

Microphysical aspects of binary neutron star mergers (BNSMIC), HAWK cluster, High-Performance Computing Center Stuttgart, Stuttgart, Germany. **100 Millions CPU-hours.** PI Luciano Rezzolla.

Publications

64 scientific publications under the NASA ADS ID **Cruz-Osorio**, including 14 ApJ letters, 2 Nature Astronomy one as first author. In total 4959 citations.

CONACYT: Consejo Nacional de Ciencia y Tecnología

UMSNH: Universidad Michoacana de San Nicolás de Hidalgo

Teaching and Mentoring

Two Bachelor graduated student in Mexico, one at UNAM and second at Universidad Veracruzana. Three graduated Master student, two in Germany and one in Italy. I have taught 18 courses (Bachelor, Master and PhD) including Hydrodynamics and Magnetohydrodynamics, Relativity, Fluid mechanics, Electrodynamics at different universities UMSNH, UNAM and Goethe-University Frankfurt.

Talks

I have given, 6 Invited talks at conferences, 23 talks in seminars, 21 contributed talks at conferences

Academic Service

Examinations: 13 times part of the synod committee of thesis defence (Bachelor, Master and PhD), 3 times Thesis Project examinations, 10 Tutor committee.

Journal Reviewer: Astrophysical Journal, American Journal of Physics, Revista Mexicana de Física, MDPI- Universe, Referee at DiRAC-cluster England: Astronomy, Particle Physics and Nuclear Physics.

Computer skills

Languages: Fortran, Python, C/C++

Code Development: CAFE, BHAC, BHOSS

High Performance: OpenMP, MPI, AMR, FMR

Codes: Einstein Toolkit, ehtim