Department of Physics
UCF
PHYSICS COLLOQUIUM

Speaker: Dr. Ramses Ramirez, UCF

Assessing Planetary Habitability Within Our Solar System and Beyond

Friday, September 4, 2026, 1:30 pm, PSB 160/161

Zoom: https://ucf.zoom.us/j/97271704305?pwd=jBv3TPzoBmLhXsBCie7tABxPBBMjCb.1
Meeting ID: 972 7170 4305 Passcode: 430

Abstract:

Planetary habitability refers to a terrestrial planet's or natural satellite's potential to develop and sustain environments suitable for life, focusing on factors like liquid water, energy sources, and stable conditions. Here, I will first review the first of these habitability metrics, the habitable zone, which is the circumstellar region where standing bodies of liquid water can be stable on a planet's surface. Climate feedbacks, in particular the carbonate-silicate cycle and water-ice albedo feedbacks are crucial for understanding how life is sustained on a planet. I will also review some planetary habitability work my research group has conducted in our solar system and beyond. I will discuss how the above feedbacks impact habitability for planets orbiting F – K stars. I will then review the advanced energy balance model (EBM) I had developed, which is the first 2D EBM capable of evaluating the habitability of both solar system and exoplanetary terrestrial planets. The big advantage of such a model is to include much of the technical complexity of more complex 3-D models while retaining the speed of simpler models, enabling proper exploration of parameter space. The TRAPPIST-1 planets, Mars, and Earth are examples of both rapid and slow rotators that the EBM simulates. I also discuss our recent proposal to use nanorods, which are manufactured soil particles, to potentially warm Mars and facilitate human exploration and settlement. Lastly, I introduce our preliminary magma ocean modeling results that incorporate machine learning with the purpose of speeding up climate modeling calculations.

BIO:
Ramses Ramirez is an Assistant Professor of Physics and member of the Planetary Sciences Group at the University of Central Florida (UCF). He is a planetary scientist and astrobiologist that develops models to simulate the atmospheres of potentially habitable planets in our solar system and beyond, including Mars, Venus, Titan, magma ocean worlds, and exoplanets located within the habitable zone.

His diverse background starts with a B.S. in Aerospace Engineering with High Honors from the Georgia Institute of Technology. He then took geology coursework at the University of South Florida and received a M.S. in Planetary Geology from Arizona State University. Ramses then attended Pennsylvania State University and obtained a dual Ph.D. in Geosciences and Astrobiology. Before coming to UCF, he had previously worked as a research associate at Cornell University, and then as a research scientist at the Earth-Life Science Institute (ELSI) in Tokyo