

Title: Water, Asteroids, and Planet Formation

Abstract:

The small bodies in our Solar System and fragments from them, i.e., meteorites can provide vital constraints on planet formation, and the process of volatile acquisition by early formed bodies. Space missions have done successful flybys to several asteroid bodies in the near-Earth space, and in 2005, the Japanese Space Agency's Hayabusa mission collected samples from an asteroid Itokawa. My team at Arizona State University performed high-spatial resolution, hydrogen isotopic analyses of Itokawa dust grains and their meteorite analogs namely the undifferentiated ordinary chondrite meteorites using the NanoSIMS 50L. We show that undifferentiated, primitive asteroids that form in the inner solar system, close to the Sun are not completely dry, and is likely to provide substantial amounts of water to planets, as the planets grow via collisions. More recent analyses on primitive and differentiated achondrites also shows that these samples also contain substantial amounts of volatiles. I will present the results from ongoing studies in my lab. Two more missions are currently ongoing with the motivation to collect samples from additional small bodies, focusing on highly primitive asteroids rich in organics and water. Japan's Hayabusa2 has successfully collected and brought back ~5 gms of asteroid Ryugu, while NASA's OSIRIS-Rex likely collected 100 times more regolith dust from the surface of Bennu. In my talk, I will focus on how my team is preparing for studying samples from asteroids Bennu and Ryugu, and what that can reveal about planet formation.

About the Speaker:

Dr. Maitrayee Bose received her Bachelor of Science and Master of Science degrees in Physics from University of Pune, India, followed by her PhD from Washington University in St. Louis. Presently, she is an Assistant Professor in the School of Earth and Space Exploration at Arizona State University. She is a cosmochemist investigating the chemistry of small bodies, namely asteroids and comets in our solar system. Her interest is to understand aqueous, thermal, and shock processes in small bodies, and how that affects the mineral & organic components. She is an expert on the NanoSIMS (Secondary Ion Mass Spectrometry at the nano-scale) and use this unique and novel tool to study components in meteorites. Her team is currently studying particles from asteroid 25143 Itokawa collected by JAXA's Hayabusa mission and is preparing for additional missions to small bodies.