



UNIVERSITÀ
DI TRENTO

Dipartimento di
Fisica



PhD Program in Space Science and Technology - SST

Interpreting Planetary Surfaces through Near-Infrared Spectroscopy and Thermal Emission

Specific Seminar – Curriculum 3

2026, May 26, 11 a.m.

Speaker:

Dr. Federico Tosi - Institute of Space Astrophysics and Planetology, National Institute for Astrophysics

Abstract:

Airless and nearly airless bodies preserve on their surfaces the cumulative effects of solar illumination, impacts, radiation, and endogenic activity. These exposed terrains act as long-term records of planetary evolution, and near-infrared imaging spectroscopy offers a powerful means to decode them quantitatively. Diagnostic absorption features reveal surface composition, while continuum properties and thermal emission provide insight into physical conditions and surface energy balance.

In this seminar, I will present a research path developed through mission-oriented investigations of a broad range of planetary bodies, including differentiated asteroids, dwarf planets, comets, and the icy and volcanic satellites of Jupiter. I will first discuss the mapping of surface composition on atmosphereless environments, highlighting detections of minerals and ices and their relation to geological context. I will then turn to thermal studies based on near-infrared observations, showing how the separation of reflected sunlight from emitted radiation can be used to derive temperature distributions and thermophysical properties.

The final part of the seminar will focus on mission science and future perspectives, with particular attention to JUICE and my coordination of the WG2 Surfaces activity, before moving toward terrestrial planetary bodies through recent developments in lunar surface investigations.

Short Bio:

Federico Tosi is a senior research scientist at Italy's National Institute for Astrophysics (INAF) in Rome, and an adjunct professor at Roma Tre University. His work focuses on the interpretation of remote-sensing data acquired by instruments onboard major NASA and ESA planetary missions, including Cassini-Huygens, Rosetta, Dawn, Juno, BepiColombo, and JUICE. His research addresses the physical and chemical characterization of Solar System bodies through multisensor data analysis. He has authored more than 230 papers in international peer-reviewed journals.

Online attendance:

Information on remote participation can be requested by sending an e-mail to dn_sst@unitn.it