Université d'ORLÉANS

AVIS DE SOUTENANCE EN VUE DE

L'HABILITATION A DIRIGER DES RECHERCHES

Discipline : Sciences de la vie/Astrobiologie

MILOJEVIC Tetyana

présentera ses travaux en vue de l'habilitation à diriger des recherches

Le 15 mars 2023 à 12:30 heures

Lieu : Centre National de la Recherche Scientifique, 3 Avenue de la Recherche Scientifique 45071 Orléans, amphithéâtre Charles Sadron

devant le jury constitué par les personnalités suivantes :

-M. Dirk Schulze-Makuch, Professeur des Universités, Université technique de Berlin, président de la Société allemande d'astrobiologie (DAbG)
-Mme Rosa de la Torre Noetzel, Professeur des Universités, Institut national de technologie aérospatiale (INTA), vice-président (European Astrobiology Network Association, EANA)
-Mme Daniela Billi, Professeur des Universités, Université de Rome Tor Vergata
-M. Jean Susini, Directeur de recherche, Directeur Scientifique du Synchrotron SOLEIL
-Mme Frances Westall, Emérite, Directeur de recherche (CBM), président émérite (EANA)
-M. Josef Hamacek, Professeur des Universités, CBM, Université Orléans
-Mme Mihaela Albu, Scientifique principal, expert à l'Agence autrichienne de promotion de la recherche (FFG)

Résumé des travaux :

Astrobiology is a young and rapidly developing branch of science that strives to address the question of whether life exists, or has existed, elsewhere in the Universe. Current research activities in the field of astrobiology have evolved at the boundaries of biosphere, geosphere, hydrosphere and atmosphere, exploring the interactions between the biological, geological, hydrological, and atmospheric elements in the Universe. My main research interest lies in the astrobiological implication of microbial-mineral interactions and molecular mechanisms of microbial survival beyond Earth, which I resolve by means of a space biochemistry approach. My recent investigations seek to address the impact of planetary conditions on the evolution of microorganisms, molecular mechanisms driving the limits of life under different physicochemical regimes, and traces of life that can be detected in the physicochemical conditions of Earth and beyond. This thesis summarises some of my contributions in the area of Mars-relevant biosignatures, tungsten-microbial interactions as a microbial strategy to withstand harsh environments, and molecular mechanisms of microbial survival beyond Earth.

My recent study on the Noachian Martian breccia composed of ~4.5 Gyr old Mars crustal fragments, delivered a prototype of microbial life experimentally designed on a real Martian material. This life of pure Martian design is a rich source of Mars relevant mineral and metabolic biosignatures, which may pave the way to efficient nano-assessment of the biogenicity of returned Mars samples. Besides this, I will present molecular mechanisms of microbial survival during interplanetary travel resolved with a space biochemistry approach. Our investigations of microbial long-term survival outside the ISS help to understand the mechanisms and processes through which life can exist beyond Earth, expanding our knowledge how to survive and adapt in the hostile environment of outer space. Additionally, some of my recent research has indicated that microbial cells form a robust, tungsten-bearing mineralized cell crust that may help them withstand harsh environments. An integrative approach of microbiology, –omics techniques, wet chemistry and electron microscopy coupled to spectroscopy nanoanalysis, which has been developed during these investigations, contributes to the advanced development of astrobiological research.