Paper ID: 80954
interactive
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IAF/IAA SPACE LIFE SCIENCES SYMPOSIUM (A1)
Interactive Presentations - IAF/IAA SPACE LIFE SCIENCES SYMPOSIUM (IP)

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AN INVESTIGATION OF THE EFFECTS OF SOUNDING ROCKET TRAVEL IN THE IONOSPHERE ON THE STRUCTURE, ELEMENTAL COMPOSITION AND PHOTOSYNTHETIC VIABILITY OF CYANOBACTERIA NOSTOC.

Abstract

Background: Cyanobacteria, as architects of our atmosphere, inventors of photosynthesis and precursors of eukaryotic multicellularity, formed the foundations for all Earth's ecosystems 3.5 billion years ago. Aim: To investigate whether Cyanobacteria nostoc can remain viable on a NASA sounding rocket in the ionosphere, to determine their potential value in long distance space missions and colonisation of distant planets. Methods: A small cube of Cyanobacteria nostoc in blue-green BG-11 agar was transported on a NASA sounding rocket mission in the ionosphere. Structure, elemental composition, and photosynthetic viability of Cyanobacteria nostoc was compared pre and post spaceflight against a control Earth cube. Results: Element composition was unchanged after ionospheric exposure for most elements with the exception of carbon, which was reduced, and nitrogen which was absent post-flight. Photosynthesis did not occur in spaceflight but resumed in subcultures subsequently. Conclusions: Cyanobacteria nostoc appears to remain viable in the ionosphere on board a NASA sounding rocket, though with suppression of metabolic activities in flight. Future research to examine real-time data for biological processes of Cyanobacteria nostoc during spaceflight in the ionosphere, ideally in a BG-11N medium, would be advantageous.