

PPOSS (PLANETARY PROTECTION OF THE OUTER SOLAR SYSTEM) – BEST PRACTICE FOR ORGANIC CONTAMINATION CONTROL

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Planetary Protection of the Outer Solar System is aimed at preventing contamination between Earth and other bodies, in particular the icy moons, in the context of life detection missions. In the context of organic (rather than biological) contamination control the aim is to avoid jeopardizing the search for extraterrestrial life and its precursors and remnants through creating false positives. So far the search for life beyond the Earth has focused on Mars and so current thinking towards avoiding forward contamination of potentially habitable environments is based on our knowledge of the Martian environment. As there is now increasing evidence for the potential of life to exist on the icy moons of the outer solar system, it is necessary to think about the unique challenges for planetary protection and contamination control these environments hold. This is especially difficult, compared to Mars, due to the abundance of liquid water, both in subsurface oceans and hydrothermal plumes, which will enhance the risk of forward contamination and false positives. Due to the non-self-replicating nature of organic contaminants, unlike biological contaminants, we are mostly worried about affecting the reliability of the current mission rather than damaging the future scientific prospects of the body, although this must still be considered. While organic compounds are highly scarce on Mars and the challenge is purely to detect them, organics are likely to be plentiful on the icy moons. The complex radiation environment will create polymers and macromolecules leading to a complex and varied suite of organics. This means that the background level of indigenous abiotic organic compounds will be high and the challenge will be to distinguish between the sources of the observed organics. Planetary Protection and contamination control policy will need to be adaptable as our knowledge about the target bodies increases through future successful missions.