

A strategy for sample retrieval and possible onboard biosafety controls: Perspectives

Y. Takano¹, H. Yano², Y. Sekine^{1,3}, R. Funase³, K. Takai^{1,2}

¹Japan Agency for Marine-Earth Science & Technology (JAMSTEC),

²Japan Aerospace Exploration Agency (JAXA), ³University of Tokyo,

Issues of planetary protection are generally handled by the space community, although these issues often come to the attention of various academic communities and the public (e.g., [1, 2]). Since the establishment of the Panel on Planetary Protection (PPP) and the Committee on Space Research (COSPAR), an international consensus has emerged regarding the development and promulgation of planetary protection knowledge and policies, and regarding plans for mitigating the harmful effects of biological contamination on Earth. The investigation of biological quarantine for planetary protection against both forward and back-contamination has been discussed from the viewpoint of risk management and public consensus, in the context of further planetary exploration. However, selection of a candidate location for initial quarantine, especially for materials with high biosafety levels, is problematic due to the potential risk of biological back-contamination and the difficulty of obtaining public consensus in the host countries of the sample recovery site.

To resolve key issues related to extraterrestrial sample-return projects, we suggest that international waters (i.e., areas of oceans, seas, and waters outside of national jurisdiction; Figure 1) are a meaningful option for the location of sample retrieval, likewise the pioneering Apollo missions in 1960's. To conduct an initial investigation of onboard biological control, we propose application of a BSL laboratory on a developed research vessel operating in international waters. According to the United Nations Convention on the Law of the Sea (UNCLOS), international waters are defined as all waters beyond national boundaries with freedom of navigation and also freedom of scientific research (see, Article 87: Freedom of the High Seas). We think that the international waters are the most likely place for the future public consensus of onboard quarantine because of the potentially minimum risk of back-contamination in the ocean environments and the most rapid and convincing processing of the subsequent scientific research. On this basis, we propose potential onboard protocols for the initial biological control of future sample-return missions (e.g., [3], [4]).

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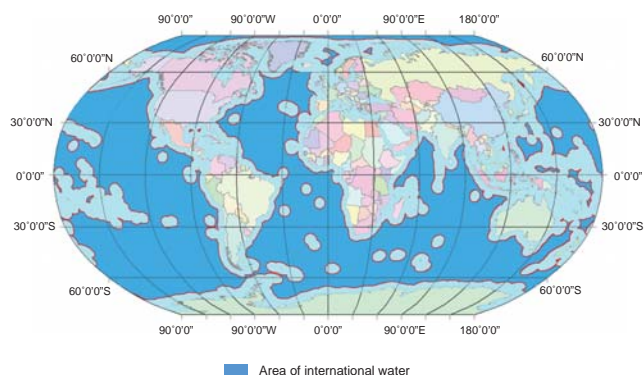


Figure 1. Global distribution of international waters.