Agriculture on Mars: Soils for Plant Growth

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Robotic rovers and landers have enabled the mineralogical, chemical, and physical characterization of loose, unconsolidated materials on the surface of Mars. Planetary scientists refer to the regolith material as “soil.” NASA is currently planning to send humans to Mars in the mid 2030s. Early missions may rely on the use of onsite resources to enable exploration and self-sufficient outposts on Mars. The martian “soil” and surface environment contain all essential plant growth elements. The study of martian surface materials and how they might react as agricultural soils opens a new frontier for researchers in the soil science community. Other potential applications for surface “soils” include (i) sources for extraction of essential plant-growth nutrients, (ii) sources of O_2, H_2, CO_2, and H_2O, (iii) substrates for microbial populations in the degradation of wastes, and (iv) shielding materials surrounding outpost structures to protect humans, plants, and microorganisms from radiation. There are many challenges that will have to be addressed by soil scientists prior to human exploration over the next two decades.