

Shallow groundwater systems in a polar desert, McMurdo Dry Valleys

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Abstract

The McMurdo Dry Valleys (MDVs), Antarctica, exist in a hyperarid polar desert, underlain by deep permafrost. With an annual mean air temperature of -18°C , the MDVs receive <10 cm snow-water equivalent each year, collecting in leeward patches across the landscape. The landscape is dominated by expansive ice-free areas of exposed soils, mountain glaciers, permanently ice-covered lakes, and stream channels. An active layer of seasonally thawed soil and sediment extends to less than 1 m from the surface. Despite the cold and low precipitation, liquid water is generated on glaciers and in snow patches during the austral summer, infiltrating the active layer. Across the MDVs, groundwater is generally confined to shallow depths and often in unsaturated conditions. The current understanding and the biogeochemical/ecological significance of four types of shallow groundwater features in the MDVs are reviewed: local soil-moisture patches that result from snow-patch melt, water tracks, wetted margins of streams and lakes, and hyporheic zones of streams. In general, each of these features enhances the movement of solutes across the landscape and generates soil conditions suitable for microbial and invertebrate communities.

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