

Preface

Most of the Earth's biosphere is characterized by low temperatures. Vast areas (>20%) of the soil ecosystem are permanently frozen or are unfrozen for only a few weeks in summer. Permafrost regions occur at high latitudes and also at high elevations; a significant part of the global permafrost area is represented by mountains.

Permafrost soils are of global interest, since a significant increase in temperature is predicted for polar regions. Global warming will have a great impact on these soils, especially in northern regions, since they contain large amounts of organic carbon and act as carbon sinks, and a temperature increase will result in a release of carbon into the atmosphere. Additionally, the intensified release of the climate-relevant tracer gas methane represents a potential environmental hazard.

Significant numbers of viable microorganisms, including bacteria, archaea, phototrophic cyanobacteria and green algae, fungi and protozoa, are present in permafrost, and the characteristics of these microorganisms reflect the unique and extreme conditions of the permafrost environment. Remarkably, these microorganisms have been reported to be metabolically active at subzero temperatures, even down to -20°C .

This book summarizes recent knowledge on various aspects of permafrost and permafrost-affected soils, including typical properties of these soils, distribution and biodiversity of permafrost microorganisms, examples for microbial activity in frozen soils, and genomic and proteomic insights into cold adaptation of permafrost bacteria. The impact of global warming on microbial communities, carbon dynamics, geomorphology, and frozen-ground engineering are further discussed. Other chapters describe the feasibility and limitations of methods for removing contaminants in frozen ground. Finally, terrestrial permafrost is considered as a model for extraterrestrial habitats.

I wish to thank all authors, who are authorities in their field, for their excellent contributions. I also thank Dr. Franz Schinner for many interesting discussions and Dr. Jutta Lindenberg and Dr. Dieter Czeschlik, Springer Life Sciences, for continuous support during the preparation of this volume.

Innsbruck, April 2008

Rosa Margesin

Permafrost Soils

Margesin, R. (Ed.)

2009, XIV, 348 p. 78 illus., 4 illus. in color., Hardcover

ISBN: 978-3-540-69370-3