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Periglacial and permafrost research in the southern hemisphere

The following pages feature reviews of current understanding of present-day and Quaternary permafrost and periglacial environments in the southern hemisphere. The articles were solicited from members of the Southern Hemisphere Working Group of the International Permafrost Association (IPA). This working group was established in 1998 with the primary aim to facilitate information exchange between researchers within the southern hemisphere, as well as with their counterparts in the northern hemisphere; furthermore, the working group intends to synthesize existing information and make it more accessible.

International awareness of southern hemisphere permafrost and seasonally frozen ground is limited. However, extensive areas of permanently or seasonally frozen ground exist in the southern hemisphere, including the Antarctic, the Andes and Patagonia, and the New Zealand Alps, as well as the mountain summits of Irian Jaya and Papua New Guinea. Evidence for Quaternary periglacial activity is also documented for the mountains of southern Africa and Tasmania, where spatially and temporally limited activity presently takes place. Reasons for the limited recognition of these areas, as in the case of South America, may be in part because the research is published in a language other than English, and/or because it is inaccessible due to publication in journals not readily available outside the country of origin. In addition, the research itself may have progressed, to some degree, in isolation from the scientific activities and debates in the northern hemisphere, where most of the permafrost terrain, and resources for their study, are concentrated. In the case of the Antarctic, including both the continent and peri-Antarctic islands, permafrost science has seldom been advanced through dedicated programmes. Rather, information is scattered throughout the literature of the life and earth sciences and frequently as observations related only indirectly to the main topic. An important limitation on the output of southern hemisphere permafrost science

is the small capacity in many countries, in terms of both human and financial resources, compared with their northern hemisphere counterparts.

The outcome of this strong northern hemisphere influence and emphasis is a general lack of awareness of issues pertaining to southern hemisphere permafrost and periglacial science. Environmental conditions in the southern hemisphere in which frost processes occur may be very different from those encountered in northern, high-latitude environments. These differences pose new questions regarding the understanding of processes and the palaeo-environmental significance of resulting forms. Such a situation is exemplified by the blockstreams of Tasmania and southern Africa; the non-periglacial interpretations of these forms in Tasmania have stimulated reconsideration of the origin of blockfields and blockstreams in northern, high-latitude environments. Similar examples can be identified for diurnal soil frost processes at low and mid-latitudes, as well as weathering in the hyper-arid Antarctic. Because of the differences, southern hemisphere perspectives have the potential to contribute substantially to the scientific understanding of basic driving mechanisms and boundary conditions in permafrost and periglacial processes.

This collection of reviews offers the first comprehensive access in English to the literature on southern hemisphere permafrost and periglacial research and the issues it contains. The articles offer a frank assessment of the current status of periglacial research in various regions. From the papers it will be clear that there are large differences in the level of scientific understanding that has been achieved to date. This can be easily understood taking cognisance of the context in which scientists in the various regions have worked. Even so, these papers are important in that they emphasize the existence of past and present periglacial environments, raise directly or indirectly the problems concerning research in these areas, and indicate the

potential of research in the southern hemisphere.

The significance of raising awareness of southern hemisphere permafrost goes far beyond the purely scientific. The impact of climatic change is expected to be very significant in the permafrost regions of the world. Already, permafrost thawing has led to major landscape changes and terrain instability that has triggered widespread interest from the research community, such as in the PACE project funded by the European Union. To date, this work has largely focused on the northern hemisphere. Attention is drawn here to the fact that the southern hemisphere possesses equally large and ecologically important and sensitive areas of permafrost and periglacial terrain. Current changes in permafrost in these areas are largely unknown, as are the potential responses in landscape dynamics. Thus, there is a need to understand changes in permafrost conditions, given the potential impact these may have on erosion rates, natural hazards and ecosystem functioning in sensitive areas such as the Andes, the New Zealand Alps and the Antarctic. Already, for the Antarctic, a dedicated permafrost-monitoring project has been started and closer collaboration between the permafrost community and the Scientific Committee on Antarctic Research is being forged. International participation in the IPA/Global Terrestrial Network for Permafrost is being sought to extend permafrost temperature monitoring in the southern hemisphere.

We hope that these articles will contribute to raising awareness in permafrost and periglacial issues relating to the southern hemisphere and, as a consequence, highlight the scope for meaningful research in these areas.

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