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The Cryosphere Discussions

Interactive comment on "Derivation and analysis of a high-resolution estimate of global permafrost zonation" *by* S. Gruber

Anonymous Referee #1

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Review

S. Gruber Derivation and analysis of a high-resolution estimate of global permafrost zonation

Overall evaluation: Acceptable with minor revision

Comments

The scientific problems discussed in this paper are very relevant to the scope of the Special Issue of the Cryosphere journal. Although national permafrost maps exist for different regions of the Northern Hemisphere, there is no consistent cartographic or temperature criteria on which to base a unified permafrost map for the more topographically complex mountain regions that exist in North America, Europe, Scandinavia

and even prevail in mountains regions such as Central Asia and Andes. The International Permafrost Association's (IPA) Circum-Arctic Map of Permafrost and Ground-Ice Conditions (1:10,000,000) employed an international legend developed primarily for continental (lowland) permafrost regions (Brown et al. 1997). That classification was applied to mountainous and high altitude regions with considerable uncertainties. Accelerated warming of permafrost in mountainous, highland, and plateau regions of Asia will result in disequilibrium of the water cycle, increased mass wasting processes, and related sediment transport and slope hazards. Without a unified and verified regional permafrost map these processes cannot be assessed adequately.

The most important achievement of this paper is exactly the extending earlier studies by including the Southern Hemisphere and provides insight at the global scale. The methodology is sound and the assumptions are clearly identified. But in spite of the "re-formulation" and "re-interpretation" of relationships between permafrost extent and mean annual air temperature it is still very simple and primitive model, which has a large number of substantial method limitations and uncertainties. It is no secret to everybody that surface and sub-surface conditions (snow, surface vegetation, soil thermal properties etc) within the Discontinuous and Sporadic permafrost zones are very often play a crucial role in permafrost formation and occurrences and overlap effect of air temperature. Some times these factors define does permafrost exist there or does not. There are large areas in the Northern Hemisphere underling by Pleistocene permafrost, which now does not in compliance with modern climate in terms of permafrost temperature and thickness. Presented model does not take into account long-term history of permafrost formation and as a result it is allow as seeing potential areas of permafrost formation under modern climate only. A permafrost zonation index method used in this research does not provide actual extent or probability of permafrost location. References are not complete.

At the same time it is a good paper in terms of method development and the publication of this kind of paper will be very timely and beneficial for researchers working

in the same field, as well as for many other researchers conducting a wide spectrum of environmental studies. The paper in review could be published in the Cryoshere journal.

Interactive comment on The Cryosphere Discuss., 5, 1547, 2011.