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Impact of the variability of the seasonal snow cover on the ground surface regimes in Hurd Peninsula (Livingston Island, Antarctic)

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Seasonally snow cover has a great impact on the thermal regime of the active layer and permafrost. Ground temperatures over a year are strongly affected by the timing, duration, thickness, structure and physical and thermal properties of snow cover.
The purpose of this communication is to characterize the shallow ground thermal regimes, with special reference to the understanding of the influence snow cover in permafrost spatial distribution, in the ice-free areas of the north western part of Hurd Peninsula in the vicinity of the Spanish Antarctic Station "Juan Carlos I" and Bulgarian Antarctic Station "St. Kliment Ohridski".
We have analyzed and ground temperatures as well as snow thickness data in four sites distributed along an altitudinal transect in Hurd Peninsula from 2007 to 2013: Nuevo Incinerador (25 m asl), Collado Ramos (110 m), Ohridski (140 m) and Reina Sofia Peak (275 m). At each study site, data loggers were installed for the monitoring of air temperatures (at 1.5 m high), ground temperatures (5, 20 and 40 cm depth) and for snow depth (2, 5, 10, 20, 40, 80 and 160 cm) at 4-hour intervals.
The winter data suggests the existence of three types of seasonal stages regarding the ground surface thermal regime and the thickness of snow cover: (a) shallow snow cover with intense ground temperatures oscillations; (b) thick snow cover and low variations of soil temperatures; and (c) stability of ground temperatures. Ground thermal conditions are also conditioned by a strong variability. Winter data indicates that Nuevo Incinerador site experiences more often thicker snow cover with higher ground temperatures and absence of ground temperatures oscillations. Collado Ramos and Ohridski show frequent variations of snow cover thickness, alternating between shallow snow cover with high ground temperature fluctuation and thick snow cover and low ground temperature fluctuation. Reina Sofia in all the years has thick snow cover with little variations in soil temperatures.
The analysis of the Freezing Degree Days (FDDs) and freezing n-factor, FDDs and n-factor reveal significant interannual variations. Ohridski and Reina Sofia show the highest values of FDDs and n-factor of the studied period, and Nuevo Incinerador the lowest. The differences among the sites are mostly dominated by variations in snow cover. These differences are particularly significant in permafrost terrains, where snow cover is a critical factor determining the presence or absence of permafrost.