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Spatial variability models of soil respiration from some vegetation types in Maritime Antarctica

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Soil respiration is an important part of the terrestrial carbon cycling and is influenced by several aspects, such as type and distribution of vegetation. In this work we evaluated the spatial variability of the soil respiration (or soil CO2 emission) in three sites located in Maritime Antarctica at Admiralty Bay, King George Island under contrasting vegetation, representative of this region: (I) a mixed Deschampsia/Mosses field, (II) a moss carpet of Sanionia uncinata and (III) a grass field of Deschampsia Antarctica. Soil respiration was measured in a 60-point regularly spaced grid previously installed at each site. The grid size was 3 x 1.5 meter with a minimum distance of 0.5 m between grid points in March 2009 during the morning at site I and afternoon at sites II and III. The spatial variability was analyzed by using descriptive statistics and the adjustment of the semivariogram models to the soil respiration and soil temperature data. The model adjusted to the semivariogram was used in order to generate the so-called kriging map by interpolation techniques, estimating the studied property at non-sampled places. Higher mean emission was observed in the Deschampsia field (4.13 μmol m-2 s-1), but the highest variability was detected in the mixed vegetation site I. The overall results indicate that soil temperature is not directly related to the spatial pattern of the soil respiration in the studied sites. The degree of spatial dependence was moderate for emission in all studied sites. Temperature values presented degree of spatial dependence classified as strong for sites I and III and moderate in site II. CO2 emission ranges were 1.29, 2.23 and 2.79 m for sites I - II - III, respectively. Higher range values observed in site II and III suggest higher emission homogeneity. In mixed vegetation at site I, points under Deschampsia Antarctica had an overall higher mean respiration (1.49 μmol m-2 s-1) compared with remaining points under mosses tuffs (1.32 μmol m-2 s-1). Kriging maps of soil CO2 emission and soil temperature indicate a more continuity of isolines for emission maps from sites II and III. This can also be observed in soil temperature maps, suggesting that vegetation cover may also control the continuity or discontinuity of both properties in space. Therefore distribution of soil respiration and soil temperature did not appear to be related to soil type, but more associated to the vegetation type and distribution at each site.