



A sensitivity study to global desertification in cold and warm climates

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The climatic impacts of large-scale global desertification in warm (2100 using SRES A2 scenario), pre-industrial and cold (Last Glacial Maximum, 21 thousand years ago) climates are assessed by using the IPSL OAGCM. For each climate, two simulations have been performed, one in which the continents are covered by the modern vegetation, and one in which global vegetation is changed to desert i.e. bare soil for which the same albedo as the present day vegetation is kept. The difference between the temperatures simulated with present day vegetation and in a desert world is dominated by the change in the net radiation related to the modulation of the albedo snow by the vegetation. This difference appears to be larger in the cold climate than in the warm ones. However, the change in the hydrological cycle is larger in the warm climate. The enhanced albedo in the desert world simulations induces a large temperature decrease, especially in the summer in the cold and modern climatic contexts, whereas the largest difference occurs for the winter in the warm climate. This temperature difference requires a larger heat transport to the northern high latitudes. Part of this heat transport increase is achieved through an intensification of the Atlantic Meridional Circulation. Our set of simulations also depict that this increase depends on the climatic context: it is stronger for the glacial and pre-industrial contexts.