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Climatic change in the north hemisphere due to change in the sea surface isotherms associated to the gulf stream

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ABSTRACT

This work is based on the following hypothesis: "A decreasing in the salinity of North Atlantic due to the melting of the Greenland Glacial by a global warming, can to stop partially or totally the “conveyor belt” altering the Gulf Stream and debilitating or annulling the sub-polar gyres to the south and east of Greenland and moving towards the south the Gulf Stream". In agreement with this hypothesis the horizontal heat transport by the Gulf Stream towards Europe can diminish and therefore modify the climate in this region.

The used method to corroborate partially this hypothesis consists of transferring the isotherm of 0˚C, which has in winter in the actual climate an average position of 62 ˚N, to an average position of 52 ˚N in the supposed climate and in summer of the average position of 65 ˚N in the actual climate to an average position of 55 ˚N in the supposed climate. The isotherms higher than 0˚C also are transferred towards the south, maintaining approximately a uniform gradient throughout of meridian 20˚W. This movement of isotherms is consistent with the hypothesis of annulling the sub-polar gyres and moving towards the south 10˚ of latitude the Gulf Stream on meridian 20˚W.

With this method are obtained sea surface temperature anomalies of the order of -10 ˚C for winter and summer, with a pattern very similar to the one of the Last Glacial Maximum (22 ky). These anomalies are used as external forcing in a model of balance energy, called climate thermodynamic model (CTM), in where the isotherm of 0 ˚C is

coupled with the boundary of the snow-ice layer.

As answer to this forcing, the CTM generates on Europe a diminution in the air surface temperature of the same order that the prescribed for the ocean. These results suggest that a weakening in the sub-polar gyres of the Gulf Stream by melting of the Greenland Glacial can generate an important cooling in Europe after a global warming.