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Pliocene closure of the Central American Seaway: Effects on the global climate system

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The closure of the Central American Seaway in the Pliocene has prevented the exchange of tropical and subtropical water masses between the Atlantic and Pacific Oceans. The implications for large-scale ocean circulation, global climate and Northern Hemisphere Glaciation are far from being elucidated. We study the effects of the Central American Seaway using the Community Climate System Model (CCSM2). Climatic equilibria with open (800 m deep) and closed Panamanian Seaway are compared. The model results indicate an increase in annual-mean sea-surface temperatures of about 1 K in the North Atlantic and North Pacific oceans as a result of the Panama closure. This warming influences the hydrological cycle, leading to a northward shift of the Intertropical Convergence Zone and enhanced winter snow fall over Siberia and Canada (approx. 10 cm/yr). With present-day orbital forcing, however, this winter snow melts during the summer season due to enhanced northward heat transport. Additional model experiments will be presented, in which orbital parameters are applied that favor cold northern hemisphere summers. On the basis of these new model results, we discuss the potential role of the formation of the Central American Isthmus in Northern Hemisphere Glaciation.