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Influence of continentality on a global climate model

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This work deals with the effect of continentality on the global ocean temperature. We consider an energy balance model, given by a 2D ocean model with a 1D dynamic and diffusive boundary condition, which includes a nonlinear diffusive term. This mathematical model is based on the pioneering works [1, 2, 3], but modified according to that proposed, for instance, in [4], where a detailed theoretical analysis and numerical simulation are performed. In [5], the effect of continents distribution is analyzed, both from the theoretical and numerical point of view. In this work, we also show the influence of the non-monotone coalbedo on the solution, as performed in [6]. We remark that the coalbedo, which depends on the spatial coordinate and the temperature, is the fraction of the solar radiation which is absorbed by a certain surface. Coalbedo may have a monotone or non-monotone dependency on temperature, considering here ice-water-land distribution. In this work we obtain numerically the effect of the non-monotone coalbedo on the solution which represents the temperature-coalbedo feedback. The results for the monotone and non-monotone cases are compared, according to [6]. In the case of oceanic regions, the value of the coalbedo is lower than the one for continental zones.

The numerical method used is based on a finite volume method, with WENO reconstruction in space and RK3-TVD for time integration. The numerical results indicate that there is an influence of the continentality on the surface temperature.

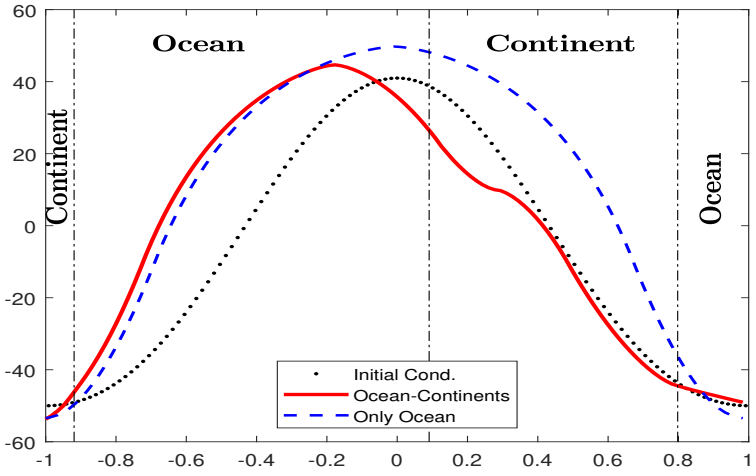

Figure 1: Influence of non-monotone coalbedo in land-sea temperature distribution for two cases: ocean model and land-ocean model.

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