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# Parametrization of the orographic triggering of deep convection in LMDZ4 GCM

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From a statistical analysis of MSG IR data over West Africa during 2005 and 2006 summer seasons, Fiolleau et al. (2007) showed that the triggering of deep convection was strongly enhanced over regions with steep mountains. Moreover, they showed that the trigger linked to orography displayed a strong diurnal cycle, with a maximum of occurence around 15:00 local time.

In order to represent these observed features in climate models, we have developed a parametrization of the effect of sub-grid scale orographic processes on deep convection triggering. It is based on a model of the mountain breeze induced by the heating of the mountain slopes by solar radiation. It is implemented in the LMDZ4 GCM using a version of the Emanuel convection scheme in which the trigger is expressed in terms of ALE (Available Lifting Energy):(i) ALE is assumed equal to the kinetic energy of the mountain breeze; (ii) convection occurs when ALE>CIN (where CIN is the convective inhibition).

ALE maximum value depends on slope, orientation and height, and ALE diurnal cycle depends on orientation. Thus, accounting for the multiplicity of mountain slopes and orientations is a key issue of this parametrization. A possible method is to use of a limited number of typical orientations. Work is still going on to find an optimal method.

We present sensitivity results in a 1D configuration and validation results of 3D simulations compared to diurnal cycle and spatial distribution of triggers in Fiolleau et al. (2007) results.

Reference: Fiolleau T., R. Roca, J.Y. Grandpeix and J. Yu (2007): Analysis of deep convection intiation over West Africa from MSG infrared data. In AMMA second International Conference, Karlsruhe, Germany, 26-30 November 2007.