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A parametrization of third order moments for the convective boundary layer

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In the Convective Atmospheric Boundary Layer (CABL), the mean potential temperature ($\overline{\theta}$) gradient follows usually two tendencies; unstable in the lower part and slighty stable in the upper half part. This means that in the latter zone, the heat transport is countergradient. To retranscribe with one dimension (1D) simulation, this countergradient zone of $\overline{\theta}$, this study has introduced the Third Order Moments (TOMs) into a turbulent scheme of relatively low order, with turbulent kinetic energy equation but without prognostic equation for other second order moments. In fact, the countergradient term is formally linked to these TOMs; $\overline{w'^2\theta'}$ and $\overline{w'\theta'^2}$. Then, a simple parametrization of those TOMs have been proposed and validated on several cases of dry CBL, using LES simulations done with MESO-NH model. The analyse of the runs shows that TOMs are responsible for the inversion of the $\overline{\theta}$ gradient in the higher part of the CBL. More accurately, budget analyses show that main terms responsible for turbulent fluxes and variances are now well reproduced.