

Deep convection versus shallow circulations: who wins?

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The replication of the coastline a few kilometers inland by convective clouds is the best visual expression of the interactions between convection and shallow circulations, in this case the sea breeze. Shallow circulations are confined in the planetary boundary layer and are generated by density anomalies resulting from heterogeneous heating in the boundary layer. Besides sea breezes, cold pools, soil moisture-induced circulations, or lately radiatively driven shallow circulations, where the heating anomaly results from heterogeneous radiative cooling, are all examples of such shallow circulations. In this talk, I'll investigate and quantify the interactions between convection and shallow circulations. The aim is to understand whether, when and which shallow circulation controls the distribution of convection. I'll start from idealized problems, derive some simple concepts to quantify the interactions, and apply the derived concepts to observations as well as to understand model biases.