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A new conceptual picture of the transition layer

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In the trades, the transition layer above the mixed layer top has long been observed and simulated. Yet its origins remain little investigated. The transition layer is often associated with an about 150 m deep layer between the mixed and subcloud layer tops that acts as a barrier to overlying convection. Using extensive observations from the EUREC4A field campaign, we propose a new conceptual picture of the transition layer. Strong jumps at the mixed layer top, as expected from cloud-free convective boundary layers, are only found rarely and when they occur, they tend to occur in large cloud-free areas. We show that small clouds with their bases above the mixed layer top maintain the transition layer, in analogy with the maintenance of the trade-wind inversion by deeper clouds. Small clouds appear to play an active role in vertical mixing, which is based on the ability to engender evaporative cooling when these small clouds detrain within the transition layer.

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