Interactive comment on “Conceptual model of diurnal cycle of stratiform low-level clouds over southern West Africa”

Response to reviewer 1

Dear reviewer 1,

We thank the reviewer for his/her suggestion which led to clarify the contribution of the different terms to the total local cooling.

Measurements examining the low-level stratocumulus clouds over southern West Africa are summarized and integrated into a conceptual model that explains the general diurnal cycle and three different scenarios for the breakup of the clouds. The paper follows a clear, logical path that incorporates all available data processed with proper methods to support the proposed conceptual model. It is well-written with appropriate figures. Publication is recommended. The only suggestion pertains to the interpretation of the horizontal advection and how it relates to the local cooling. Horizontal advection is just a transport of some atmospheric property by the motion of air, so it represents moving air around but it cannot actually cool the air to saturation. Since measurements are at a fixed point (Eulerian), it is necessary to include horizontal advection. However, the cooling rate following a parcel is driven by diabatic processes or through adiabatic cooling associated with upward vertical motion. Those are the processes that are actually responsible for cooling air to saturation. So, it would be good to acknowledge and discuss this caveat since it is stated several times that horizontal advection contributes to 50% of the total cooling. It might be helpful to refer to the cooling as ‘local cooling’ to reflect the idea that cooling is at a fixed point.

We agree with reviewer that it would be clearer to precise “total local cooling” instead of “total cooling”. This has been changed at different places in the text. Also, the term TOT in equation 1 in the manuscript is now defined as local tendency of the potential temperature. We think that a discussion about this would puzzle the reader since everything is clearly defined in equation (1). Equation (1) is an Eulerian equation and the term TOT (partial derivative of potential temperature with respect to time) is the cooling at fixed point which is the local cooling. Because it is the local cooling, the equation includes the horizontal and vertical advection terms.