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On the use of moist entropy in the parameterization of the moist turbulence.

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It is possible to compute the moist entropy on the basis of a barycentric atmospheric representation accounting for the dependency of C_p, C_v and R on the composition of the moist air parcels (suspended and falling condensates included).

Those analytical calculations deliver a few interesting basic pieces of information:

- the moist entropy can be converted into the definition of a moist entropic potential temperature θ_s in a way that makes it completely independent of the reference parameters needed for obtaining an absolute entropy value (this is the novelty with respect to past approaches);

- there exists a good approximation of θ_s that can be expressed as a combination of both Betts' so-called moist-conservative variables (θ_l, q_t), leading to $(\theta_s)_1 = \theta_l \exp(\Lambda\, q_t)$, with the relative weights of the heat and moisture parts depending on a non-dimensional constant Λ of about 5.87 (a term related to the second and third laws of thermodynamics);

- the vertical flux of $(\theta_s)_1$ corresponds to the flux of a modified "liquid-water moist static energy", with an account for all phenomena linked to diffusive as well as precipitating vertical transports;

- and inspection of observed profiles of marine stratocumulus (Sc) reveal a far better homogeneity of $(\theta_s)_1$ (both in the horizontal and in the vertical) than for any proposal made up to now to describe moist entropy conservation in Sc clouds (like for instance θ_l or θ_e).

The presentation will examine the consequences of the above findings on parameterization of moist non-precipitating turbulence, by computing first the saturated and non-saturated adiabatic lapse rates and the associated moist Brunt-Väisälä frequencies, then the associated moist Richardson number, leading to a possible unified view between source and sink terms (like conversion from potential to kinetic energy and irreversible entropy production due to all moist processes).