Convective Triggering Potential & Humidity Index

- References:
  - Findell, K. L., and E. A. B. Eltahir, 2003: Atmospheric controls on soil moisture-boundary layer interactions. Part I: Framework development. *J. Hydrometeor.*, **4**, 552-569, doi: [1525-7541(2003)004%3C0552%3AACOSML%3E2.0.CO%3B2](#).
  - Findell, K. L., and E. A. B. Eltahir, 2003: Atmospheric controls on soil moisture-boundary layer interactions. Part II: Feedbacks within the continental United States. *J. Hydrometeor.*, **4**, 570-583, doi: [1525-7541(2003)004%3C0570%3AACOSML%3E2.0.CO%3B2](#).

- Principle:
  - The combination of two indices is meant to capture both the thermal and moisture contributions to cloud formation and convection and is typically applied to early morning profiles before a daytime boundary layer has penetrated the surface inversion and begun to grow.
  - CTP is defined as the area on a *skew-T log-P* diagram between the atmospheric temperature profile T_{env} and the moist adiabat that intersects the temperature profile 100hPa above the ground T_{MALR} – the integral is performed between 100hPa and 300hPa above the surface:

  $$CTP = R_d \int_{p_s-100hPa}^{p_s-300hPa} (T_{env} - T_{MALR})\, d\ln p$$

  Thus, it is analogous to CAPE but defined within a fixed vertical interval of the profile.
  - Humidity index: $HI_{Low} = (T_{950hPa} - D_{950hPa}) + (T_{850hPa} - D_{850hPa})$, where T is temperature and D is dew point at the specified pressure levels. This can be generalized to, say, 50 and 150hPa above the surface, or similar combinations – the key is a consistent application across space.

- Data needs:
  - Temperature and humidity profiles through the lowest 300hPa (approximately 3 km) of the atmosphere during early morning.

- Observational data sources:
  - Well suited to application to radiosonde profiles, namely where early morning soundings are available, or AMDAR profiles.

- Caveats:
  - The metric quantifies atmospheric potential, or pre-conditioning, and not actual land surface impacts *per se*. In the 2-D phase space of these indices different likely outcomes have been found for the formation of clouds and precipitation over wet versus dry soils, from which "wet soil advantage" versus "dry soil advantage" for convective initiation has been inferred.
  - Categories of feedback regimes defined by Findel and Eltahir (2003a,b) have been found not to be universally applicable (cf. Ferguson & Wood [2011](#); Roundy et al. [2013](#)) and should be considered as loose guidelines.