

Comment on **essd-2021-424**

Anonymous Referee #1

Referee comment on "Sub-mesoscale observations of convective cold pools with a dense station network in Hamburg, Germany" by Bastian Kirsch et al., Earth Syst. Sci. Data Discuss., <https://doi.org/10.5194/essd-2021-424-RC1>, 2022

summary. This manuscript describes the dataset, including instrumentation and network deployment, associated with the FESST@HH experiment designed to study the sub-mesoscale structure of convective cold pools. The authors also present some preliminary analysis of a cold pool event, nocturnal urban heat island, and turbulent temperature fluctuations. The manuscript is well-written, dataset well-described, and the topic relevant to the journal. Some comments are suggested for consideration.

Comments

- The title does not quite represent the manuscript content given that it is not meant to be a detailed analysis of the observed cold pools' sub-mesoscale structure, but rather to describe the dataset and present some preliminary findings on several different topics not only related to cold pools. Re-consideration of the title is suggested.
- L46-48: These statements are not actually correct, re-wording is suggested based on the C3LOUD-Ex reference.
- L95-99 and Fig 3: The APOLLO sensor is smoother overall than the Ultrasonic measurement, which appears to capture higher magnitudes of variability, and the APOLLO sensor's running mean does not always match the running mean of the Ultrasonic sensor (e.g. near minutes 3-4, 7-7.5, 9-10). What could cause these differences? The corresponding text (e.g. L97) seems to skate over the differences that are seen in Fig 3.
- Section 3.1: Does the coverage of sites permit study of land-atmosphere interactions for different land classes? This could be another interesting application of the dataset.
- L247, section 6.1: Can weaker or dissipating cold pools be detected with these data? The criteria of -2K seems somewhat restrictive?
- L254 "deepened" – Re-wording is suggested here, since the dataset does not contain observations of cold pool depth.
- L273: How can there be an expected range of propagation velocities without any observations of cold pool depth? Some additional explanation would be helpful in this section.

- L276-282: The authors could consider dynamic contributions to pressure perturbations in this discussion. The fluctuations in both temperature and pressure for 104PGa shown in Figure 9 are intriguing. Additionally, it is difficult to relate pressure perturbations to the strength of surface-observed cooling because pressure perturbations are also related to the depth of cooling as well as the dynamic contributions. It has been well-known in the literature that pressure perturbations in cold pools are controlled by multiple factors aside from just hydrostatic cooling.
- Figure 10: It would be helpful to indicate the urban and rural stations somehow in panel a, such as by different line styles or thickness.