

Review on manuscript JAMC-D-18-0081 with title “Response of Sea-Breeze to Urbanization in the Pearl River Delta Region”

Urbanization has an important impact on sea breezes. Many efforts have been dedicated by other studies to investigate the effects of urbanization on lake or sea breezes. However, most of the studies were focused on single case and very few of them were able to define any standard parameters to quantify the characteristics of lake or sea breezes. In this study, the authors presented about three-month simulations; they defined several parameters including normal divergence, normal original velocities, etc. to determine starting time, ending time, height, and inland penetration distance. They used the frontogenesis functions to describe the physical processes that govern the sea breeze development. The study provides a more robust method to quantify the urbanization effects on sea or lake breezes. The manuscript is well written and all the figures and tables support the conclusions presented. However, more detailed information and deep analyses are needed. A major revision is suggested to improve the manuscript. More specific comments can be found below.

1. Statistical evaluations of the model simulations for the base runs with all available observational data are needed to ensure that all the numerical experiments completed were based on the reasonable base run simulations.
2. A brief description of the model and model configurations used in this study is required. For instance, what is the horizontal grid-spacing used in the simulations?
3. A typical case study is helpful for better understanding how urbanization affects characteristic parameters of sea breezes.
4. Lines 77-82: How are the normal divergent velocity ( $V_D$ ) and normal original velocity ( $V_O$ ) calculated for the coastal shorelines *AG* and *DE* since they have different orientations? The positive values are used to define the starting and ending time, what directions do the positive and negative values represent in these two different coastal shorelines *AG* and *DE*? As illustrated in Figure 2.a, do they use the same coordinates in the calculations for these two costal lines?
5. Lines 102-103: The case numbers presented here are different from those listed in Table 2.
6. A summary table is needed to show how many sea-breeze cases were observed during the studying period? Was the model able to capture all the sea-breeze occurrences? How did the model perform on simulating those sea-breeze events?

7. Figure 11 should be presented in Section 2 of Methods rather than in Section 5. This will help readers understand why and how the authors use frontogenesis function related variables to elucidate the physical mechanism of sea breeze development.
8. Tables 1-3 are too simple. The details of each case during the studying period are useful. Some deep analyses are needed.
9. Table 4: Does the inland penetration distance represent the maximum distance of inland penetration? If yes, please specify explicitly.
10.  $f_H$  represents the pumping ability defined as  $f_x$  at the height of  $H_{SB}$ . But  $f_x$  denotes the integrated  $V_O$  over height (Line 87). Is  $m^3/s$  the correct unit for pumping ability (see Table 4)?
11. Line 162: Where is the mountain located? Please show the location in Figure 1. How are the sea-breeze and mountain-valley circulations interacted to each other? How are the sensitivity results affected by the mountain-valley circulations when the urbanization effects are discussed for the coastal lines  $DE$ ?
12. Very few studies used the solenoid term to investigate the sea breeze. This is new at least for me since I did not see this term used in other lake or sea-breeze studies. What is the mathematics equation or formula that can be used to describe the relationship between the solenoid and temperature gradient? How does this term change with the geographical location such as latitude?
13. Please spell out the full names of FG1, FG2, FG3, and FG4. Please provide mathematics formula for these four factors.
14. Line 61: Please add the locations of the cities mentioned here in Figure 1.
15. The background map is not clear. It is better to show the location of these coastal lines in horizontal plane map such as Figure 1.
16. In the caption of Figure 4, vertical velocity and potential temperature were mixed up.
17. The writing of captions of Figures 2-7 needs further improvement.

18. In Figures 2.b, 5, 6, 7, 8, 9, and 10, the directions of positive and negative distances need a clear specification.