This manuscript examines several typical dust storm events over the Taklimakan Desert during spring and summer 2024 using gradient observations from two stations, together with ERA5 reanalysis and HYSPLIT backward trajectories. The topic is worthwhile, particularly because in situ observations in this region remain limited and the dataset used here is relatively valuable. The analysis of transport pathways, dynamic and thermal backgrounds, and dust-flux characteristics is potentially useful. Overall, the manuscript has merit and publication value, especially if the methodological description and technical issues are further improved.

Major issues:

a) The manuscript suggests that spring dust events are mainly controlled by dynamic forcing, whereas summer events are more closely related to thermal forcing, and it further identifies the 12-6 h period before onset as a key prediction window. At present, however, this interpretation is still supported mainly by descriptive evidence, and more direct diagnostic analysis would be needed to make the argument more convincing.

b) The conclusion that 12-6 h represents a key time window is drawn largely from the contrasts in variance and range shown in Tables 2 and 3. However, the individual events do not show a fully consistent pattern, and some still display marked variability at shorter timescales. As a result, the broader applicability of this conclusion is not yet fully clear.

c) Section 2.5 provides the general framework for calculating Q, F, and u*, but several important methodological details remain insufficiently explained. In particular, the treatment of F, the assumptions used in estimating u*, the source of z_0, the wind-speed averaging timescale, and the consideration of stability effects should be clarified, as these directly affect the reproducibility and reliability of the results.

d) The manuscript states that BSNE samples were collected and weighed after each dust event, indicating that the measurements represent cumulative mass over a sampling interval. In contrast, the calculation of F requires a clearly defined concentration difference between two levels, together with the corresponding

average wind speed and u* over the same period. At present, the sampling interval, event-based integration procedure, temporal consistency among sampling heights, and the matching with meteorological data are not sufficiently clear.

e) The manuscript attributes the mid-level anomalies at TZ and the enhanced summer variability of F to secondary dust entrainment from surrounding dunes or to stronger topographic effects. However, these interpretations are not supported by sufficiently direct evidence, such as terrain parameters, wind-direction conditions, local turbulence characteristics, or surrounding geomorphological information.

Technical issues:

a) The presentation of formulas and units is not sufficiently rigorous. The definition of c and the use of mixed units for u*, u, z, and z0 should be reviewed carefully to ensure dimensional consistency.

b) HYSPIT should be corrected to HYSPLIT.

c) X Station and XT Station are used inconsistently and should be unified throughout the manuscript.

d) Table 1 contains obvious typographical errors such as XT(and XT).

e) The heading of Table 3 still refers to Variance of ΔP24h and related terms, which does not match the temperature-difference content of that table.

f) The presentation of Figures 10–12 should be improved, especially with regard to image resolution, uniform font sizes, and the overly small subtitles in Figures 10 and 11.