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Influence of various criteria on identifying the springtime tropospheric ozone depletion events (ODEs) at Utqiaġvik, Arctic

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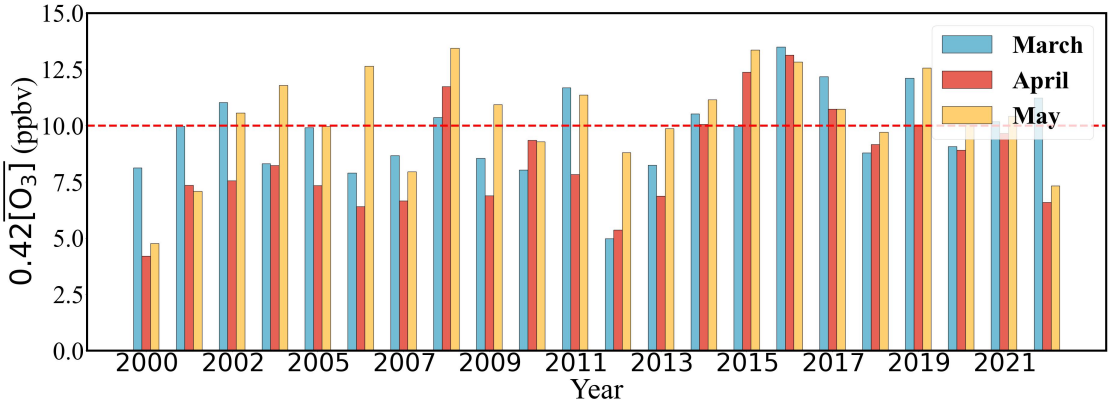
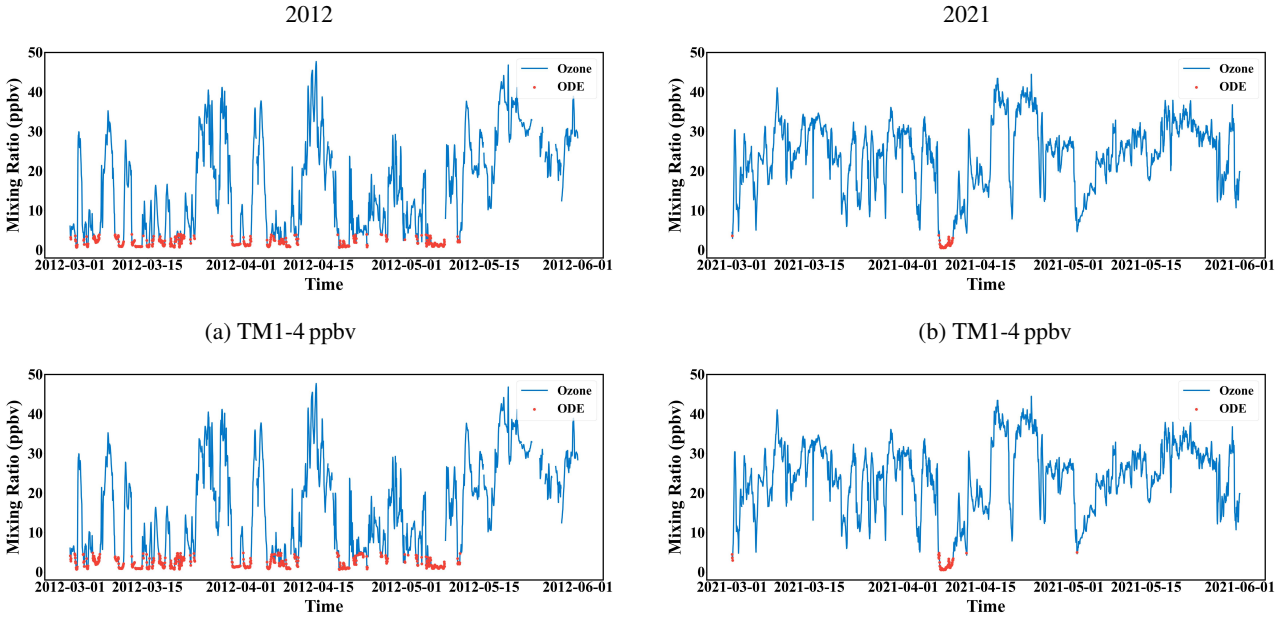


Figure S1. Comparison of the value of $0.42\overline{[O_3]}$ against the 10 ppbv constant (the red dashed line) for spring months (March, April, and May) from the year 2000 to 2022.



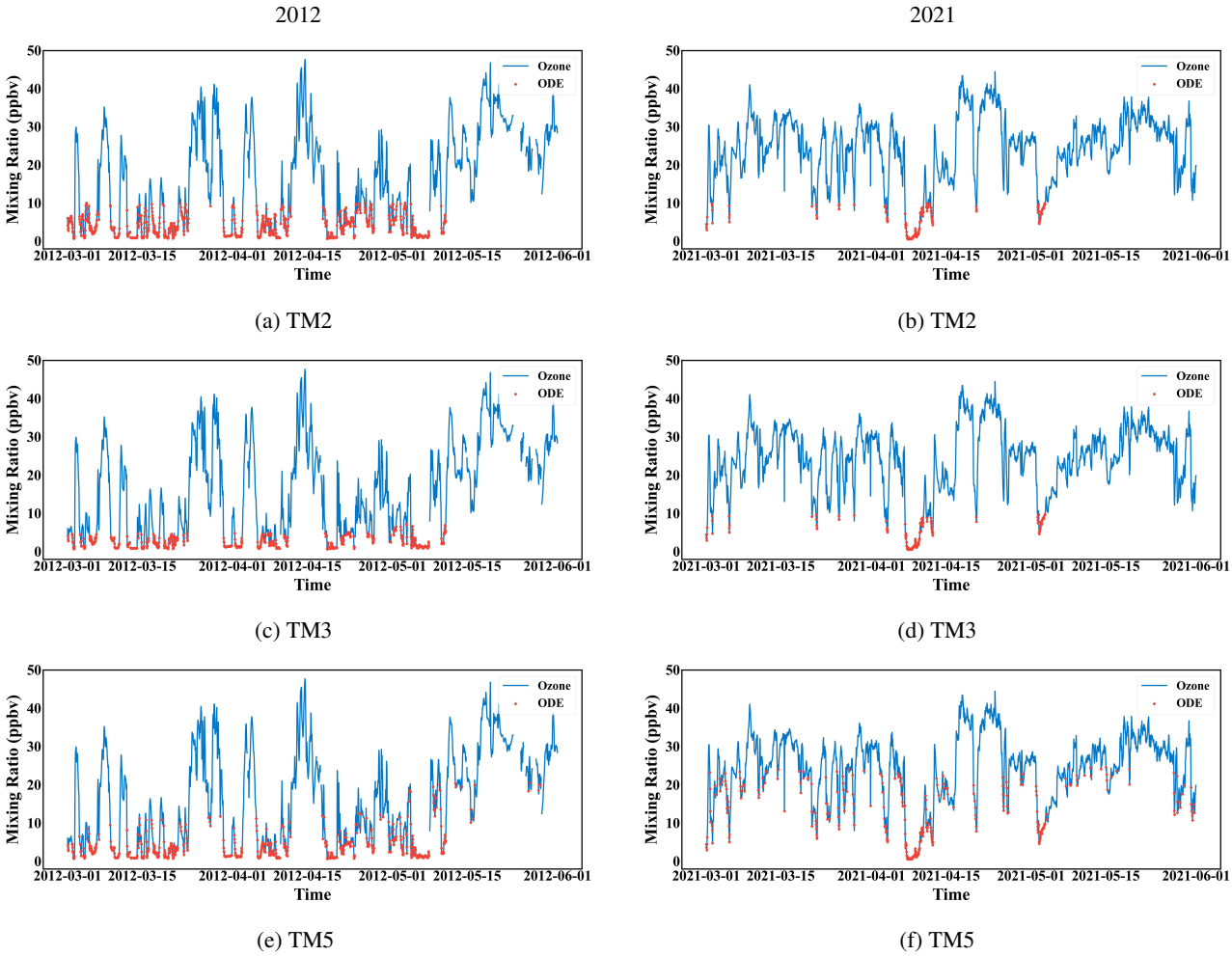
(a) TM1-4 ppbv

(b) TM1-4 ppbv

(c) TM1-5 ppbv

(d) TM1-5 ppbv

Figure S2. Screened results for the years 2012 and 2021 using TM1-4 ppbv and TM1-5 ppbv criteria. The blue curve represents the hourly time series of the ozone mixing ratio, and the red dots denote the ODE hours identified by the respective criteria.



(a) TM2

(b) TM2

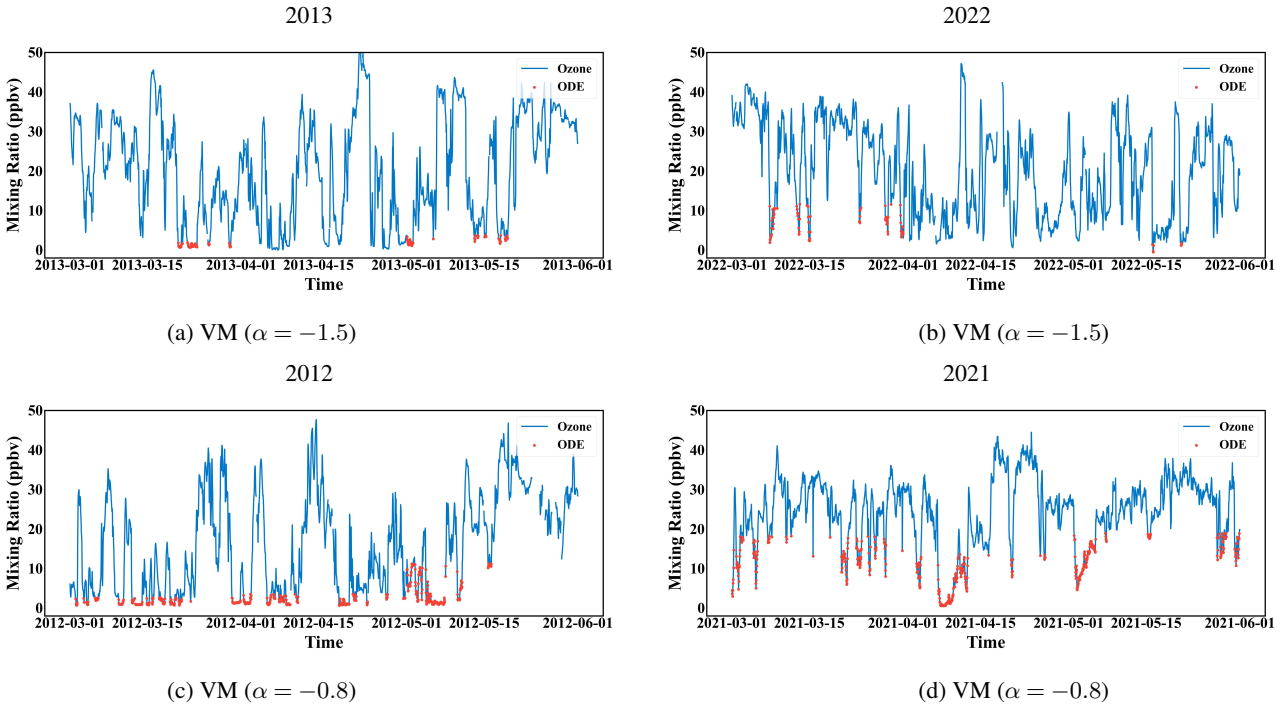
(c) TM3

(d) TM3

(e) TM5

(f) TM5

Figure S3. Screened results for the years 2012 and 2021 using different criteria (TM2, TM3 and TM5). The blue curve represents the hourly time series of the ozone mixing ratio, and the red dots denote the ODE hours identified by the respective criteria.



(a) VM ($\alpha = -1.5$)

(b) VM ($\alpha = -1.5$)

(c) VM ($\alpha = -0.8$)

(d) VM ($\alpha = -0.8$)

Figure S4. Screened results for different year using the modified VM criteria with different values of α (-1.5 and -0.8). The blue curve represents the hourly time series of the ozone mixing ratio, and the red dots denote the ODE hours identified by the criterion.

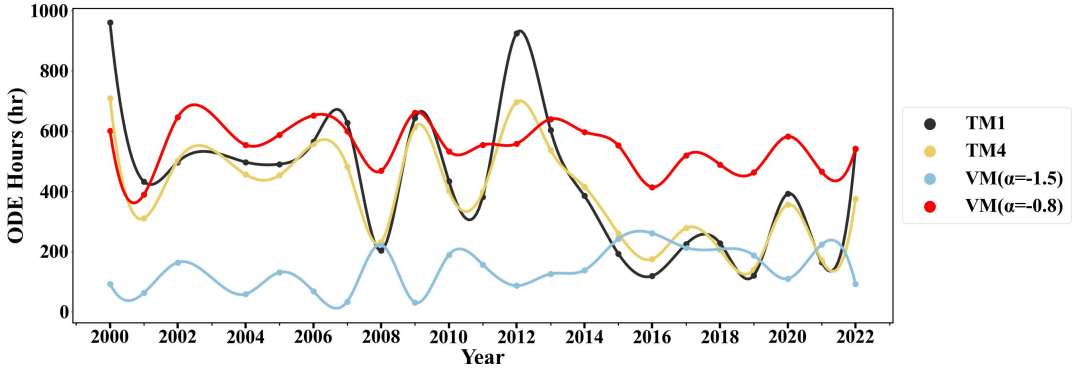


Figure S5. Number of ODE hours identified by different criteria from 2000 to 2022. VM ($\alpha = -1.5$) denotes that α in the VM criterion ($[O_3]_i - \overline{[O_3]} < \alpha \cdot \sigma$) is set to -1.5, and VM ($\alpha = -0.8$) denotes that α is set to -0.8.

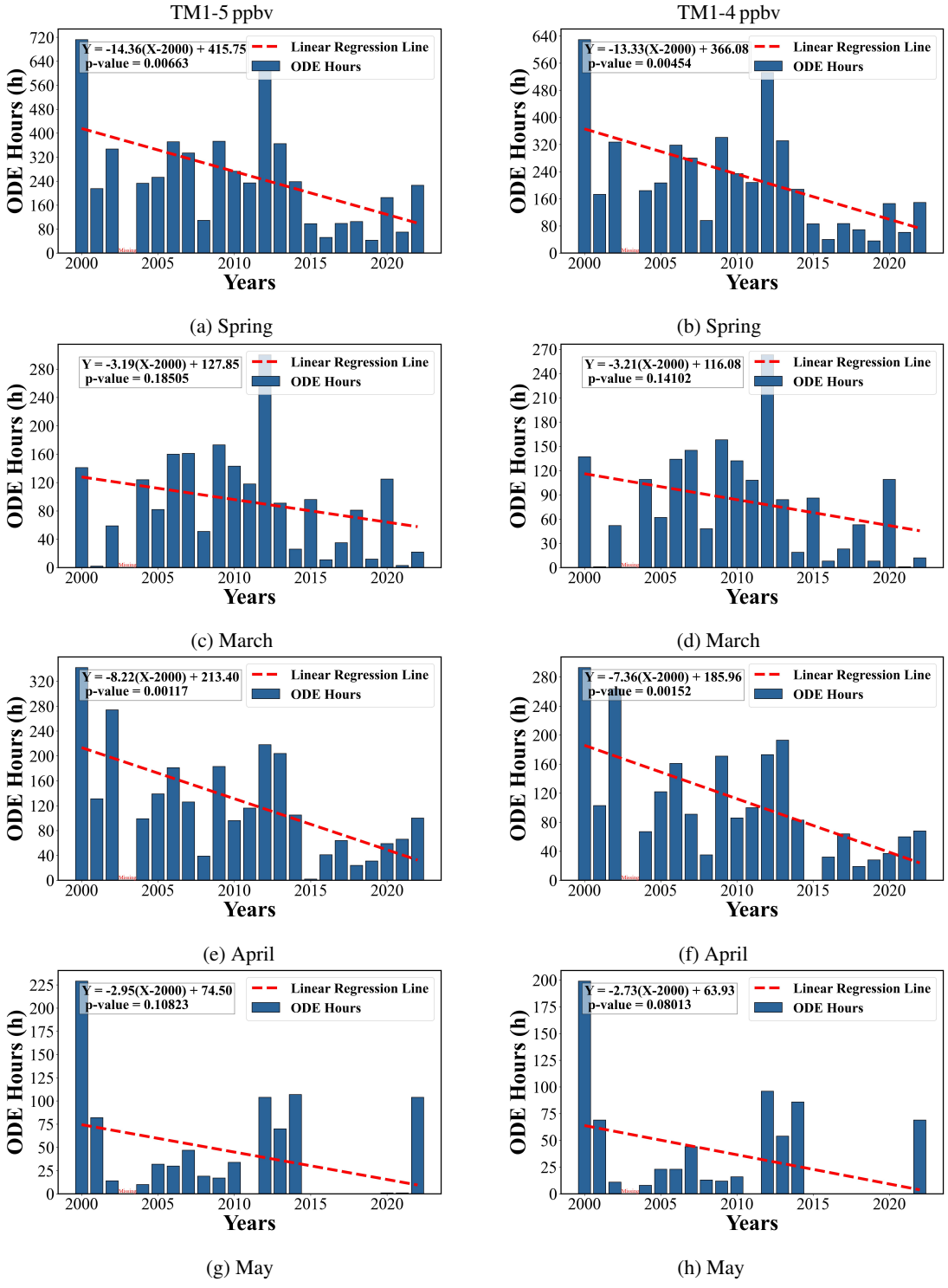
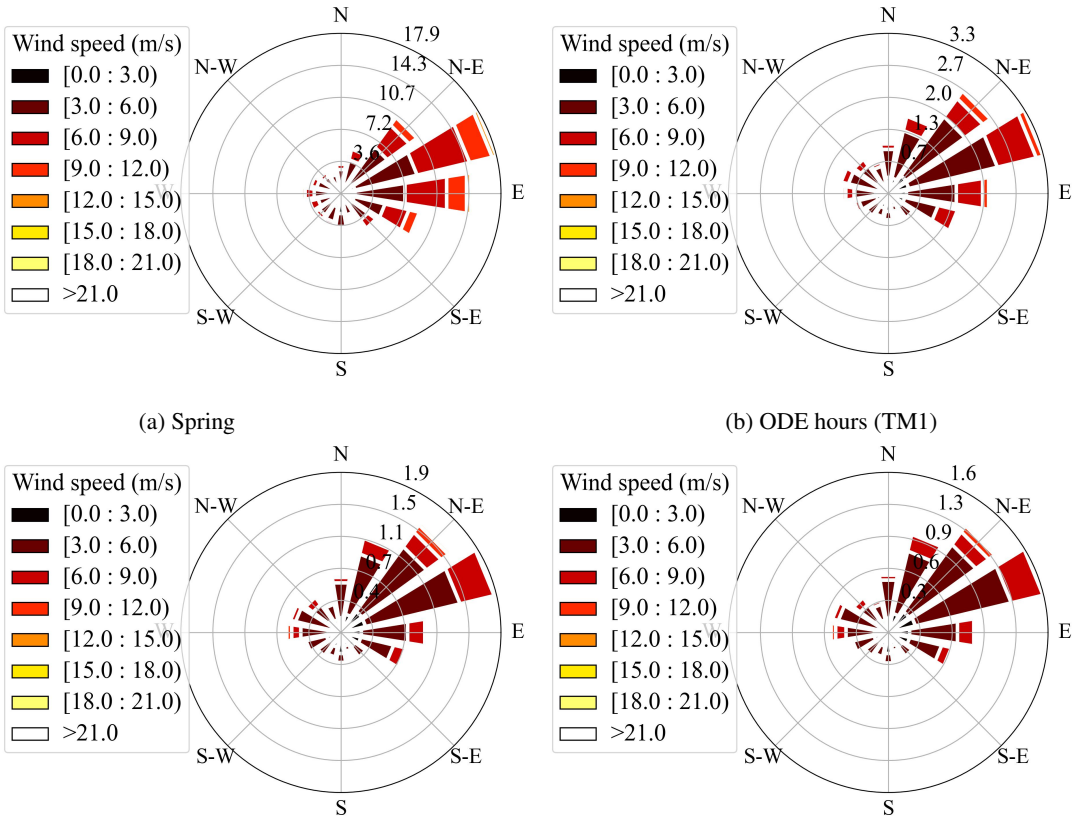


Figure S6. Yearly variability of ODE hours at the BRW Station, identified by two criteria with different constant thresholds (5 ppbv and 4 ppbv). Subplots (a), (c), (e) and (g) show the ODE hours screened by the TM1-5 ppbv method for the whole spring, March, April and May, respectively, and subplots (b), (d), (f) and (h) show the hours screened by the TM1-4 ppbv method. Red dashed lines represent linear regressions of the ODE hours. The regression equations and p-values are also given.



(a) Spring

(b) ODE hours (TM1)

(c) ODE hours (TM1-5 ppbv)

(d) ODE hours (TM1-4 ppbv)

Figure S7. Wind rose diagrams during (a) the investigated spring seasons from 2000 to 2022, and ODE time periods identified by (b) TM1, (c) TM1-5 ppbv and (d) TM1-4 ppbv.

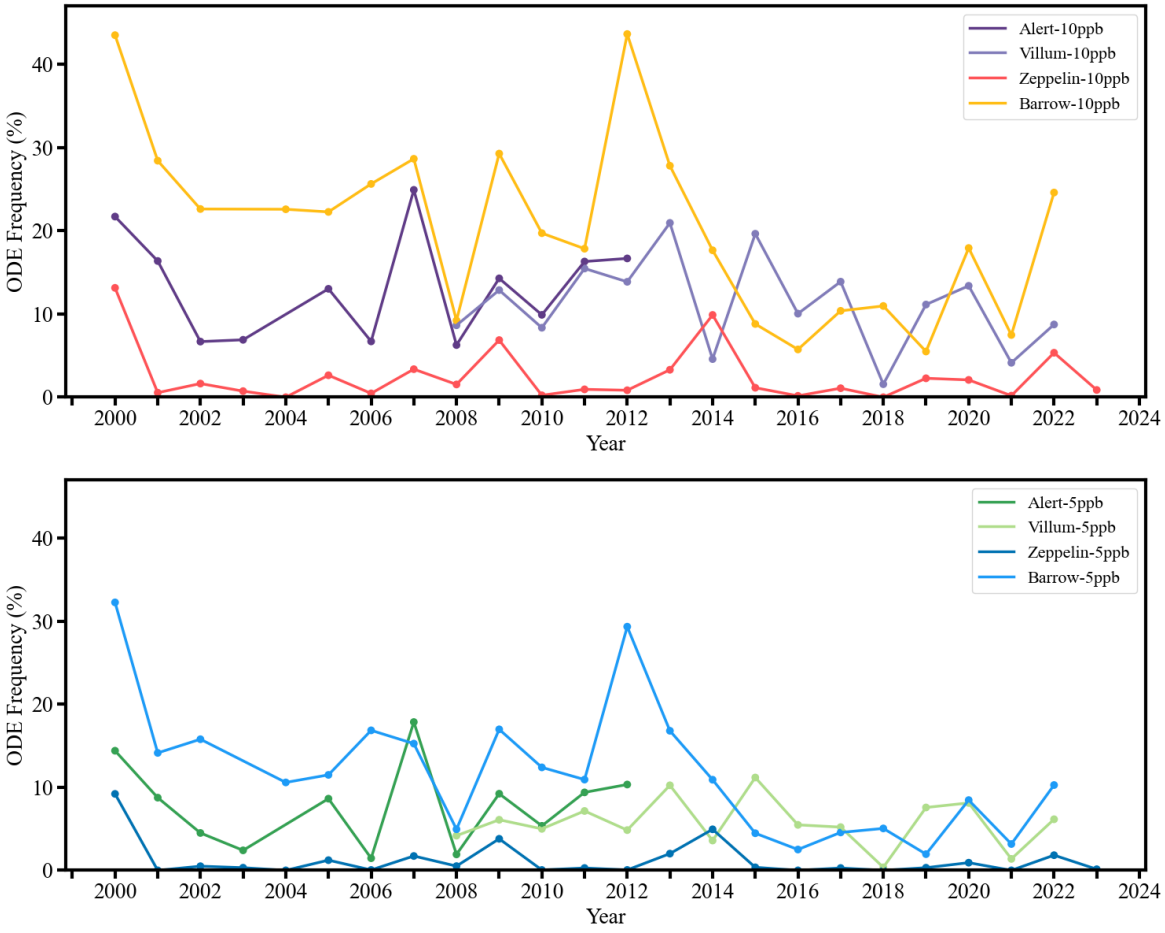


Figure S8. Occurrence frequency of ODEs at different stations (Alert, BRW, Villum, and Zeppelin). The occurrence frequency is calculated as the ratio of ODE hours to total hours, in which the ODE hours are identified using the TM1 and TM1-5 ppb screening criteria.