

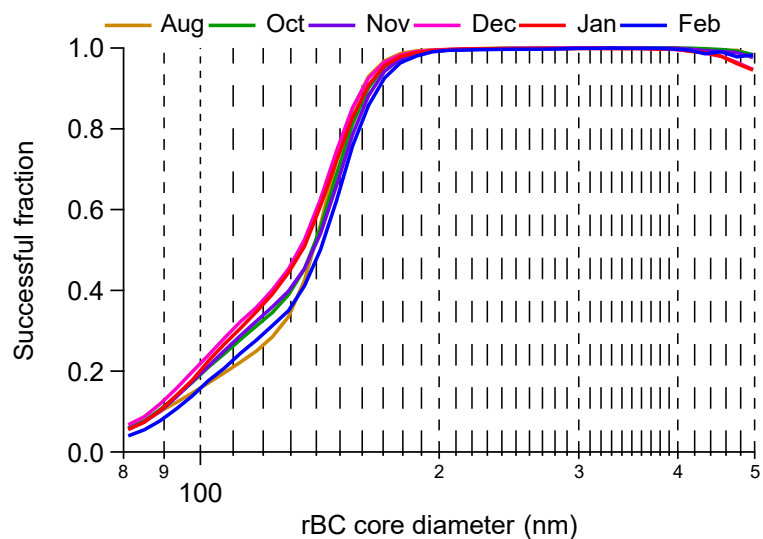


Figure. S1 The LEO successful fraction as a function of BC core diameter.

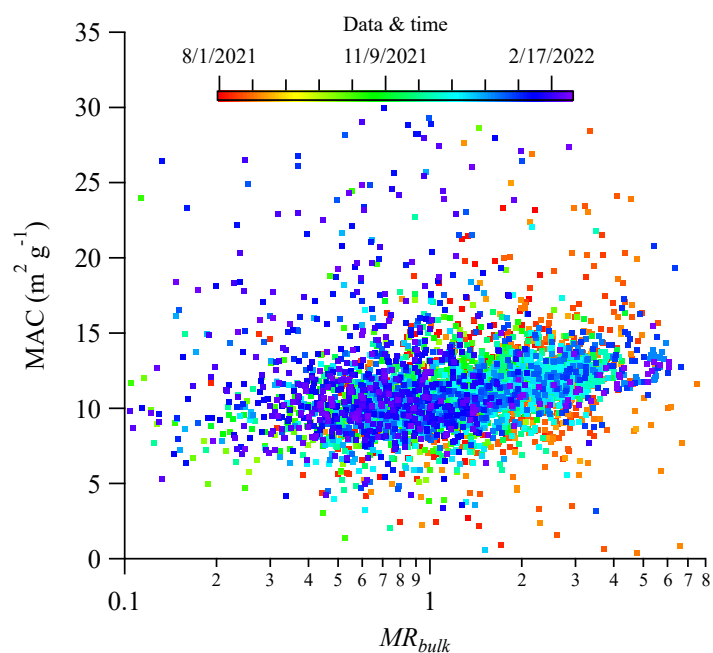


Figure. S2 Relationship of MAC and MR_{bulk} . The colour bar indicated the data and time.

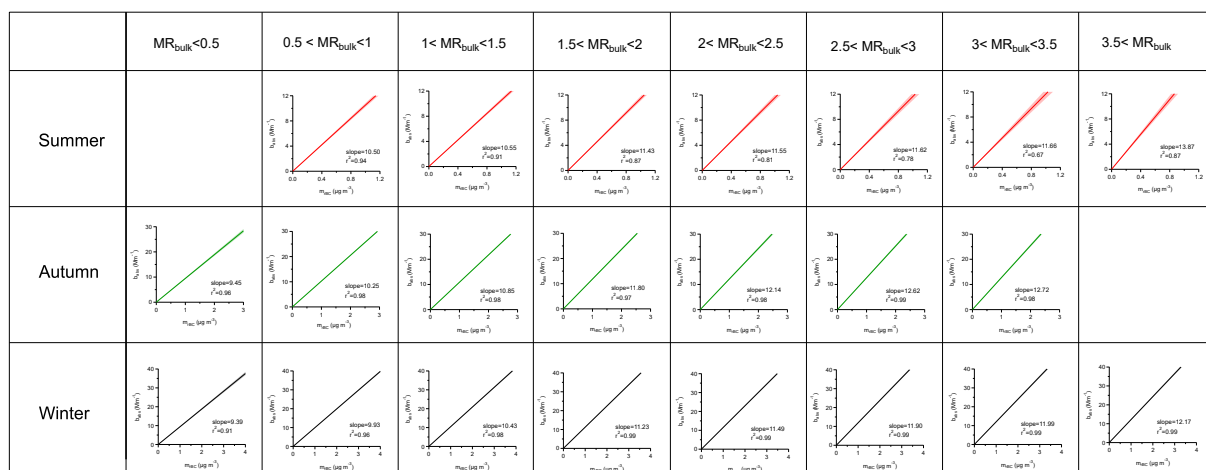


Figure. S3 b_{abs} versus m_{rBC} for each MR_{bulk} bin in different seasons.

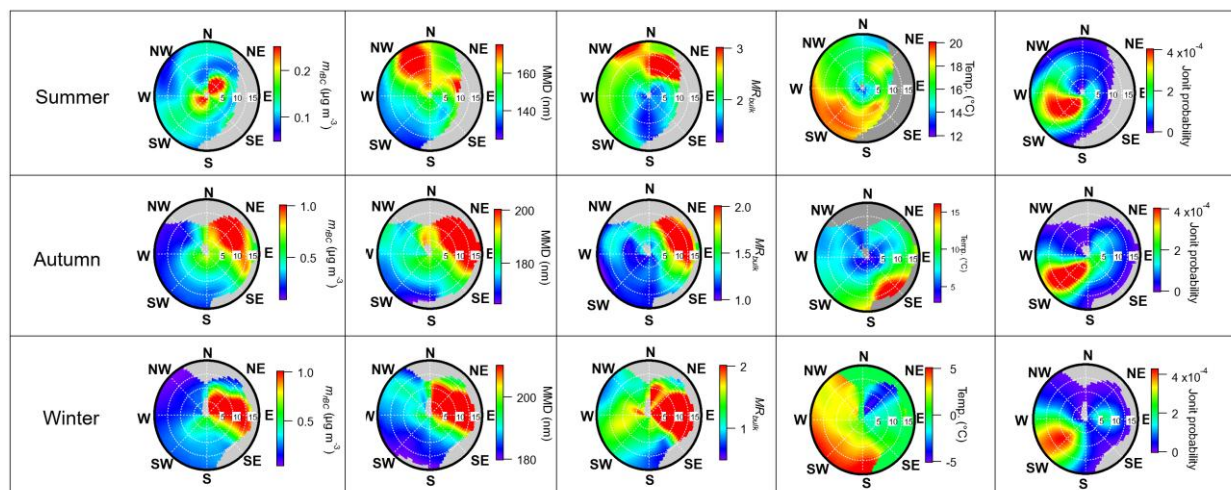


Figure.S4 wind analysis on mass concentrations, MMD, and MR_{bulk} of rBC and joint probability distribution of wind speed and wind direction.

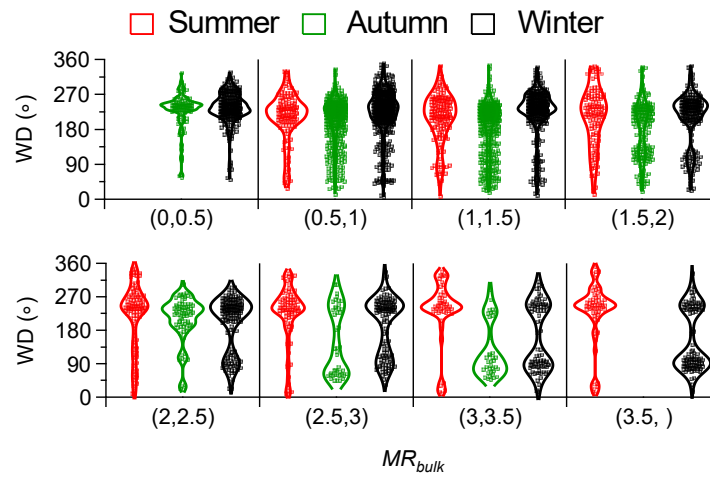


Figure. S5 Violin plots of wind direction (WD, °) across MR_{bulk} intervals for each season. The width of each violin reflects the kernel density of WD values, with broader sections indicating wind directions that occurred more frequently. Individual measurements are overlaid as scatter points.

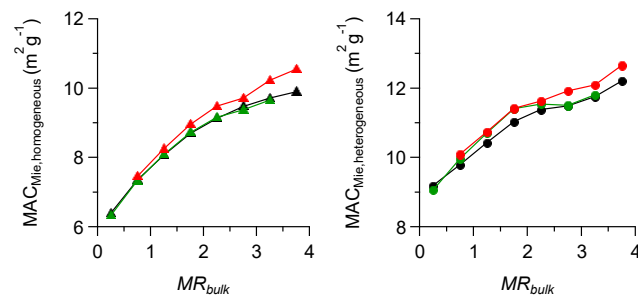


Figure.S6 Seasonal comparison of $MAC_{Mie,homogeneous}$ and $MAC_{Mie,heterogeneous}$