Announcement of a topic for:

Seminar Research ☐
Seminar Methods ☐
Master Theses **x** (please mark one or more)

Topic	Unraveling the Complexity of Black Carbon: Heterogeneities and Mixing State
Release Date	21 August 2023
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Description:	Black carbon (BC), a ubiquitous component of atmospheric aerosols resulting from incomplete combustion, is an intricate and important contributor in climate change. BC particles can vary widely due to differences in their emission sources, atmospheric aging, and transport processes. BC can interact with other aerosols during its formation and transport, leading to complex particle mixtures. This influences its optical properties, atmospheric lifetime, and impact on climate. Moreover, the heterogeneity of BC, encompassing variations in size and shape, further adds to its multifaceted behavior in the atmosphere. This study places a central emphasis on two critical aspects: the heterogeneity of BC particles and their mixing state. The research goal of the proposed master's thesis is to understand the characteristic patterns observed between the particle size distributions and BC mass concentration correlations (BC- size correlation spectrums), to provide a novel BC related approach for aerosol classification. The study will utilize the in-situ observations of BC mass concentrations and particle size distribution measurements from several field stations across the globe and also validated with Single particle soot photometer measurements from selected TROPOS research stations. In addition to this, the study will also investigate how BC's mixing state, heterogeneity, and volatility influence its atmospheric behavior and interactions.
Literature:	**1.** Romshoo, B., Müller, T., Pfeifer, S., Saturno, J., Nowak, A., Ciupek, K., Quincey, P. and Wiedensohler, A.: Optical properties of coated black carbon aggregates: Numerical simulations, radiative forcing estimates, and size-resolved parameterization scheme, Atmospheric Chemistry and Physics, 21(17), 12989–13010, 2021. **2.** Romshoo, B., Pöhlker, M., Wiedensohler, A., Pfeifer, S., Saturno, J., Nowak, A., Ciupek, K., Quincey, P., Vasilatou, K., Ess, M. N., Gini, M., Eleftheriadis, K., Robins, C., Gaie-Levrel, F., and Müller, T.: Importance of size representation and morphology in modelling optical properties of black carbon: comparison between laboratory measurements and model simulations, Atmos. Meas. Tech., 15, 6965–6989, 2022. **3.** Chenjie Yu, Dantong Liu, Kurtis Broda, Rutambhara Joshi, Jason Olfert, Yele Sun, Pingqing Fu, Hugh Coe, and James D. Allan, Characterising mass-resolved mixing state of black carbon in Beijing using a morphology-independent measurement method, Atmos. Chem. Phys., 20, 3645–3661, 2020. **4.** Sun, C., Adachi, K., Misawa, K., Cheung, H. C., Chou, C. C.-K., Takegawa, N, Mixing state of black carbon particles in Asian outflow observed at a remote site in Taiwan in the spring of 2017. Journal of Geophysical Research: Atmospheres, 125, e2020JD032526. 2020.