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# Mixing state and hygroscopicity of black carbon aerosol during severe haze events in the North China Plain

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Black carbon (BC) is the most important light-absorbing species in the atmosphere and has a strong positive direct radiative forcing. Recent studies found that BC-containing particles may also modify the structure of planetary boundary layer and thus enhance haze pollution, especially in densely populated areas, for instance, in China. It is however difficult to quantify these effects due to their complex mixing state, hygroscopicity and the high spatial variability of concentration. During an intensive field campaign conducted in the North China Plain in a cold season, the mass size distribution and mixing state of BC was measured with a single particle soot photometer (SP2). During a severe haze event, the BC mass concentration exceeded 15 ug m-3. Stemming from the strong aging process under high relative humidity condition, freshly emitted BC particle was observed to turn into internally mixing within a short time scale. To understand the variation of the hygroscopicity of BC during its aging process, the hygroscopic growth factor of BC-containing particles was measured with a combination of a hygroscopic tandem differential mobility analyzer and a SP2. The particle hygroscopic growth factor was found to be correlated with the volume fraction of BC. During haze events, a fraction of the more-hygroscopic mode particles was observed to contain BC cores; while a minor fraction of the hydrophobic mode particles contained no BC.