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A study of the impact of synoptic weather conditions and water vapour on aerosol-cloud relationships

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We study here the relationships between Aerosol Optical Depth (AOD) and cloud cover (CC) over 3 major urban clusters of China under different sea-level pressure (SLP) and water vapor (WV) regimes using a decade (2003 - 2013) of MODIS observations. Over all urban clusters, and for all sea level pressure regimes, AOD is found to increase with CC, thus pointing out that the CC dependence on AOD is not due to meteorological co-variability. WV is found to have a stronger impact on CC than AOD. This impact is more pronounced at high aerosol load than at low aerosol load. Hence, studies of AOD-CC relationships based on satellite data, might greatly overestimate the AOD impact on CC in regions where AOD and WV have similar seasonal variations, while they might greatly underestimate the AOD impact on CC in regions where AOD and WV have opposite seasonal variations.