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Land - Atmosphere interaction during heat wave events in the Pearl River Delta region

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Atmospheric heat waves are one of the natural disasters that have become more frequent in recent years, with dire consequences for human health, economy, and ecosystem. Recent studies have shown that these events are accentuated by both regional and local climatic factors. The importance of understanding the synergy between heat waves and urban heat island during these events becomes very evident as they have far reaching implications in our health, economy and climate. This study focused on the Pearl River Delta (PRD) region which is one of the most industrialized, urbanized and polluted regions of China, thus making the research critical. Daily maximum temperature, ozone (O_3) and respiratory suspended particle (RSP) during the summer and early autumn months (June to October) from 2009 – 2011 were used for heat wave episode identification. A total of 8 cases were identified and the method used ensured that both meteorology and air quality variables exceeded the defined threshold. The Weather Forecasting and Research with Chemistry (WRF-Chem) version 3.7.1, an integrated meteorology-chemistry three-domain nested model will be used to downscale the meteorology and air quality from regional scale (27 km) to local scale (3 km). The study examined the energy dynamics during the events, especially on how they affect and control the temperature regimes during the event. This will help to increase our understanding of the effect of land cover in hot and humid climate, as contrasting urban and vegetated landscapes will also give more information on the synergistic interactions between the urban heat Island and heat waves. The results indicate that five of the eight heat wave cases had a significant positive synergistic interaction between UHI and HWs, and the interaction was influenced by local factors such as the heat wave intensity, duration and cloud cover. The result also showed the synergy was closely related to available and stored energy, with its peaks occurring at the same time as the maximum insolation. This therefore shows that the peak UHI and HW intensity are day time phenomenon for our region, but also the peak of the interaction. The other three cases were found to have lower heat wave intensity and hence no synergy between HW and UHI.