

Luo, Y., R. Xia, and J. C. L. Chan, 2020: Characteristics, physical mechanisms, and prediction of pre-summer rainfall over South China: research progress during 2008-2019. *J. Meteor. Soc. Japan*, **98**, 19-42.

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Plain Language Summary: Pre-summer rainy season (April to mid-June) over South China is characterized by high intensity and frequent occurrence of heavy rainfall in the East Asian monsoon region. This review describes recent progress in the research related to such a phenomenon, including the temporal and spatial characteristics of the rainfall, new insights into the relevant multiscale processes governing initiation and development of rainstorms, and convection-permitting modeling studies aiming at improving the quantitative precipitation forecast skill.

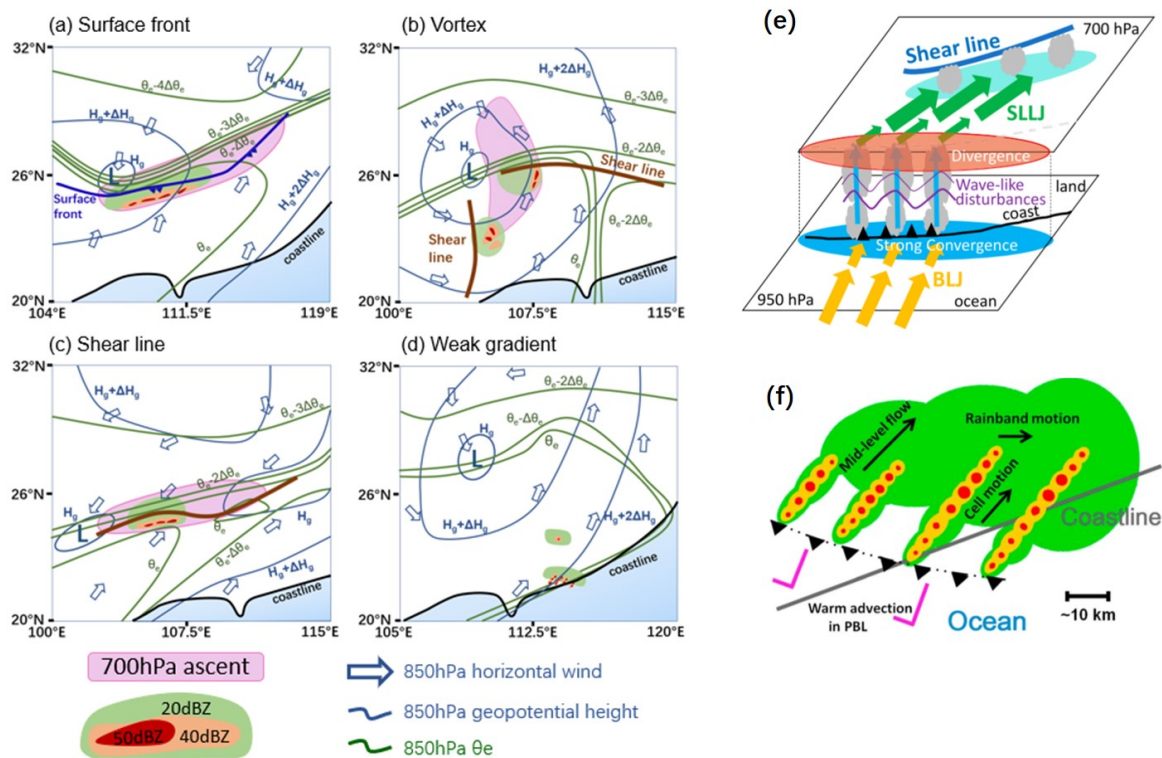


Figure 1. Schematic diagrams of environmental conditions in the mid- and lower troposphere at the time of the extreme hourly rainfall over South China during the pre-summer rainy season, including the: (a) surface front, (b) low-level vortex, (c) low-level shear line, and (d) weak gradient types. Schematic diagrams depicting (e) the convective initiation near the coast associated with double LLJs and (f) the back building, echo training, and rainband training associated with a type of extreme rain-producing mesoscale convective systems during their mature stage.

- Average rainfall distribution, diurnal variation of rainfall, and climatology of extreme hourly precipitation are described including a comparison before and after the monsoon onset over South China Sea.
- Association between the heavy rainfall and multi-scale factors, such as SSTs over tropical oceans, synoptic disturbances, mesoscale processes, and microphysical features, are discussed.
- NWP studies summarized include data-assimilation impact studies, evaluation and improvement of cloud microphysics parameterizations, and development of ensemble forecast technique.