Decadal Cooling in the Indian Summer Monsoon After 1997/1998 El Niño and Its Impact on the East Asian Summer Monsoon

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Observational evidences are presented to show a significant atmospheric diabatic cooling in the Indian summer monsoon (ISM) region after the 1997/1998 El Niño. This study investigates the cause of this decadal cooling and its impact on the East Asian summer monsoon (EASM). The cooling in the ISM is primarily due to the deficient large-scale condensation and enhanced long-wave radiative cooling. After 1997/1998, the abnormal sea surface temperature warming in the western Pacific induces enhanced local convection. This enhanced convection strengthens the Walker-type circulation and leads to moisture divergence, subsidence, and decreased cloudiness over the ISM, which in turn causes the diabatic cooling. The decadal cooling of the ISM, on the other hand, may affect the EASM through development of an anomalous local meridional cell over the EASM region and through enhancement of the Eurasian wave train pattern. Consequently, rainfall over the ISM and northern EASM has decreased concurrently, while the southern EASM rainfall has increased after 1997/1998. A linear baroclinic model reproduces the Eurasian wave pattern induced by the ISM heat sink. Understanding the impacts of abrupt climate changes in ASM would contribute to the improvement on the seasonal prediction in changed climate systems.

Key words: 1997/1998 El Niño, Indian summer monsoon, East Asian summer monsoon