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Modulation of the Tibetan Plateau Snow Cover on the ENSO Teleconnections: From the East Asian Summer Monsoon Perspective

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The East Asian summer monsoon (EASM) may exhibit rather large variability between years characterized by the same ENSO phase. Such inconsistency reduces the EASM predictability based on ENSO. Results in this study show that the Tibetan Plateau snow cover (TPSC) exerts a modulating effect on ENSO teleconnections and ENSO significantly correlates with the EASM only during the reduced TPSC summers. Three-dimensional circulation structures are examined to manifest that the typical ENSO signals in reduced TPSC summers tend to be stronger than in excessive TPSC summers. Numerical and theoretical evidences indicate that the anomalously reduced TPSC can force positive geopotential height anomalies at the upper troposphere and weaken the jet streams across eastern Asia and northwestern Pacific. Governed by such basic state zonal flows, the extratropical Rossby wave response to the ENSO forcing usually has a larger amplitude and pronounced westward development. In such case, ENSO extends its influences to the eastern Asia and enhances its connection with the EASM.