



East Asian winter temperature anomalies modulated by the circumglobal teleconnections and the coupling with Eurasian teleconnections

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The impacts of circumglobal teleconnections (CGT) on East Asian winter temperature anomalies are studied. Defined as the first two leading modes of the meridional wind anomalies in the upper-troposphere, CGT is found closely related to the East Asian near-surface temperature anomalies during winter. For the days assigned to the first mode of CGT (CGT1), significant cold temperature anomalies appear over a large area of East Asia. By contrast, cold anomalies with weaker amplitude are seen over limited southern areas during the days related to the second mode (CGT2). The difference can be explained by the large-scale circulation conditions modulated by these two modes. Under CGT1, the East Asian Trough and Siberian High are strengthened, which forms a favorable circulation background for a cold East Asia. The circulation anomalies related to CGT2 generally suppress the large-scale cold air invasion into East Asia, but with localized cooling effect over the southern area. Further, based on the Monte Carlo method, potential coupling between the CGT and three kinds of Eurasian teleconnections is investigated, i.e. the Eurasian (EU), Scandinavian (SCAND) and East Atlantic/West Russia (EAWR) teleconnections. Significant cooccurrence is identified between the events of CGT1 and EU/EAWR teleconnections, as well as between the CGT2 and all the three kinds of Eurasian teleconnections. It reveals that the cooling effects over East Asia under CGT1 are significantly modulated by its cooccurrence with both the EU and EAWR teleconnections, while the impacts of CGT2 are mainly modulated by the SCAND teleconnection. Therefore, the combined effects from the coupling of the CGT and Eurasian teleconnections are important for the East Asian winter variability.