



## **The influence of QBO on MJO prediction skill in the S2S models**

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The recent studies have shown that Madden-Julian Oscillation (MJO) is significantly modulated by the stratospheric Quasi-Biennial Oscillation (QBO). In general, boreal-winter MJOs become more stronger during the easterly phase of QBO (EQBO) than the westerly phase (WQBO). In this study, such finding is applied to the latest operational models, which participated in the WCRP/WWRP Subseasonal-to-Seasonal (S2S) prediction project, to examine the stratospheric influence on the MJO prediction skill. All models show higher MJO prediction skills during EQBO winters than during WQBO winters. Based on a bivariate anomaly correlation coefficient of 0.5, the enhancement of MJO prediction skill during EQBO winters is up to 10 days. This enhancement is largely insensitive to the initial MJO amplitude especially when initial MJO convection is located in the Maritime Continent and Western Pacific. It is argued that QBO-dependent upper-tropospheric circulation anomalies play a key role in determining such an enhancement. This result indicates that the MJO prediction skill is sensitive to the stratospheric mean state, highlighting the importance of the stratospheric processes and the related upper-tropospheric circulations in the operational S2S prediction.