



## **Response of the Pacific Walker circulation to anthropogenic warming and internal variability**

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Climate models predict a weakening of the atmospheric overturning circulation in response to anthropogenic warming that is primarily manifest as a weakening of the Pacific Walker cell. In contrast, surface pressure observations and reanalysis datasets suggest that the Pacific Walker circulation has strengthened over the satellite era. In this study, regarding this discrepancy, the impacts of anthropogenic warming and internal variability on the Pacific Walker circulation are examined by analyzing satellite observations along with a large ensemble of climate model simulation. The satellite-observed changes are found to suggest a strengthening of the Pacific Walker circulation. However, unlike reanalysis datasets, the satellite observations indicate anomalously high convective activity over the Philippines Sea and the northwestern part of the Indian Ocean rather than over the maritime continent and the equatorial western Pacific. Furthermore, it is found that some ensemble members reproduce a large part of the observed changes, whereas others forced with the same forcing exhibit a modest weakening of the Pacific Walker circulation. These findings suggest that internal variability has played a dominant role in the recent strengthening of the Pacific Walker circulation.