

Journal of Geophysical Research Atmospheres

Supporting Information for

**The Lifecycle of New Zealand Atmospheric Rivers and Relationship with the
Madden-Julian Oscillation**

Hamish D. Prince¹, Peter B. Gibson², and Nicolas J. Cullen³

¹University of Wisconsin Madison, Department of Atmospheric and Oceanic
Sciences, USA

²National Institute of Water and Atmospheric Research, NZ

³University of Otago, School of Geography, NZ

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Figures S1 to S5

Median genesis centroid location for damage percentiles

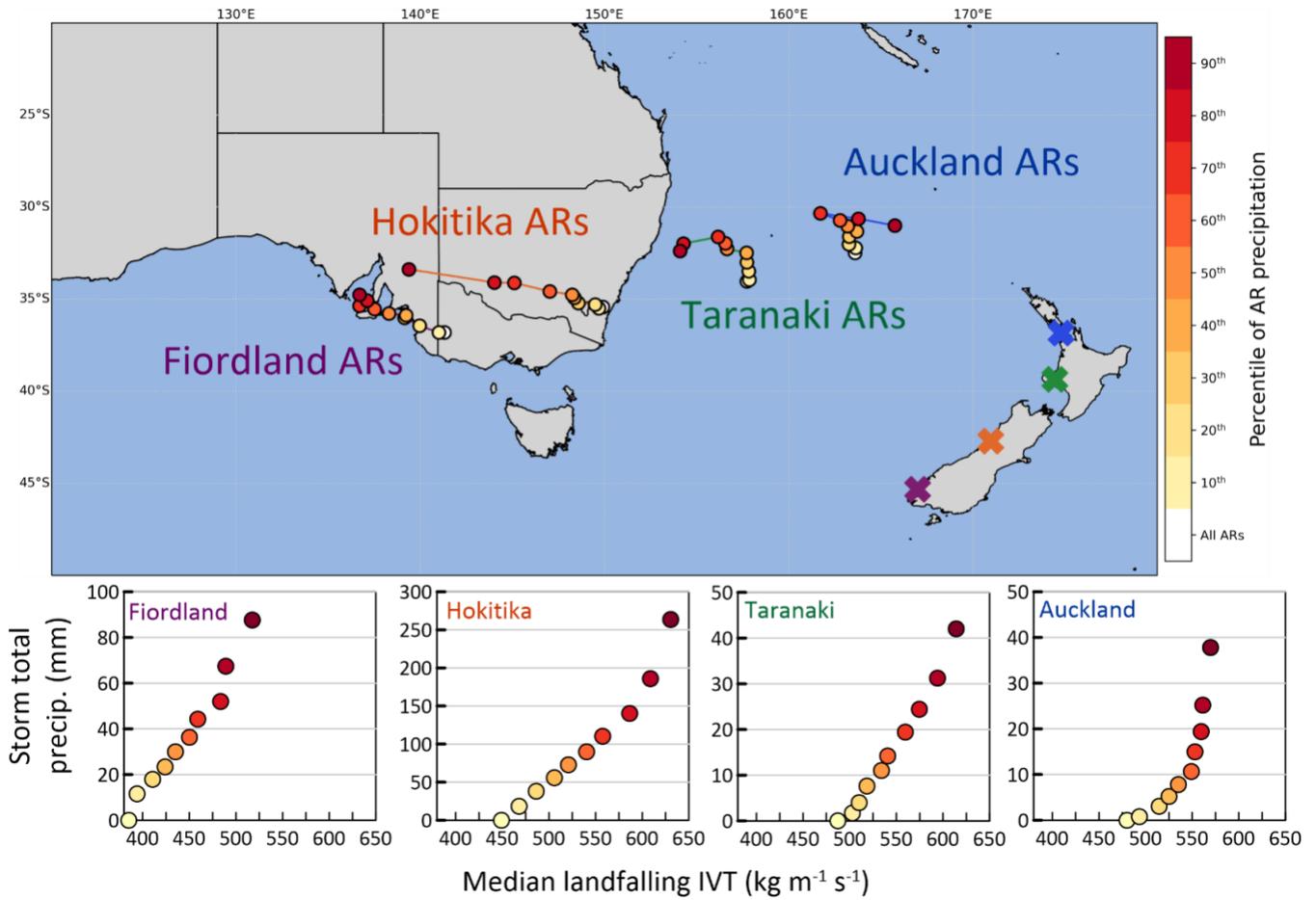


Figure S1. (upper) Median genesis location for ARs that make landfall at each weather station separated by precipitation percentile. (lower) The relationship between median landfalling IVT and storm total precipitation at the four weather stations.

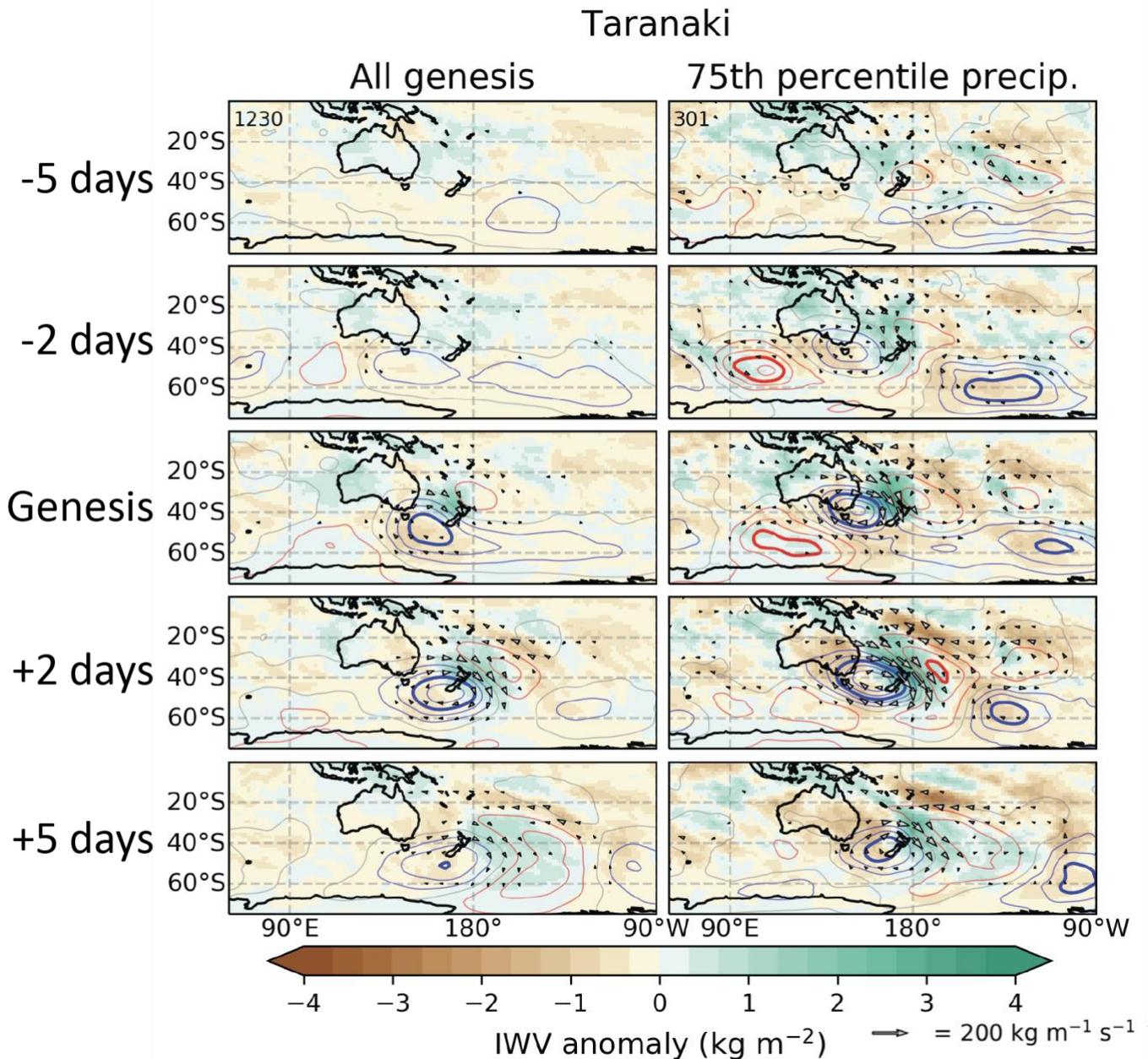


Figure S2. Synoptic-scale composites (of the same properties as Figure 7) on the day of genesis and 2 and 5 days preceding and following the genesis of ARs that make landfall in Taranaki for all ARs (left) and those that produce precipitation exceeding the 75th percentile (right).

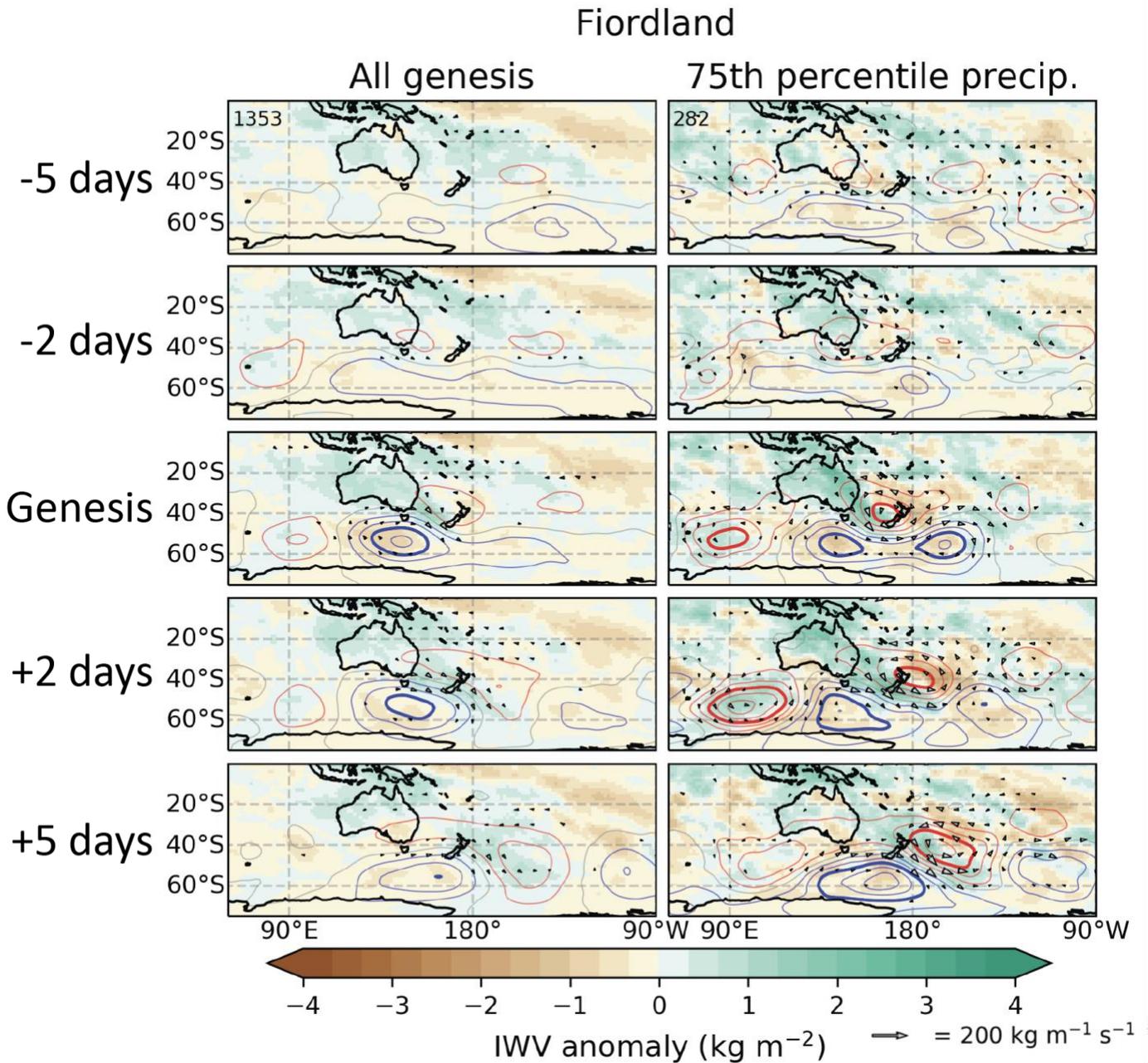


Figure S3. Synoptic- scale composites (of the same properties as Figure 7) on the day of genesis and 2 and 5 days preceding and following the genesis of ARs that make landfall in Fiordland for all ARs (left) and those that produce precipitation exceeding the 75th percentile (right).

All MJO

NZ AR MJO

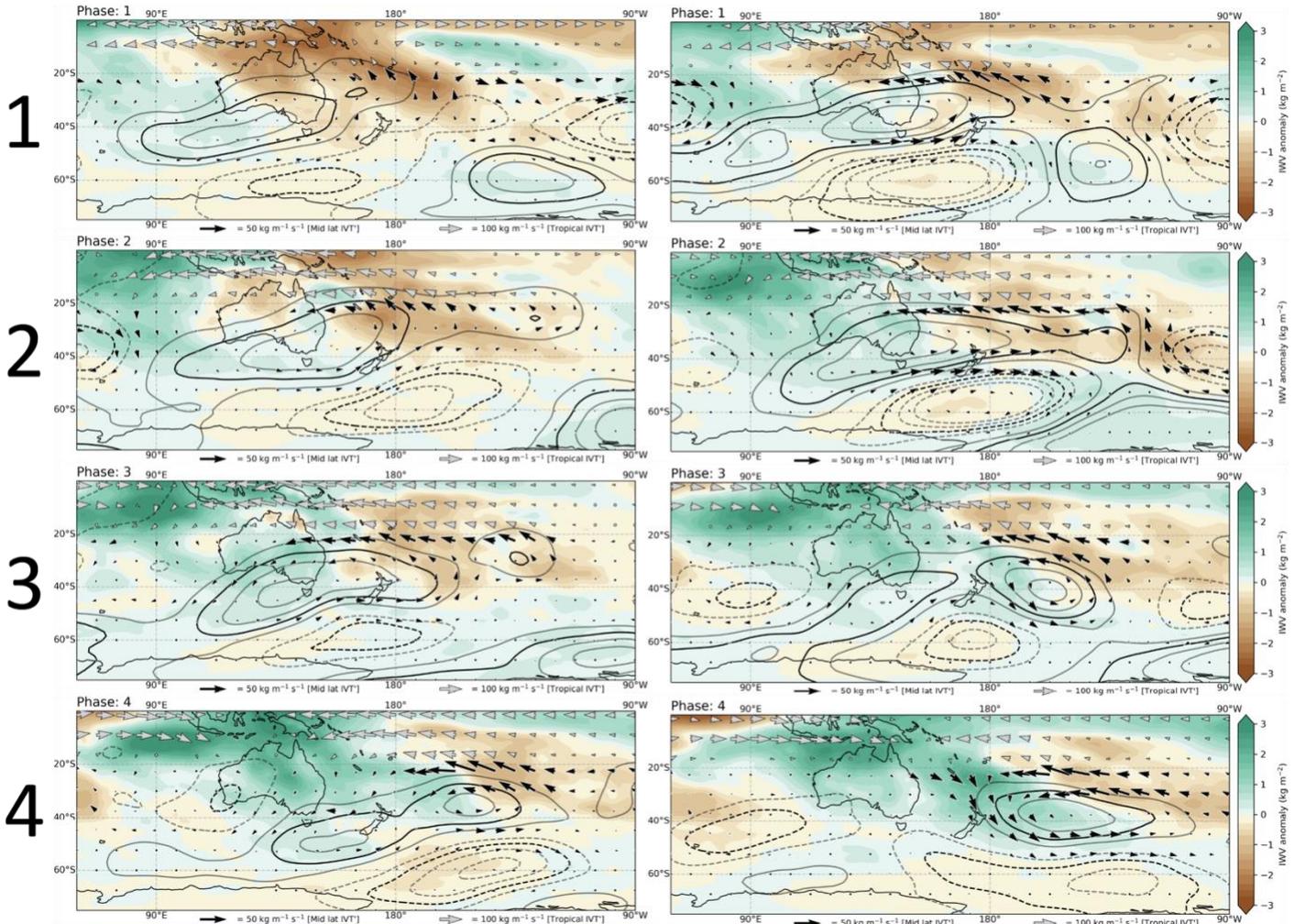


Figure S4. Atmospheric composites during MJO phases (left) and landfalling New Zealand ARs during MJO phase (right) of vertically integrated water vapor (IWV; green and brown), 500 hPa height anomalous (black 5 m contours, 10 m in bold) and vapor flux vector anomaly (arrows). Composites and anomalies are calculated from 10-day averaged starting from day of MJO phase or AR genesis during an MJO phase. The vapor flux anomalies are separated into tropical (gray arrows) and midlatitude vapor flux anomalies due to the difference in scale with the midlatitude vapor flux anomalies bring half the magnitude for the same scale.

All MJO

NZ AR MJO

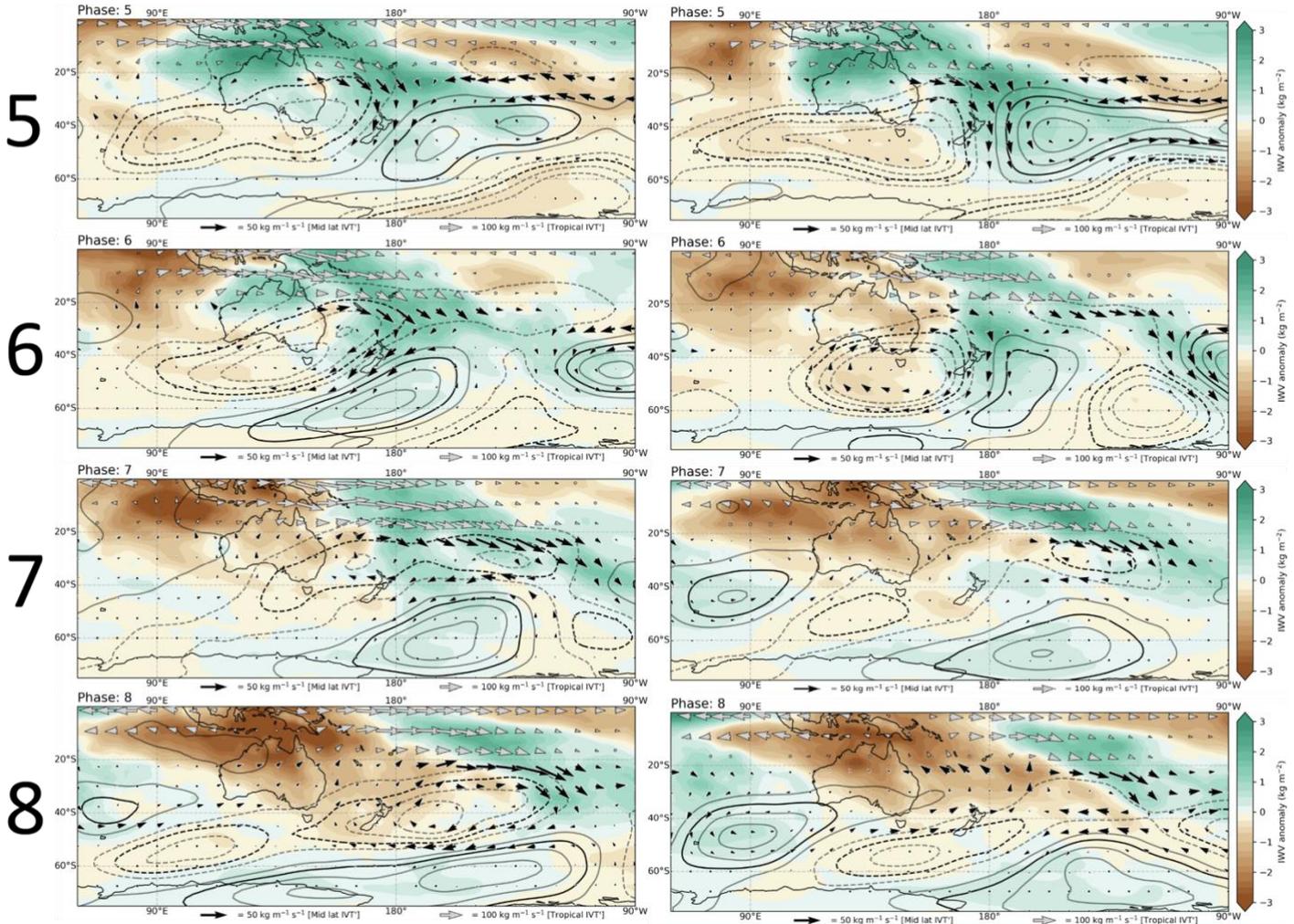


Figure S5. Atmospheric composites during MJO phases (left) and landfalling New Zealand ARs during MJO phase (right) of vertically integrated water vapor (IWV; green and brown), 500 hpa height anomalous (black 5 m contours, 10 m in bold) and vapor flux vector anomaly (arrows). Composites and anomalies are calculated from 10-day averaged starting from day of MJO phase or AR genesis during an MJO phase. The vapor flux anomalies are separated into tropical (gray arrows) and midlatitude vapor flux anomalies due to the difference in scale with the midlatitude vapor flux anomalies bring half the magnitude for the same scale.