

Supplementary material for

**Genesis locations of the costliest atmospheric rivers impacting the western
United States**

**Hamish D. Prince^{*}, Peter B. Gibson, Michael J. DeFlorio, Thomas W. Corringham,
Alison Cobb, Bin Guan, F. Martin Ralph and Duane E. Waliser**

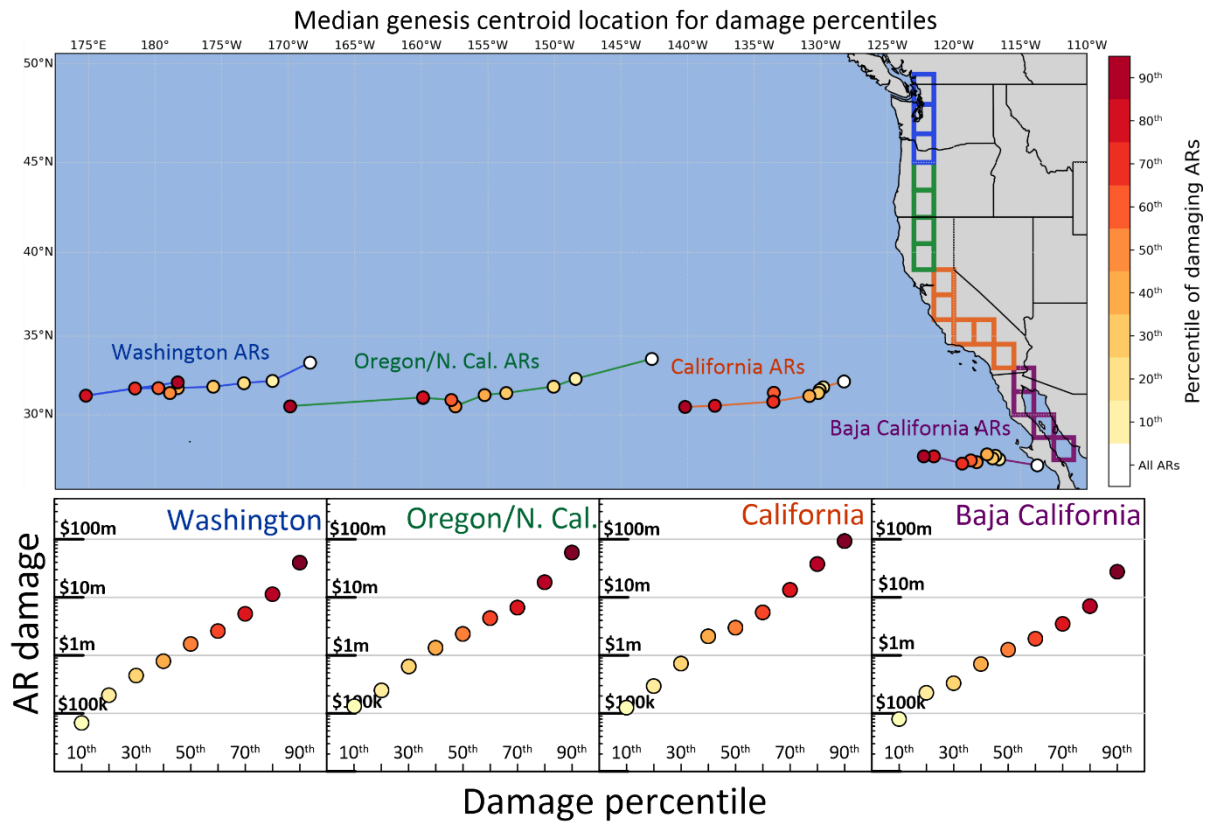
**Corresponding author: Hamish Prince, prince.hamishd@gmail.com*

The document includes:

Supplementary Figure S1. Median genesis centroid locations

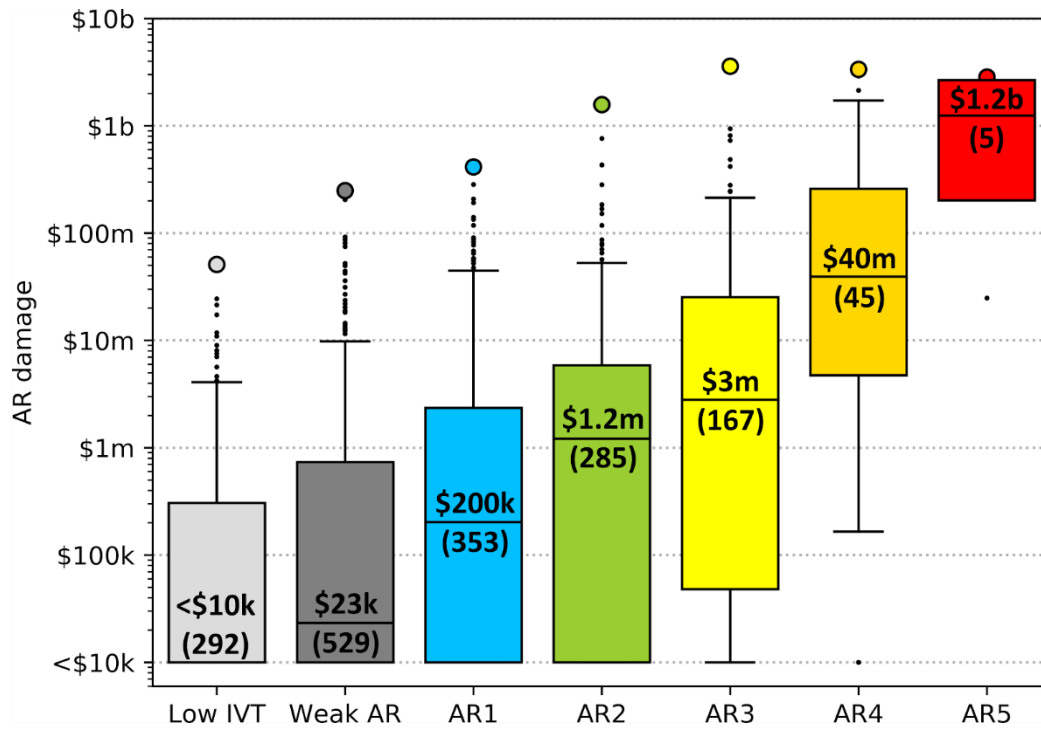
Supplementary Figure S2. Ranked AR damages on U.S. West Coast

Supplementary Figure S3. Schematic of damaging AR genesis objects and associated
atmospheric conditions

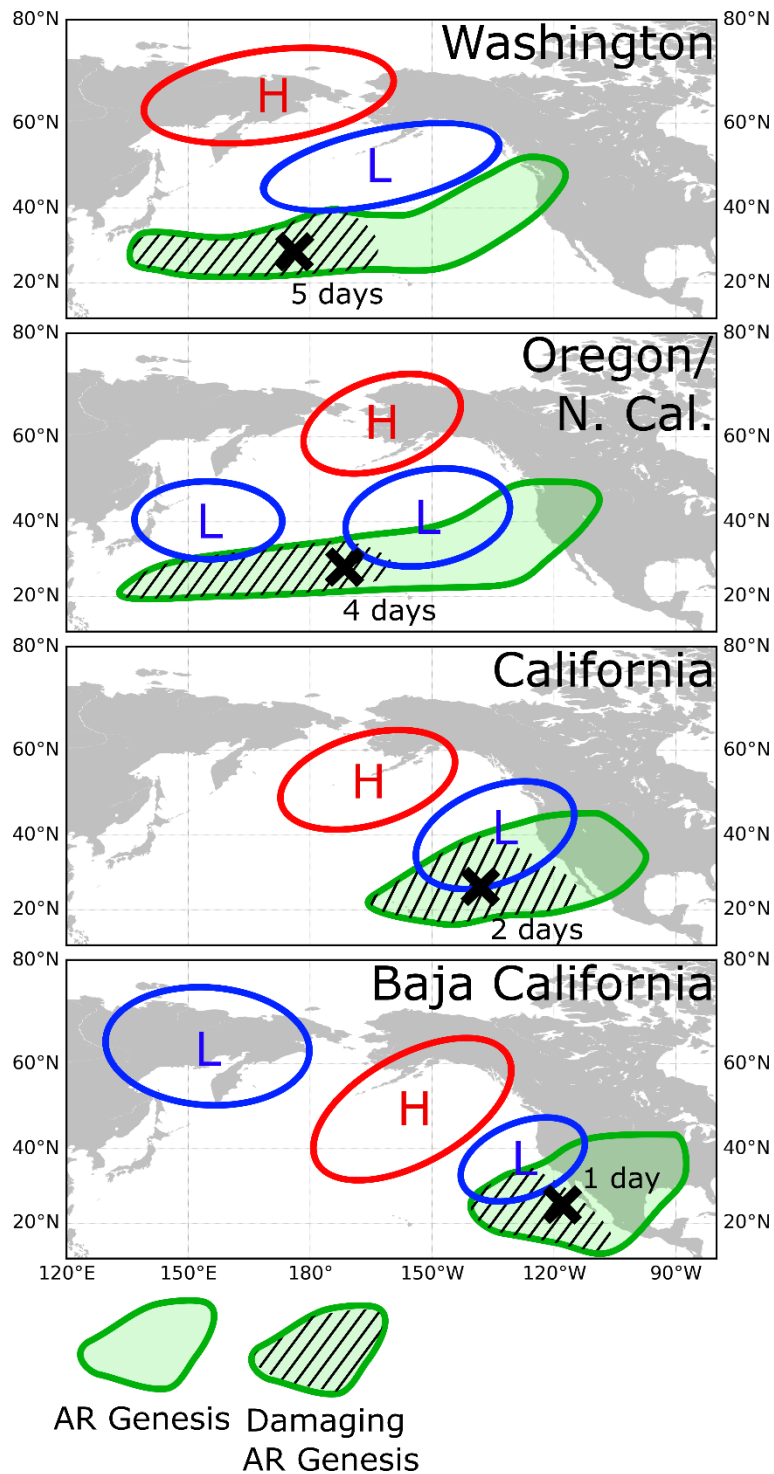


12

13 **Supplementary Figure 1.** (upper) The median genesis centroid location of ARs that cause damage in the Western
 14 U.S. for different damage percentiles (coloured white to red, white representing all ARs that make landfall).
 15 (lower) The median damage associated with each percentile level for the four regions.



Supplementary Figure 2. Winter (NDJFM) flood damages associated with ARs detected by GW₁₉ and ranked with the Ralph et al. (2019) AR scale. Median damages and number (in parentheses) of ARs displayed for each rank, boxes are 25th and 75th percentiles, whiskers are 5th and 95th percentiles and colored dots are maximums. The Low IVT rank (detected ARs with IVT less than 250 kg m⁻¹s⁻¹) as proposed by Prince et al. (2021) is used to facilitate full cohesion between AR detection (Guan and Waliser, 2019) and ranking (Ralph et al., 2019).



Supplementary Figure 3. Schematic of AR genesis locations and atmospheric conditions associated with genesis for ARs impacting the U.S. West Coast for ARs making landfall in the four regions defined in Figure 1. AR genesis footprint shown with green shading, representing the full range of AR object outlines at the point of genesis. The full range of damaging (exceeding 75th percentile) AR genesis object outlines are shown with black hatching over the green shading. The pressure anomalies typically associated with the genesis of these damaging ARs are shown with the red (high pressure) and blue (low pressure) contours. Median AR centroid location for damaging ARs shown with black crosses paired with the median number of days between genesis and the day of maximum landfalling IVT.