

Dropsonde Observations of Total Integrated Water Vapor Transport within North Pacific
Atmospheric Rivers

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Abstract

Aircraft dropsonde observations provide the most comprehensive measurements to date of horizontal water vapor transport in atmospheric rivers (AR). The CalWater experiment recently more than tripled the number of ARs probed with the required measurements. This study uses vertical profiles of water vapor, wind, and pressure obtained from 304 dropsondes across 21 ARs. On average, total water vapor transport (TIVT) in an AR was $4.7 \times 10^8 \pm 2 \times 10^8$ kg s⁻¹. This magnitude is 2.6 times larger than the average discharge of liquid water from the Amazon River. The mean AR width was 890 ± 270 km. Subtropical ARs contained larger IWV but weaker winds than midlatitude ARs, although average TIVTs were nearly the same. Mean TIVTs calculated by defining the lateral “edges” of ARs using an IVT-threshold versus an IWV-threshold produced results that differed by less than 10% across all cases, but did vary between midlatitudes and subtropical regions.