Supporting Information for

Column Relative Humidity and Primary Condensation Rate as Two Useful Supplements to Atmospheric River Analysis

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Introduction

This supporting information provides two Python programs for calculating the integrated water vapor (IWV), integrated vapor transport (IVT), column relative humidity (CRH), and principal condensation rate (PCR). These variables are defined in the main article.

Text S1.

Two Python programs, P1_IWV_IVT_CRH.py and P2_CRH_PCR.py, together with their input data files and other data used in the main article, are available from the Federated Research Data Repository at https://doi.org/10.20383/102.0472 (Mo, 2021).

Python program P1_IWV_IVT_CRH.py calculates the IWV, IVT, and CRH from an atmospheric sounding data file "Port_Hardy_YZT_Sounding_2020112712.csv". This program requires two basic libraries: Numby and Pandas.

Python program P2_CRH_PCR.py calculates the CRH and PCR fields valid at 0000 UTC 15 August 2020, based on the IWV, integrated saturation water vapor (ISWV), and integrated water vapor flux (IWVF) from the analysis (0-hour prediction) of the Global Deterministic Prediction System (GDPS) of Environment and Climate Change Canada. The input data file is "ar_glbhyb_2020081500_000.nc". This program requires three libraries: Numpy, Xarray, and MetPy (Version 1.0, available at https://unidata.github.io/MetPy/latest/index.html). The global

distributions of IWV, IVT, IWVF, CRH, and PCR from this program are used to produced Figures S1 and S2.
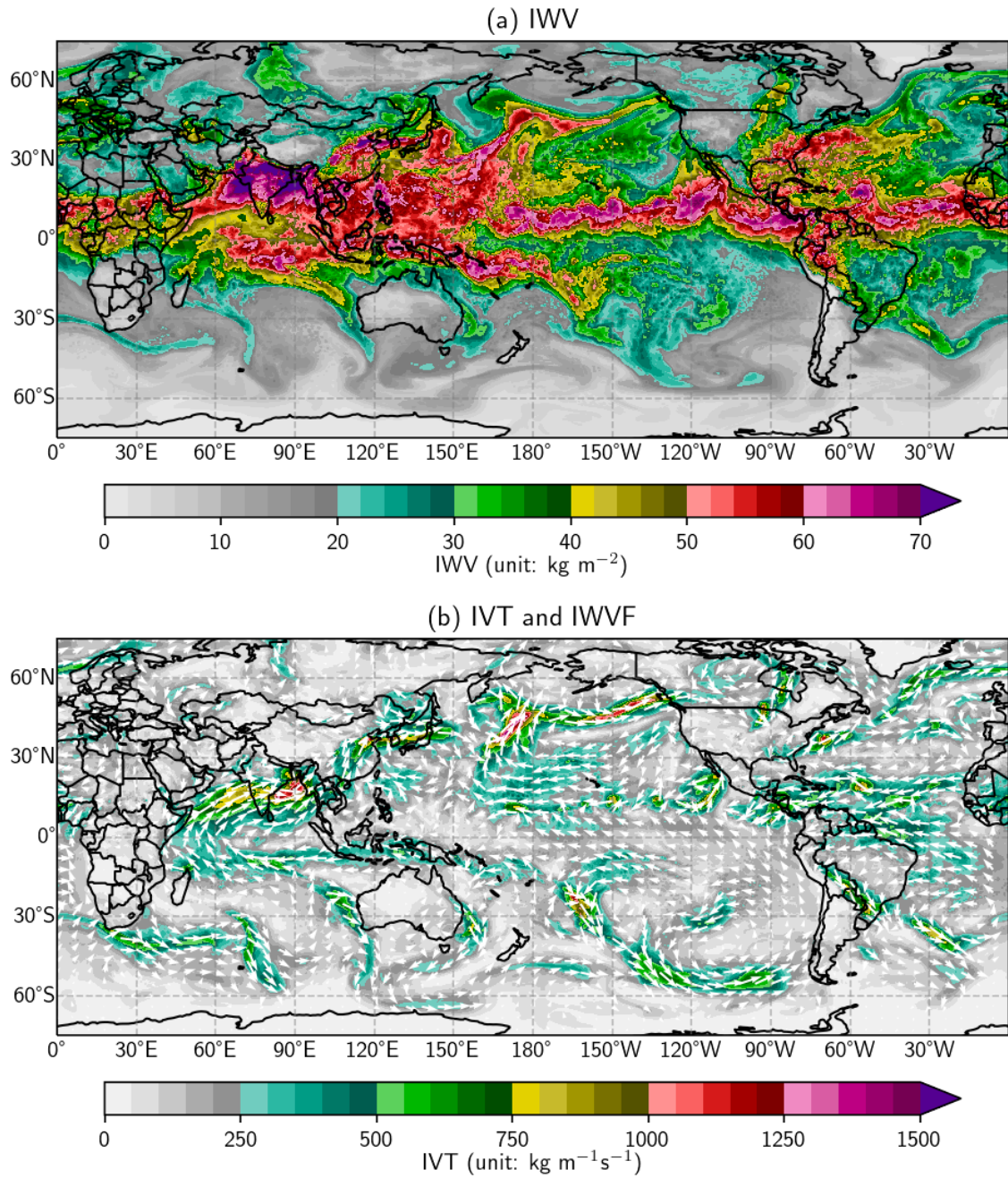
(a) IWV

(b) IVT and IWVF

Figure S1. Atmospheric river analysis based on the analysis (0-hour prediction) of the Global Deterministic Prediction System (GDPS) of Environment Climate Change Canada, valid at 0000 UTC 15 August 2020. (a) The IWV (unit: kg m^{-2}). (b) The IVT (color-filled, unit: kg m^{-1}s^{-1}) and normalized IWVF (vectors).
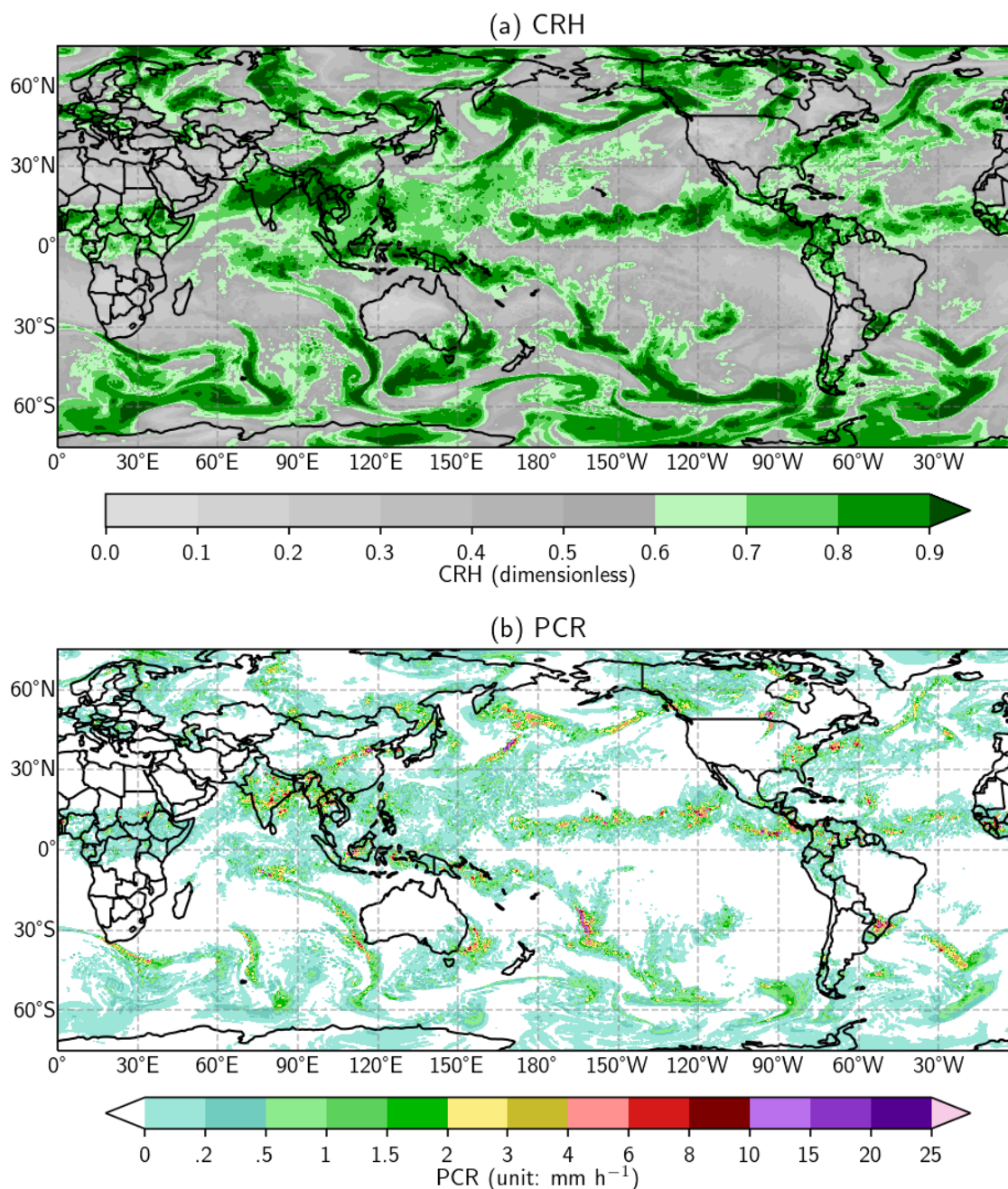
Figure S2. Atmospheric river analysis based on the analysis (0-hour prediction) of the GDPS, valid at 0000 UTC 15 August 2020. (a) CRH (dimensionless). (b) PCR (unit: mm h^{-1}).

Reference

Mo, R. (2021). Meteorological data for three atmospheric river case studies and Python programs for calculating column relative humidity and primary condensation rate. *Federated Research Data Repository*. https://doi.org/10.20383/102.0472.