Supporting Information for "Understanding the dominant moisture sources and pathways of summer precipitation in the southeast Prairie Pothole Region"

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Introduction

This supplementary material includes four additional figures and two additional tables for completeness. They do not affect the general statements made in the results or conclusions within the main article. The first figure is the source percent analysis for the 3000m and 5000m height back trajectories (Figure S1). The next three figures are aerial density plots for the three stations not shown in the main article (Figure S2, S3, S4). The

first table contains detailed information about the datasets used for the correlation maps in this study (Table S1). The second table contains all the p-values and slopes for the trend analysis performed on the time series of both the yearly precipitation amount from land and the yearly percentage of precipitation coming from land (Table S2).

The height of the raincloud for our selected rainfall events is unknown, so we chose initial heights that coincide with common meteorological analysis pressure levels for additional back trajectory calculations and source percent analysis (Figure S1). The additional heights we chose are: 3000 m and 5000 m. Because meteorologists typically examine the 700 mb pressure level when assessing moisture content in the atmosphere, we chose 3000 m to represent 700 mb. This height falls in the average range for the pressure level (National Oceanic and Atmospheric Administration, 2021b). The 500 mb pressure level is the first choice of many meteorologists to begin analysis of the atmosphere, and it can also be used to examine moisture content. We use 5000 m to represent 500 mb because it is within the average height range of this pressure level (National Oceanic and Atmospheric Administration, 2021a).

Table S1. Datasets used for correlation maps in this study.

Variable(s)	*Dataset Description*	*Spatial Resolution*	*Years Available*	*Months Covered*
Sea Surface Temperature (SST) anomalies	Kaplan et al. (1998) and Reynolds and Smith (1994) from International Research Institute's (IRI) Data Library	5° x 5° grid; 87.5S to 87.5N, 27.5E to 22.5E	1896 to 2017	June to September
850 mb height anomalies	NOAA Climate Data Assimilation System I (CDAS-1) (Kalnay et al. 1996) from IRI Data Library	2.5° x 2.5° grid; 90N to 90S, 0 to 2.5W	1949 to 2019	June to September
Palmer Drought Severity Index (PDSI)	Self-calibrated Palmer Drought Severity Index (Dai et al. 2004) from NOAA PSL Climate Data Repository	2.5° x 2.5° grid; 58.75S to 76.25N, -178.75W to 178.75E	1850 to 2014 (to 2014 available at publication)	June to September

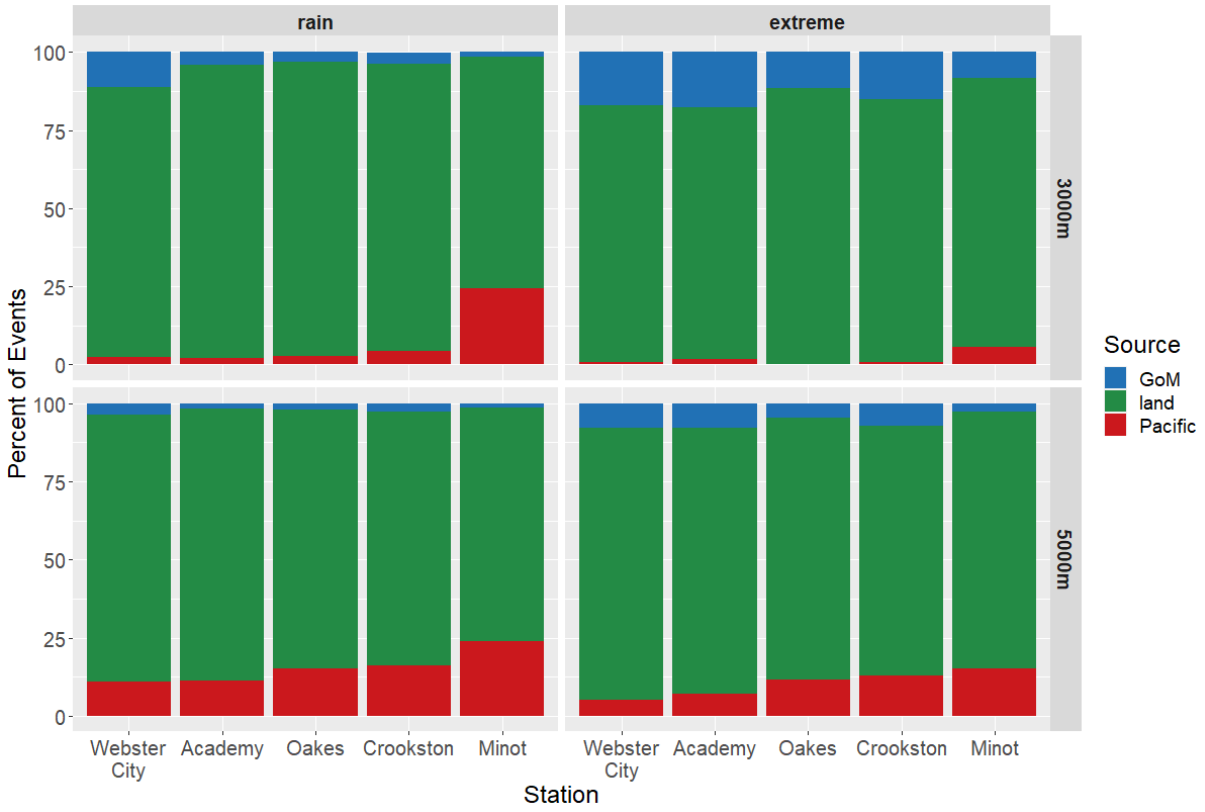

Figure S1. Percent trajectories from each source separated by station for rain and extreme events at heights of 3000 m and 5000 m.

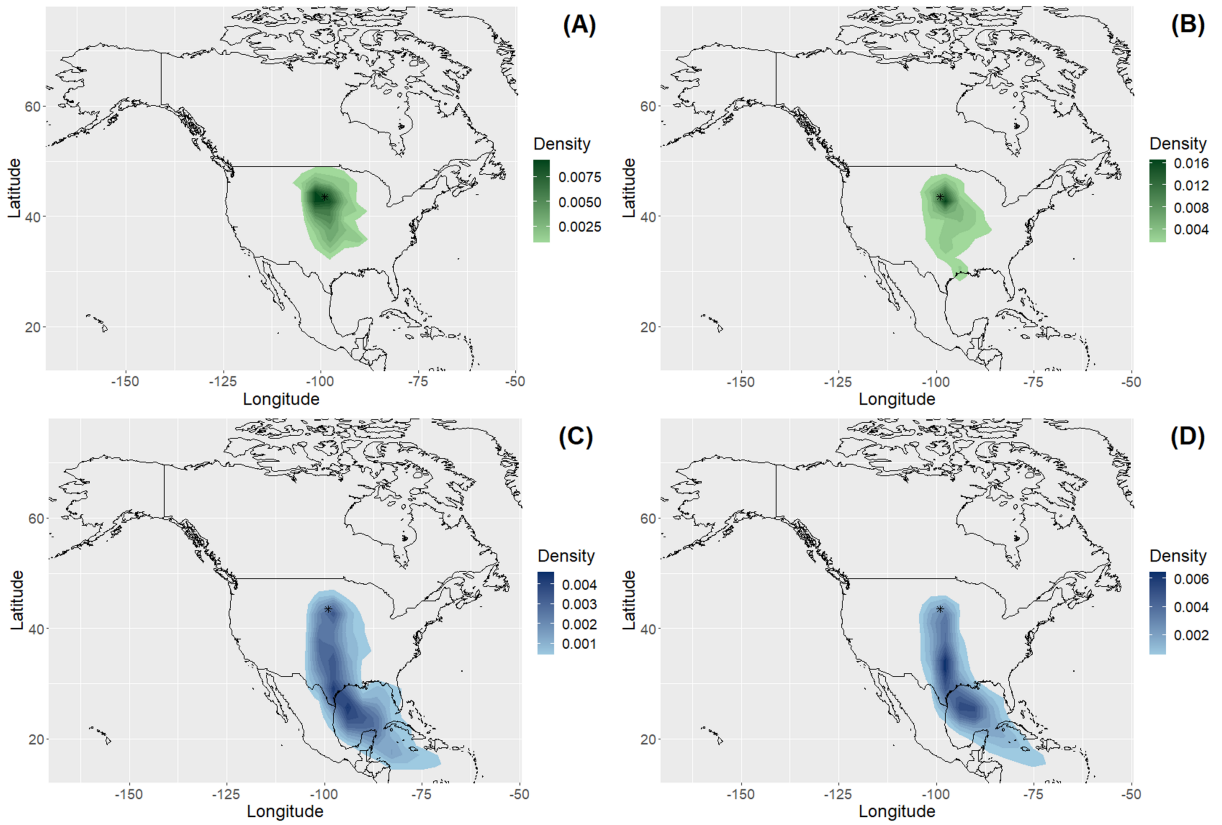

Figure S2. Density maps of Academy trajectories with land (green) and GoM (blue) as their source for rain (A, C) and extreme (B, D) events at 1500 m. The station location is marked with a black asterisk.

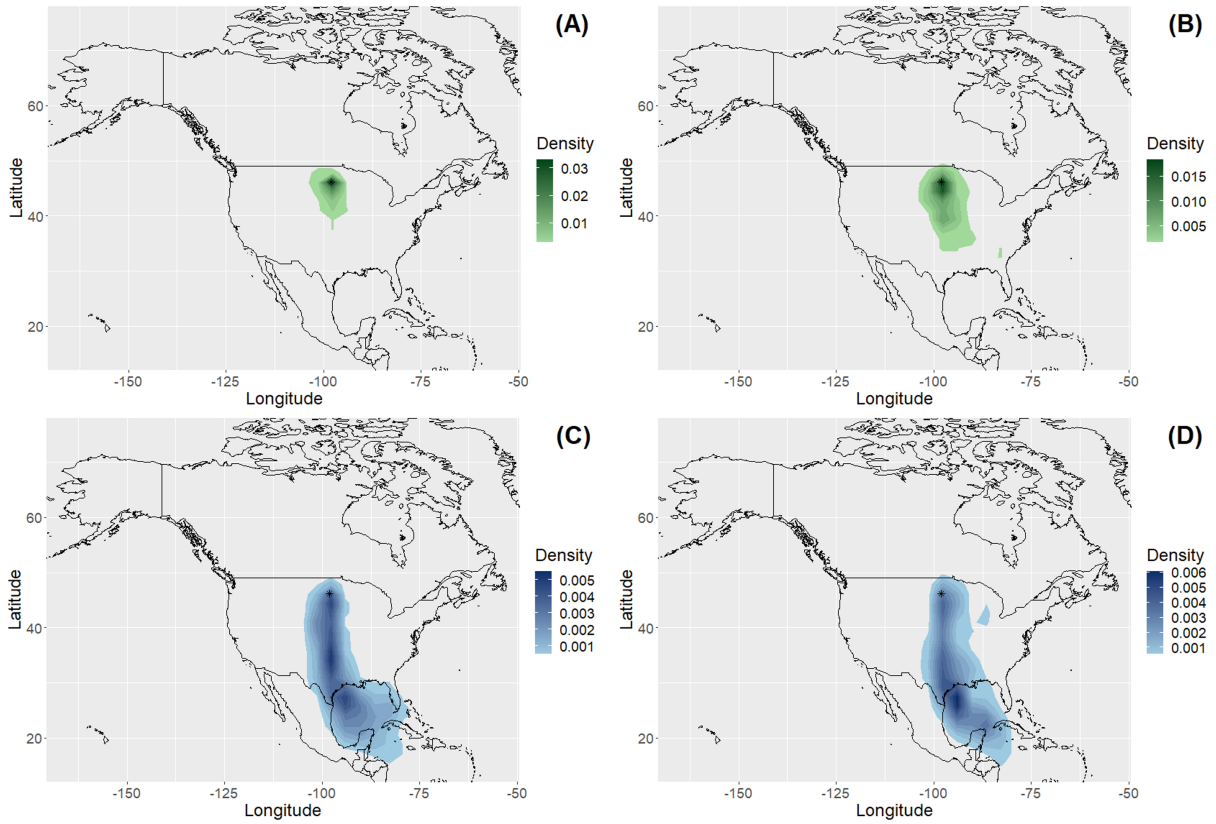

Figure S3. As in Figure S2 but for Oakes.

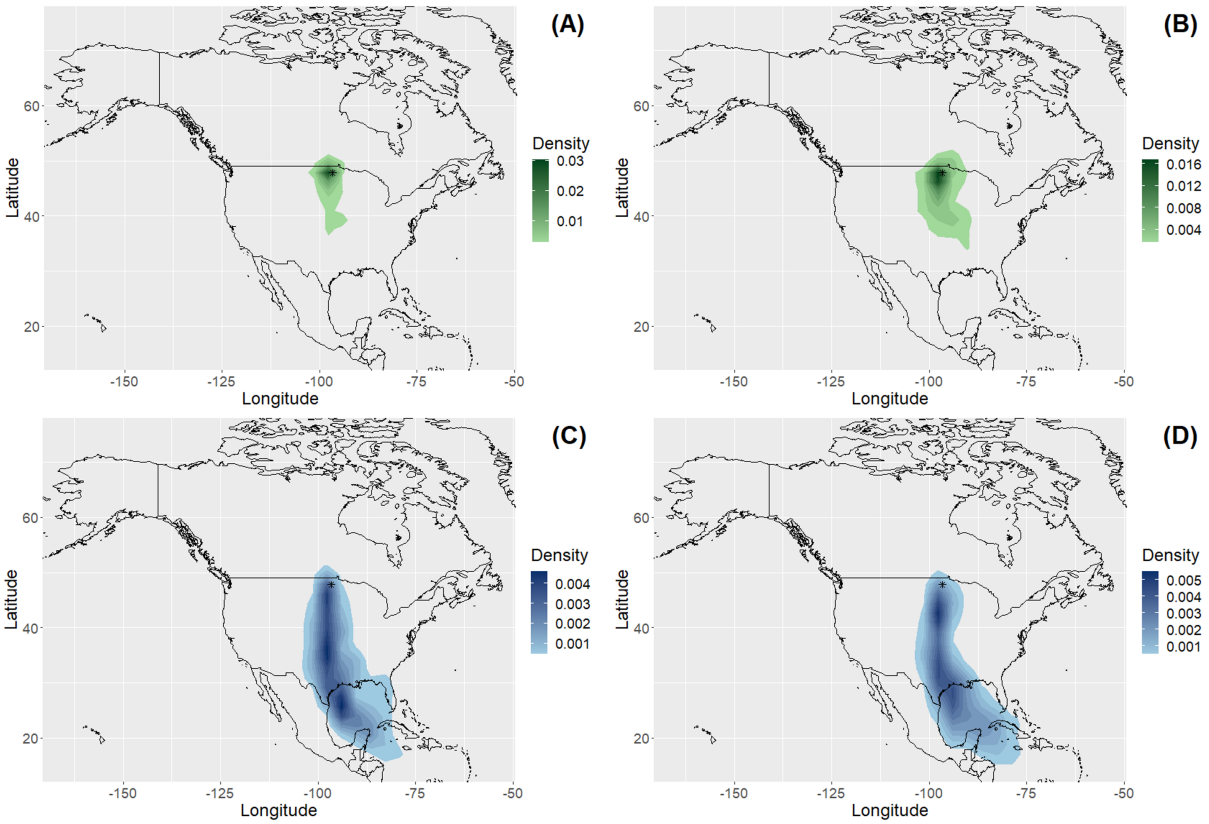

Figure S4. As in Figure S2 but for Crookston.

Table S2. P-values from the Mann-Kendall trend test and slopes for time series of both the yearly precipitation amount from land and the yearly percentage of precipitation coming from land. These results were from the back trajectories originating at 1500 m. Significant slopes at a 95% level are italicized.

Station	Event	P-value Mann-Kendall	Slope
Yearly Precipitation Amount			
academy	rain	0.24552	-0.65089
academy	extreme	0.370533	1.024028
crookston	rain	0.069555	-1.0516
crookston	extreme	0.846506	0.531437
minot	rain	0.611405	-0.23004
minot	*extreme*	*0.03225*	*2.091255*
oakes	rain	0.217247	0.694798
oakes	extreme	0.105932	1.601437
webster_city	rain	0.276278	0.770607
webster_city	extreme	0.568857	-0.0215
Yearly Percent			
academy	rain	0.625851	-9.87E-05
academy	extreme	0.370014	0.002737
crookston	rain	0.834471	-1.21E-04
crookston	extreme	0.221725	0.003174
minot	rain	0.268837	6.73E-04
minot	extreme	0.613358	0.001964
oakes	rain	0.774164	-3.41E-04
oakes	extreme	0.640644	0.005941
webster_city	rain	0.175339	0.001088
webster_city	extreme	0.679649	0.001096

References

National Oceanic and Atmospheric Administration. (2021a). *Constant pressure charts: 500 mb.* `https://www.weather.gov/jetstream/500mb`. (accessed 13 Aug 2021)

National Oceanic and Atmospheric Administration. (2021b). *Constant pressure charts: 700 mb.* `https://www.weather.gov/jetstream/700mb`. (accessed 13 Aug 2021)