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Supplement of

Variability of low flow magnitudes in the Upper Colorado River Basin: identifying trends and relative role of large-scale climate dynamics

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Abbreviations

Variable	Description
AMO	Atlantic Multidecadal Oscillation
CPC	Climate Prediction Center
DJF	Dec-Jan-Feb
ENSO	El Nino-Southern Oscillation
HCDN	Hydro-Climatic Data Network
IPO	Interdecadal Pacific oscillation
JFM	January-February-March
JJA	Jun-Jul-Aug
MAM	Mar-Apr-May
MSLP	Mean Sea Level Pressure
OND	October-November-December
ONDJFM	October-November-December-January-February-March
PDO	Pacific Decadal Oscillation
Ptotal	Total precipitation
SI	Supplementary Information
SON	Sep-Oct-Nov
SST	Sea Surface Temperature
ST	Surface Temperature
UCRB	Upper Colorado River Basin
US	United State
USGS	United State Geological Survey

Supplementary Information (SI)

Section SI: Description of stream flow data

This study uses UCRB stream flow data derived by the Hydro-Climatic Data Network 2009 (HCDN), a streamflow data set developed by the US Geological Survey (USGS) (Lins, 2012). When originally published, the network was composed of 1,659 stations (Slack and Landwehr, 1992) for which the years of primarily “natural” flow were identified (Lins, 2012). The HCDN data set is useful for studying surface water and was specifically developed for examining the effects of climate change on hydrologic conditions. The stream gauge stations selected for inclusion in the HCDN are from locations that are not affected by “artificial diversions, storage, or other human-made works in or on the natural stream channels or watersheds” and has been employed in some other streamflow studies (e.g., Douglas et al., 2000; Martin and Arihood, 2010). 17 stations from this network, with drainage basins area between 10 km² to 432 km², throughout the UCRB are examined in this research. The names and detailed descriptions of those stream-gaging stations (17 stations) of UCRB are shown in Table 1.

Section SII: Definition of “low flow”

Low flow has different definitions. Many define this as “the actual flows in a river occurring during the dry season of the year”, others define as “the length of time and the conditions occurring between flood events”, or “the changes in the total flow regime of a river on sustainable water yield or riverine and riparian ecology” (Smakhtin, 2001). On the other hand, international glossary of hydrology (WMO, 1974) defines low flow as “flow of water in a stream during prolonged dry weather”. This definition does not make a clear distinction between low flows and droughts though, which is a natural event resulting from a less than normal precipitation for an extended period of time (EPA, 2012). Hence, low flow is a seasonal phenomenon, and an integral component of a flow regime of any river and drought is a more general phenomenon that includes low-flow periods, but a continuous seasonal low-flow event might not necessarily constitute a drought (Smakhtin, 2001).

Section SIII: Tables

Table S1: Description of HCDN-2009 streamflow gaging stations in UCRB (Lins, 2012).

Station ID	Station Name	DRAIN_SQKM	LAT_GAGE	LONG_GAGE	Data available for years
9066000	Black Gore Creek Near Minturn, CO. <u>(east)</u>	32.409	39.596	-106.265	1965-2011
9034900	Bobtail Creek Near Jones Pass, CO. <u>(east)</u>	15.649	39.760	-105.906	1967-2011
9066200	Booth Creek Near Minturn, CO. <u>(east)</u>	16.097	39.648	-106.323	1966-2011
9306242	Corral Gulch Near Rangely, CO. <u>(west)</u>	81.986	39.920	-108.473	1976-2011
9081600	Crystal River Ab Avalanche C, Near Redstone, CO. <u>(east)</u>	432.893	39.232	-107.227	1957-2011
9035800	Darling Creek Near Leal, CO. <u>(east)</u>	22.944	39.801	-106.026	1967-2009
9065500	Gore Creek At Upper Station, Near Minturn, CO. <u>(east)</u>	37.776	39.626	-106.278	1965-2011
9047700	Keystone Gulch Near Dillon, CO. <u>(east)</u>	23.570	39.594	-105.973	1959-2011
9066300	Middle Creek Near Minturn, CO. <u>(east)</u>	15.522	39.646	-106.382	1966-2011
9035900	South Fork Of Williams Fork Near Leal, CO. <u>(east)</u>	72.842	39.796	-106.031	1967-2011
9107000	Taylor River At Taylor Park, CO. <u>(east)</u>	331.619	38.860	-106.567	1989-2011
9352900	Vallecito Creek Near Bayfield, CO. <u>(west)</u>	188.151	37.478	-107.544	1964-2011
9183500	Mill Creek at Sheley Tunnel, Near Moab, UT. <u>(west)</u>	74.302	38.483	-109.404	1989-2011
9210500	Fontenelle C Nr Herschler Ranch, Nr Fontenelle, WY. <u>(west)</u>	398.309	42.096	-110.417	1953-2011
9223000	Hams Fork Below Pole Creek, Near Frontier, WY. <u>(west)</u>	333.153	42.110	-110.710	1954-2011
9312600	White River Bl Tabbyune C Near Soldier Summit, UT. <u>(west)</u>	195.295	39.876	-111.037	1969-2011
9378170	South Creek Above Reservoir Near Monticello, UT. <u>(west)</u>	21.898	37.847	-109.370	1987-2011
Note: CO = Colorado; UT = Utah; WY = Wyoming; LAT_GAGE = Latitude of a streamgauge; LONG_GAGE = Longitude of a streamgauge.					

Table S2: Occurrence month(s) and/or season(s) of annual low flow (q7) for different stream gauge stations in UCRB.

Station ID	Station Name	Annual q7 Occurrence Month(s)/Season(s)
9066000	Black Gore Creek Near Minturn, CO. (<u>east</u>)	Oct-Mar
9034900	Bobtail Creek Near Jones Pass, CO. (<u>east</u>)	Dec-May
9066200	Booth Creek Near Minturn, CO. (<u>east</u>)	Aug-Apr
9306242	Corral Gulch Near Rangely, CO. (<u>west</u>)	Oct-Mar
9081600	Crystal River Ab Avalanche C, Near Redstone, CO. (<u>east</u>)	Nov-Apr
9035800	Darling Creek Near Leal, CO. (<u>east</u>)	Nov-Apr
9065500	Gore Creek At Upper Station, Near Minturn, CO. (<u>east</u>)	Nov-Apr
9047700	Keystone Gulch Near Dillon, CO. (<u>east</u>)	Aug-Apr
9066300	Middle Creek Near Minturn, CO. (<u>east</u>)	Dec-Apr
9035900	South Fork Of Williams Fork Near Leal, CO. (<u>east</u>)	Oct-Mar
9107000	Taylor River At Taylor Park, CO. (<u>east</u>)	Oct-Mar
9352900	Vallecito Creek Near Bayfield, CO. (<u>west</u>)	Oct-Feb
9183500	Mill Creek at Sheley Tunnel, Near Moab, UT. (<u>west</u>)	Jul-Aug & Oct-Feb
9210500	Fontenelle C Nr Herschler Ranch, Nr Fontenelle, WY. (<u>west</u>)	Jul-Aug & Oct-Mar
9223000	Hams Fork Below Pole Creek, Near Frontier, WY. (<u>west</u>)	Jul-Aug & Oct-Feb
9312600	White River Bl Tabbyune C Near Soldier Summit, UT. (<u>west</u>)	Jul-Aug & Oct-Jan
9378170	South Creek Above Reservoir Near Monticello, UT. (<u>west</u>)	Jul-Aug & Oct-Mar
Note: CO = Colorado; UT = Utah; WY = Wyoming; LAT_GAGE = Latitude of a streamgauge; LONG_GAGE = Longitude of a streamgauge.		

Table S3: Summary statistics table for DJF q7 time series for each stream gauge station in UCRB.

Station ID	Station Name	Mean (cfs)	Median (cfs)	Standard deviation (cfs)	Skewness	Kurtosis
9066000	Black Gore Creek Near Minturn, CO. <u>(east)</u>	2.22	1.98	1.03	3.14	15.79
9034900	Bobtail Creek Near Jones Pass, CO. <u>(east)</u>	0.73	0.71	0.13	0.33	-0.46
9066200	Booth Creek Near Minturn, CO. <u>(east)</u>	0.81	0.75	0.41	2.09	6.29
9306242	Corral Gulch Near Rangely, CO. <u>(west)</u>	0.51	0.43	0.39	1.27	1.90
9081600	Crystal River Ab Avalanche C, Near Redstone, CO. <u>(east)</u>	43.16	42.00	9.15	0.95	1.63
9035800	Darling Creek Near Leal, CO. <u>(east)</u>	1.91	1.93	0.43	0.41	0.47
9065500	Gore Creek At Upper Station, Near Minturn, CO. <u>(east)</u>	2.69	2.39	1.18	2.48	7.85
9047700	Keystone Gulch Near Dillon, CO. <u>(east)</u>	1.95	1.94	0.37	0.25	-0.42
9066300	Middle Creek Near Minturn, CO. <u>(east)</u>	0.27	0.23	0.23	2.68	10.75
9035900	South Fork Of Williams Fork Near Leal, CO. <u>(east)</u>	7.40	7.37	1.64	0.14	0.78
9107000	Taylor River At Taylor Park, CO. <u>(east)</u>	29.84	30.29	3.64	-0.30	-0.91
9352900	Vallecito Creek Near Bayfield, CO. <u>(west)</u>	17.30	17.21	5.37	1.21	4.57
9183500	Mill Creek at Sheley Tunnel, Near Moab, UT. <u>(west)</u>	4.86	4.94	0.79	0.17	0.08
9210500	Fontenelle C Nr Herschler Ranch, Nr Fontenelle, WY. <u>(west)</u>	19.53	19.86	5.01	0.46	0.05
9223000	Hams Fork Below Pole Creek, Near Frontier, WY. <u>(west)</u>	11.37	11.29	3.62	0.49	0.14
9312600	White River Bl Tabbyune C Near Soldier Summit, UT. <u>(west)</u>	3.21	2.99	1.22	0.42	0.50
9378170	South Creek Above Reservoir Near Monticello, UT. <u>(west)</u>	0.08	0.07	0.08	2.04	5.32
Note: CO = Colorado; UT = Utah; WY = Wyoming; LAT_GAGE = Latitude of a streamgauge; LONG_GAGE = Longitude of a streamgauge.						

Table S4: Summary statistics table for MAM q7 time series for each stream gauge station in UCRB.

Station ID	Station Name	Mean (cfs)	Median (cfs)	Standard deviation (cfs)	Skewness	Kurtosis
9066000	Black Gore Creek Near Minturn, CO. <u>(east)</u>	2.70	2.28	1.70	2.91	10.05
9034900	Bobtail Creek Near Jones Pass, CO. <u>(east)</u>	0.70	0.70	0.13	0.48	0.89
9066200	Booth Creek Near Minturn, CO. <u>(east)</u>	0.94	0.83	0.52	3.45	14.36
9306242	Corral Gulch Near Rangely, CO. <u>(west)</u>	0.89	0.57	0.81	1.11	0.01
9081600	Crystal River Ab Avalanche C, Near Redstone, CO. <u>(east)</u>	48.53	45.14	13.33	2.38	10.00
9035800	Darling Creek Near Leal, CO. <u>(east)</u>	1.87	1.84	0.37	0.29	0.01
9065500	Gore Creek At Upper Station, Near Minturn, CO. <u>(east)</u>	3.04	2.66	1.58	2.85	10.07
9047700	Keystone Gulch Near Dillon, CO. <u>(east)</u>	1.92	1.90	0.35	0.47	0.11
9066300	Middle Creek Near Minturn, CO. <u>(east)</u>	0.32	0.25	0.29	3.49	15.65
9035900	South Fork Of Williams Fork Near Leal, CO. <u>(east)</u>	7.30	7.60	1.73	-0.36	0.60
9107000	Taylor River At Taylor Park, CO. <u>(east)</u>	31.99	32.00	3.56	-0.85	1.50
9352900	Vallecito Creek Near Bayfield, CO. <u>(west)</u>	21.35	20.07	7.33	0.92	1.38
9183500	Mill Creek at Sheley Tunnel, Near Moab, UT. <u>(west)</u>	5.12	5.06	0.91	0.30	-0.58
9210500	Fontenelle C Nr Herschler Ranch, Nr Fontenelle, WY. <u>(west)</u>	23.62	23.00	5.99	0.91	1.83
9223000	Hams Fork Below Pole Creek, Near Frontier, WY. <u>(west)</u>	14.20	14.00	5.15	0.26	0.66
9312600	White River Bl Tabbyune C Near Soldier Summit, UT. <u>(west)</u>	5.53	4.90	3.68	4.02	21.19
9378170	South Creek Above Reservoir Near Monticello, UT. <u>(west)</u>	0.35	0.15	0.58	2.27	4.01

Note: CO = Colorado; UT = Utah; WY = Wyoming; LAT_GAGE = Latitude of a streamgauge; LONG_GAGE = Longitude of a streamgauge.

Table S5: Summary statistics table for JJA q7 time series for each stream gauge station in UCRB.

Station ID	Station Name	Mean (cfs)	Median (cfs)	Standard deviation (cfs)	Skewness	Kurtosis
9066000	Black Gore Creek Near Minturn, CO. (<u>east</u>)	5.07	4.40	2.56	2.54	8.35
9034900	Bobtail Creek Near Jones Pass, CO. (<u>east</u>)	5.38	4.66	2.79	2.53	8.06
9066200	Booth Creek Near Minturn, CO. (<u>east</u>)	2.69	2.22	1.79	2.08	5.51
9306242	Corral Gulch Near Rangely, CO. (<u>west</u>)	0.89	0.57	0.81	1.11	0.01
9081600	Crystal River Ab Avalanche C, Near Redstone, CO. (<u>east</u>)	132.19	120.71	59.88	1.73	3.83
9035800	Darling Creek Near Leal, CO. (<u>east</u>)	4.97	4.41	2.29	2.31	7.56
9065500	Gore Creek At Upper Station, Near Minturn, CO. (<u>east</u>)	12.03	9.51	7.92	2.54	8.13
9047700	Keystone Gulch Near Dillon, CO. (<u>east</u>)	4.06	3.84	1.73	1.82	5.74
9066300	Middle Creek Near Minturn, CO. (<u>east</u>)	1.64	1.25	1.43	2.77	8.37
9035900	South Fork Of Williams Fork Near Leal, CO. (<u>east</u>)	19.12	18.00	7.30	2.49	10.04
9107000	Taylor River At Taylor Park, CO. (<u>east</u>)	65.92	58.00	30.39	2.22	6.83
9352900	Vallecito Creek Near Bayfield, CO. (<u>west</u>)	72.69	66.43	39.64	1.41	2.90
9183500	Mill Creek at Sheley Tunnel, Near Moab, UT. (<u>west</u>)	7.36	6.50	3.18	0.64	-0.52
9210500	Fontenelle C Nr Herschler Ranch, Nr Fontenelle, WY. (<u>west</u>)	29.72	27.71	13.50	0.65	-0.04
9223000	Hams Fork Below Pole Creek, Near Frontier, WY. (<u>west</u>)	19.39	17.93	9.69	0.41	0.04
9312600	White River Bl Tabbyune C Near Soldier Summit, UT. (<u>west</u>)	4.23	3.76	3.06	0.72	0.09
9378170	South Creek Above Reservoir Near Monticello, UT. (<u>west</u>)	0.11	0.08	0.09	0.50	-1.22

Note: CO = Colorado; UT = Utah; WY = Wyoming; LAT_GAGE = Latitude of a streamgauge; LONG_GAGE = Longitude of a streamgauge.

Table S6: Summary statistics table for SON q7 time series for each stream gauge station in UCRB.

Station ID	Station Name	Mean (cfs)	Median (cfs)	Standard deviation (cfs)	Skewness	Kurtosis
9066000	Black Gore Creek Near Minturn, CO. <u>(east)</u>	2.89	2.50	1.41	3.14	10.63
9034900	Bobtail Creek Near Jones Pass, CO. <u>(east)</u>	1.37	1.29	0.33	0.83	0.63
9066200	Booth Creek Near Minturn, CO. <u>(east)</u>	1.26	1.15	0.76	3.04	11.14
9306242	Corral Gulch Near Rangely, CO. <u>(west)</u>	0.63	0.47	0.50	1.00	-0.05
9081600	Crystal River Ab Avalanche C, Near Redstone, CO. <u>(east)</u>	62.71	56.71	19.40	1.27	1.43
9035800	Darling Creek Near Leal, CO. <u>(east)</u>	2.63	2.56	0.70	0.90	1.37
9065500	Gore Creek At Upper Station, Near Minturn, CO. <u>(east)</u>	4.08	3.94	1.51	2.08	5.32
9047700	Keystone Gulch Near Dillon, CO. <u>(east)</u>	2.55	2.50	0.64	-0.07	-0.02
9066300	Middle Creek Near Minturn, CO. <u>(east)</u>	0.57	0.43	0.37	1.57	2.33
9035900	South Fork Of Williams Fork Near Leal, CO. <u>(east)</u>	10.12	9.90	2.31	-0.12	-0.57
9107000	Taylor River At Taylor Park, CO. <u>(east)</u>	41.13	38.71	9.44	0.42	1.47
9352900	Vallecito Creek Near Bayfield, CO. <u>(west)</u>	30.76	27.43	14.11	1.08	1.42
9183500	Mill Creek at Sheley Tunnel, Near Moab, UT. <u>(west)</u>	5.60	5.16	1.74	0.64	-0.01
9210500	Fontenelle C Nr Herschler Ranch, Nr Fontenelle, WY. <u>(west)</u>	22.77	21.14	7.57	0.56	-0.46
9223000	Hams Fork Below Pole Creek, Near Frontier, WY. <u>(west)</u>	14.40	14.43	5.34	0.05	0.35
9312600	White River Bl Tabbyune C Near Soldier Summit, UT. <u>(west)</u>	3.21	3.17	2.05	0.26	-0.95
9378170	South Creek Above Reservoir Near Monticello, UT. <u>(west)</u>	0.07	0.06	0.06	0.77	-0.16

Note: CO = Colorado; UT = Utah; WY = Wyoming; LAT_GAGE = Latitude of a streamgauge; LONG_GAGE = Longitude of a streamgauge.

Table S7: Pearson correlation coefficients between DJF q7 time series of different stations. 90% statistically significant estimates are shown.

Station ID	9034900	9066200	9306242	9081600	9035800	9065500	9047700	9066300	9035900	9107000	9352900	9183500	9210500	9223000	9312600	9378170	9034900
9066000																	
9034900																	
9066200																	
9306242																	
9081600	0.38																
9035800					0.42												
9065500		0.41	0.47														
9047700				0.45													
9066300			0.48		0.40												
9035900	0.36				0.41	0.49			0.47								
9107000						0.36											
9352900	0.42			-0.37	0.64												
9183500				0.41	0.41	0.41											
9210500	0.65				0.39			0.39		0.38							
9223000				0.38									0.58	0.39			
9312600			0.36		0.48									0.35			
9378170				0.44				0.36			0.38		0.63		0.36		

Table S8: Pearson correlation coefficients between MAM q7 time series of different stations. 90% statistically significant estimates are shown.

Station ID	9034900	9066200	9306242	9081600	9035800	9065500	9047700	9066300	9035900	9107000	9352900	9183500	9210500	9223000	9312600	9378170	9034900
9066000																	
9034900																	
9066200																	
9306242																	
9081600																	
9035800																	
9065500			0.43														
9047700				0.35													
9066300			0.46														
9035900									0.43								
9107000																	
9352900		-0.52			0.57												
9183500				0.52								0.51					
9210500																	
9223000													0.60	0.41			
9312600												0.41	0.37				
9378170		-0.48			0.52	-0.35				-0.43		0.65				0.40	

Table S9: Pearson correlation coefficients between SON q7 time series of different stations. 90% statistically significant estimates are shown.

Station ID	9034900	9066200	9306242	9081600	9035800	9065500	9047700	9066300	9035900	9107000	9352900	9183500	9210500	9223000	9312600	9378170	9034900
9066000																	
9034900																	
9066200																	
9306242																	
9081600	0.64																
9035800	0.49			0.39	0.74												
9065500	0.42		0.51		0.66	0.49											
9047700	0.65				0.50	0.44											
9066300			0.48		0.52	0.53	0.56	0.47									
9035900	0.80				0.70	0.53	0.57	0.59	0.62								
9107000	0.53		0.54	0.36	0.65	0.59	0.81	0.50	0.51	0.62							
9352900																	
9183500	0.49			0.68	0.57	0.68		0.37			0.53						
9210500	0.62			0.47	0.57	0.44		0.37		0.58	0.48		0.50				
9223000	0.70			0.37	0.55	0.48		0.42		0.63	0.39		0.43	0.86			
9312600	0.66			0.63	0.71	0.77	0.53	0.47	0.41	0.62	0.74		0.78	0.74	0.69		
9378170	0.45	-0.37		0.56	0.35	0.56					0.40		0.77	0.49	0.49	0.63	

Table S10: Periodicities identified (in number of years) for annual q7 magnitude for different stream gauge locations.

Station ID	Station Name	Active years identified	Periodicity in years (within the cone of influence)
9066000	Black Gore Creek Near Minturn, CO. <u>(east)</u>		
9034900	Bobtail Creek Near Jones Pass, CO. <u>(east)</u>		
9066200	Booth Creek Near Minturn, CO. <u>(east)</u>		
9306242	Corral Gulch Near Rangely, CO. <u>(west)</u>		
9081600	Crystal River Ab Avalanche C, Near Redstone, CO. <u>(east)</u>	1967-2003	12 - 16
9035800	Darling Creek Near Leal, CO. <u>(east)</u>	1978-1990 1980- 2000	6 - 8 15
9065500	Gore Creek At Upper Station, Near Minturn, CO. <u>(east)</u>	1976-2000	10 - 15
9047700	Keystone Gulch Near Dillon, CO. <u>(east)</u>		
9066300	Middle Creek Near Minturn, CO. <u>(east)</u>		
9035900	South Fork Of Williams Fork Near Leal, CO. <u>(east)</u>		
9107000	Taylor River At Taylor Park, CO. <u>(east)</u>		
9352900	Vallecito Creek Near Bayfield, CO. <u>(west)</u>		
9183500	Mill Creek at Sheley Tunnel, Near Moab, UT. <u>(west)</u>	1996-2004	5 - 7
9210500	Fontenelle C Nr Herschler Ranch, Nr Fontenelle, WY. <u>(west)</u>	1974-2003	13- 16
9223000	Hams Fork Below Pole Creek, Near Frontier, WY. <u>(west)</u>	1971- 2003	10 - 16
9312600	White River Bl Tabbyune C Near Soldier Summit, UT. <u>(west)</u>	1975-1995	12-16
9378170	South Creek Above Reservoir Near Monticello, UT. <u>(west)</u>		

Table S11: Periodicities identified (in number of years) for seasonal q7 magnitudes for different stream gauge locations.

Station ID	Station Name	DJF		MAM		JJA		SON	
		Active years identified	Period	Active years identified	Period	Active years identified	Period	Active years identified	Period
9066000	Black Gore Creek Near Minturn, CO. <u>(east)</u>								
9034900	Bobtail Creek Near Jones Pass, CO. <u>(east)</u>					1983-1984 1975-1990	4-5 6-16		
9066200	Booth Creek Near Minturn, CO. <u>(east)</u>								
9306242	Corral Gulch Near Rangely, CO. <u>(west)</u>			-		1989-1998	12-14		
9081600	Crystal River Ab Avalanche C, Near Redstone, CO. <u>(east)</u>	1968-2003	12 - 16			1994 - 1996 1980-2005	2 -3 10-15	1973-2001	10 - 16
9035800	Darling Creek Near Leal, CO. <u>(east)</u>	1975-1988 1979-1999	6-9 12-16	1977-1997 2005-2008	6-8 2.5-3	1983-1987 1975-1990	3.5-5 9-15	1976-1995	12-15
9065500	Gore Creek At Upper Station, Near Minturn, CO. <u>(east)</u>			1982-1986	3-4			1971-1993	10-16
9047700	Keystone Gulch Near Dillon, CO. <u>(east)</u>								
9066300	Middle Creek Near Minturn, CO. <u>(east)</u>							1977-1991	13-15
9035900	South Fork Of Williams Fork Near Leal, CO. <u>(east)</u>	1989-2011	11-15			1975-2000	10-15	1978-2011	11-14
9107000	Taylor River At Taylor Park, CO. <u>(east)</u>			1998-2005	2-4				
9352900	Vallecito Creek Near Bayfield, CO. <u>(west)</u>	1979-2005	10-12						
9183500	Mill Creek at Sheley Tunnel, Near Moab, UT. <u>(west)</u>								
9210500	Fontenelle C Nr Herschler Ranch, Nr Fontenelle, WY. <u>(west)</u>	1988-2003	13- 15			1981-1986 1981-2010	3-4 12-16	1977-2003	12-16
9223000	Hams Fork Below Pole Creek, Near Frontier, WY. <u>(west)</u>	1967-1972 1973-1982	3-4 8-10						
9312600	White River Bl Tabbyune C Near Soldier Summit, UT. <u>(west)</u>	1974-1993	10-15	1984-1987 1980-1993	2.5-3.5 8-15	1977-1996	11-15	1977-1998	11-15
9378170	South Creek Above Reservoir Near Monticello, UT. <u>(west)</u>								

Section S4: Figures

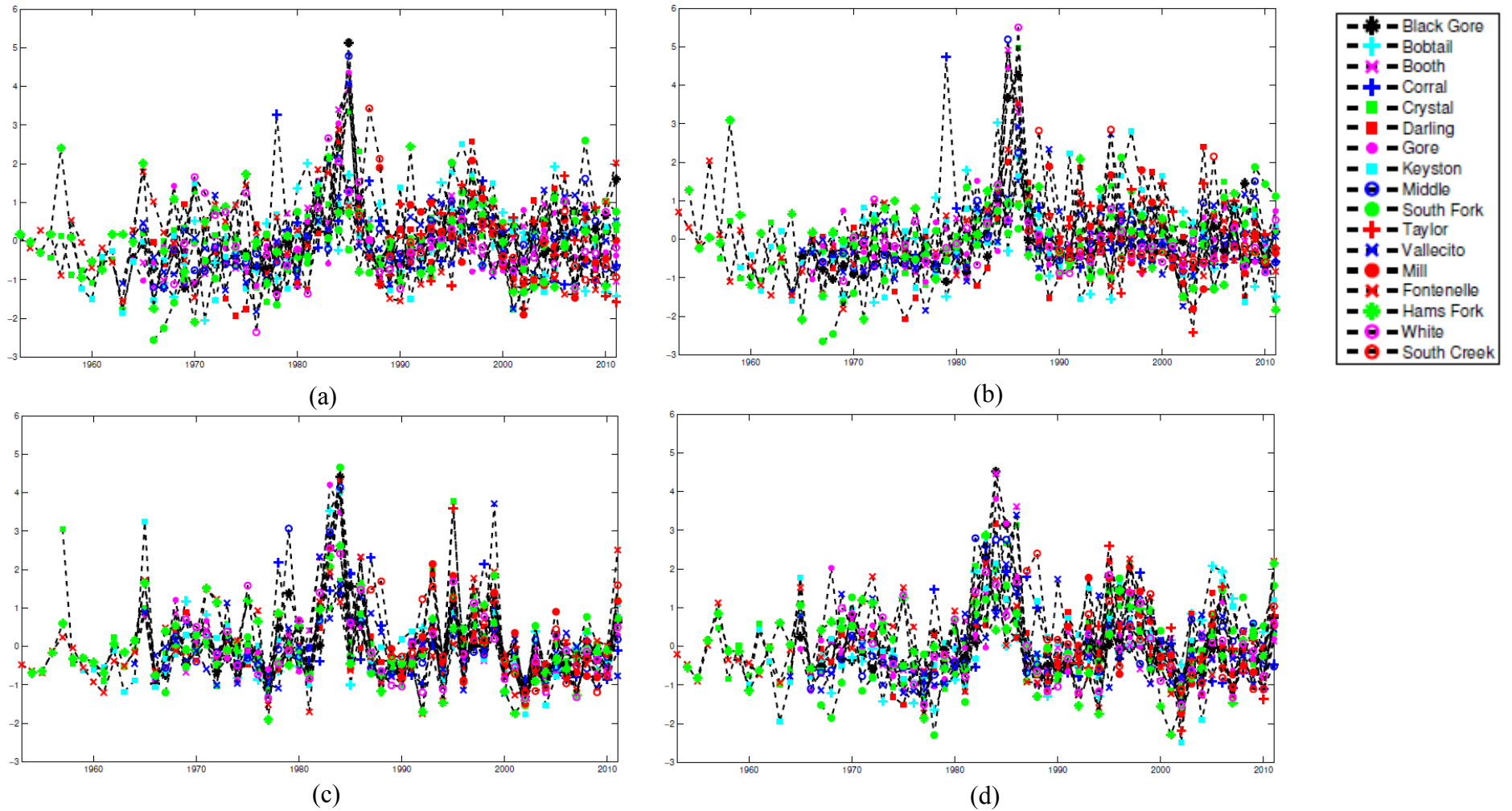
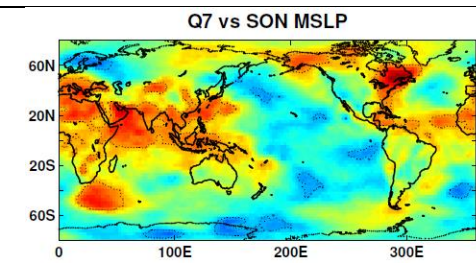
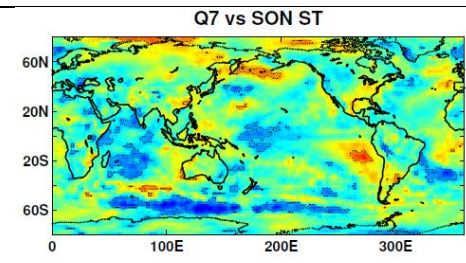
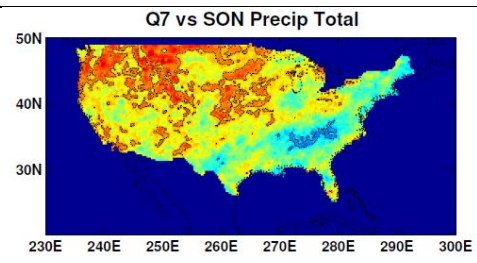
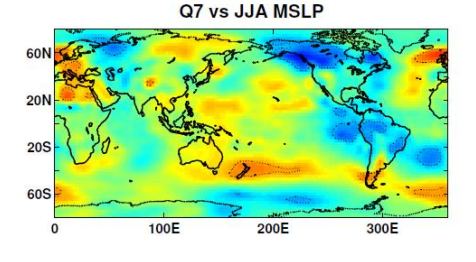
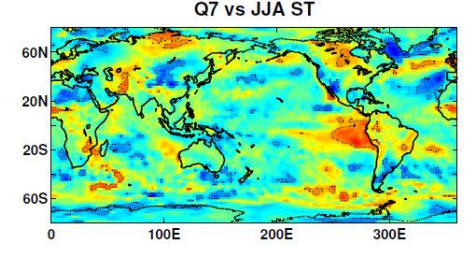
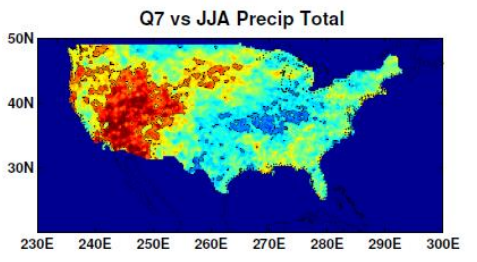


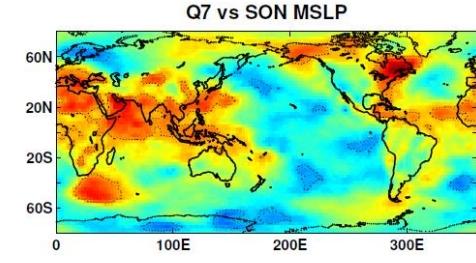
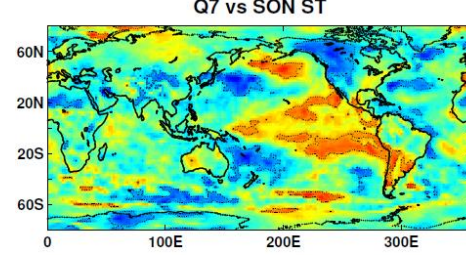
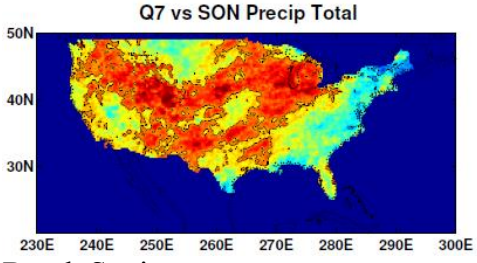
Figure S1: Standardized q7 (z-score) for the traditional seasons (a) Dec-Jan-Feb (DJF); (b) Mar-Apr-May (MAM); (c) Jun-Jul-Aug (JJA); (d) Sep-Oct-Nov (SON).



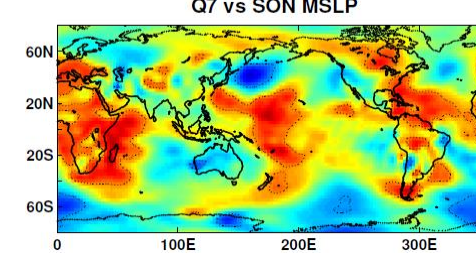
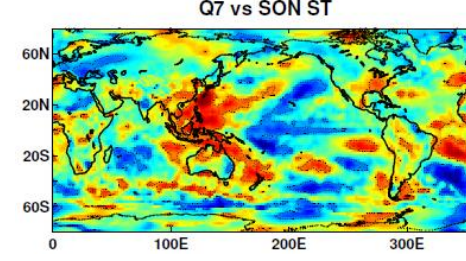
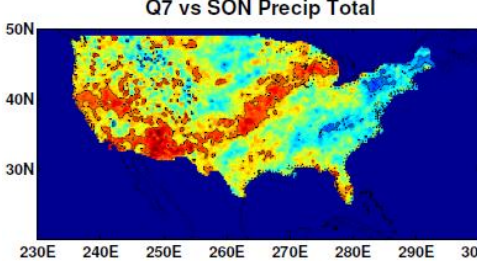
Black Station



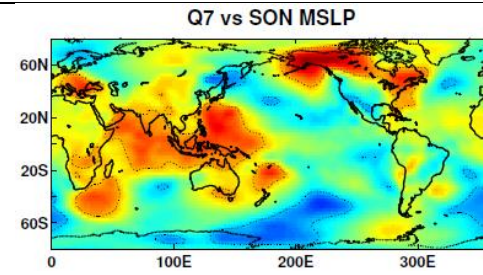
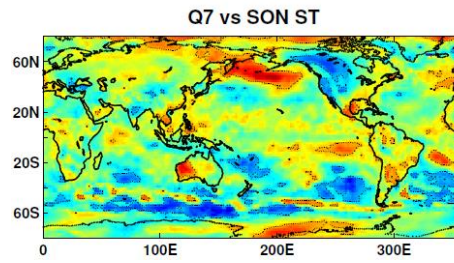
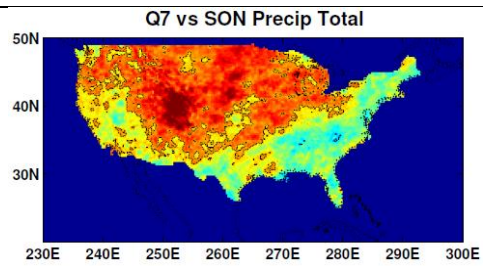
Bobtail Station



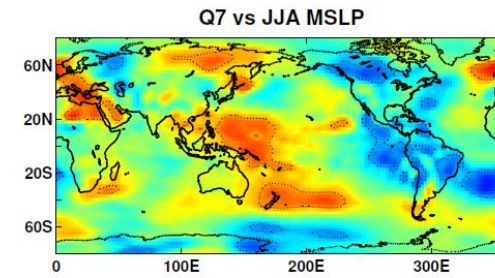
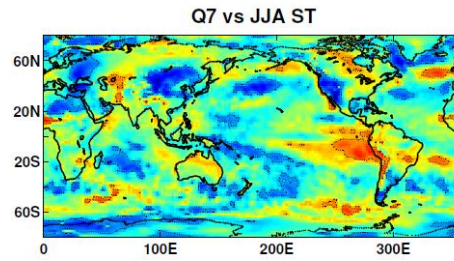
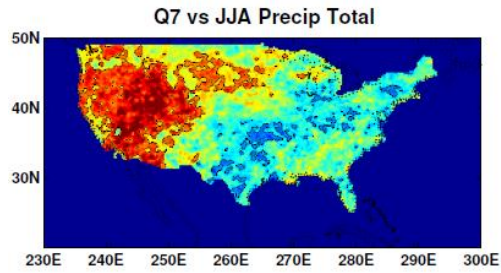
Booth Station



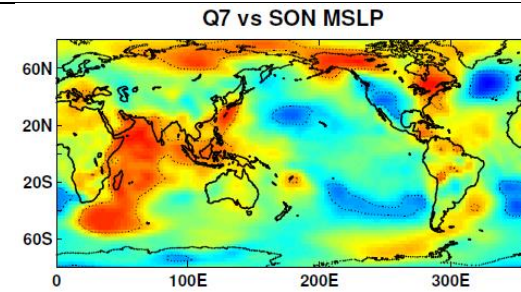
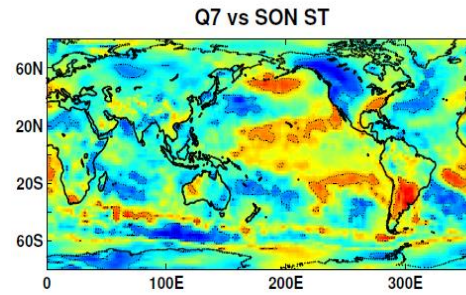
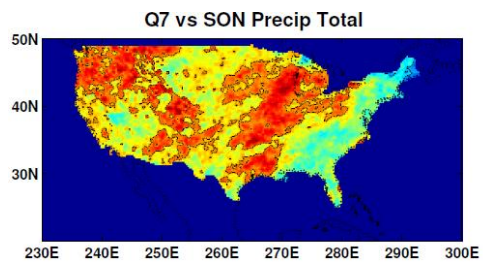
Corral Station



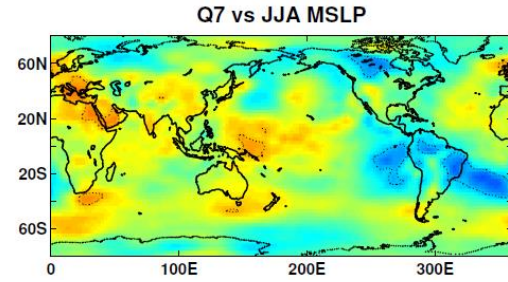
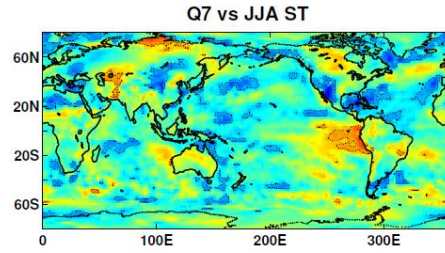
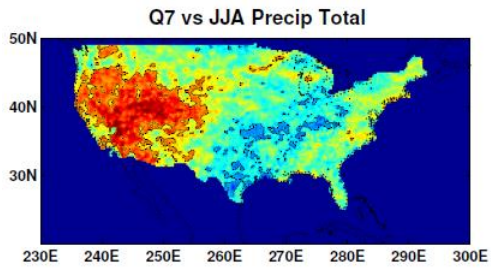
Crystal Station



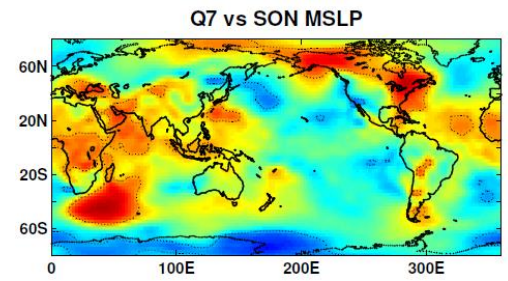
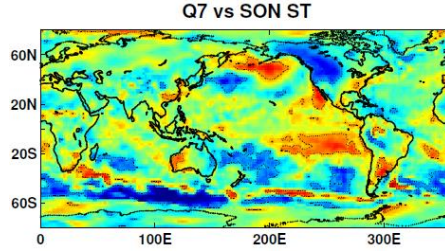
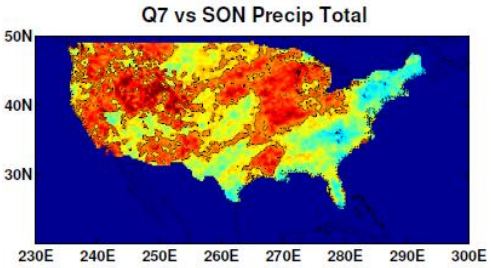
Darling Station



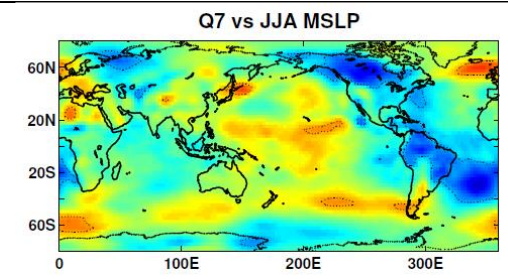
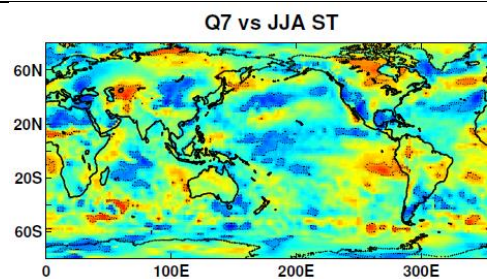
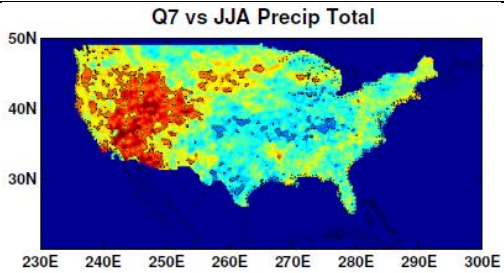
Gore Station



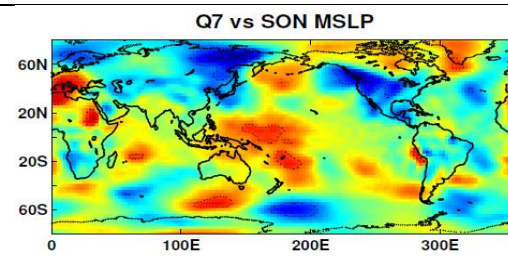
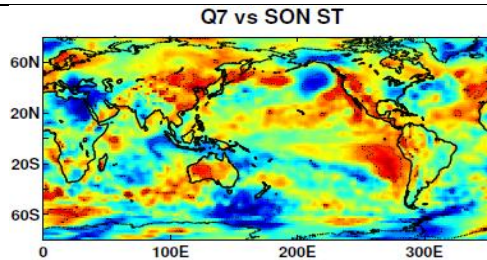
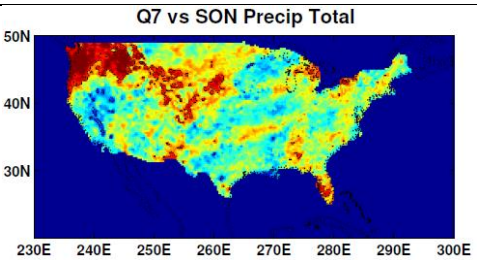
Keystone Station



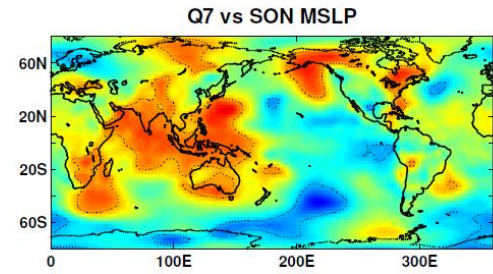
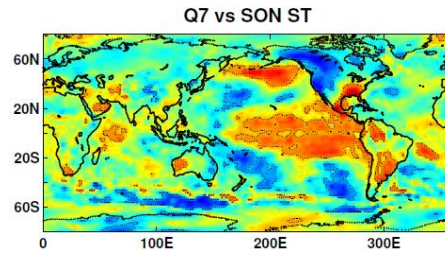
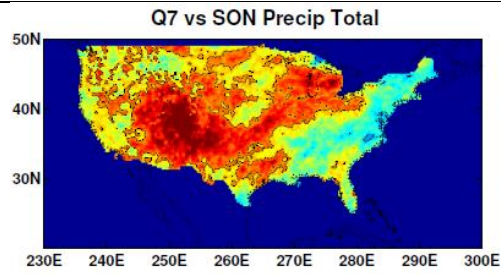
Middle Station



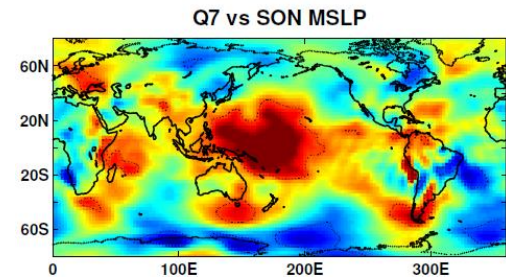
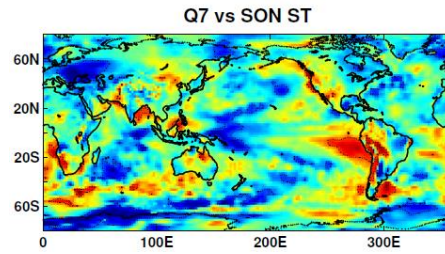
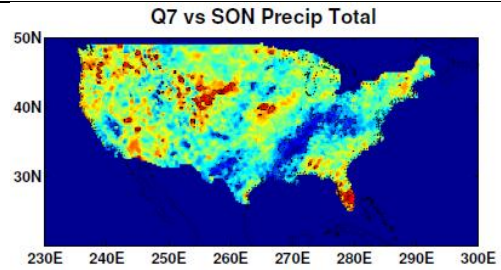
South Fork Station



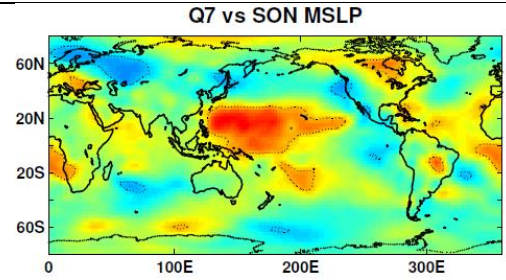
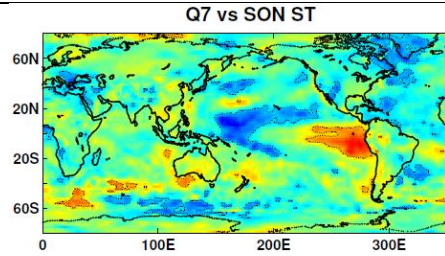
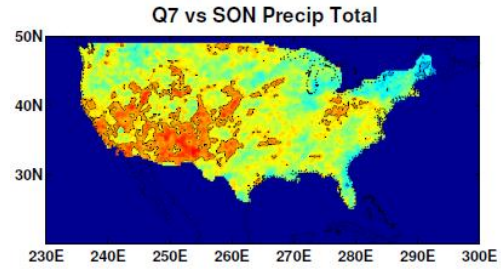
Taylor Station



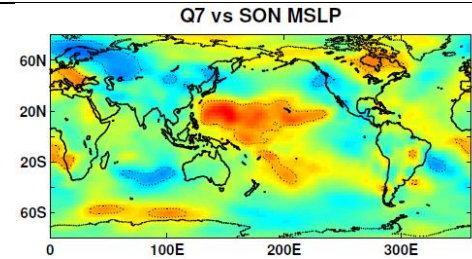
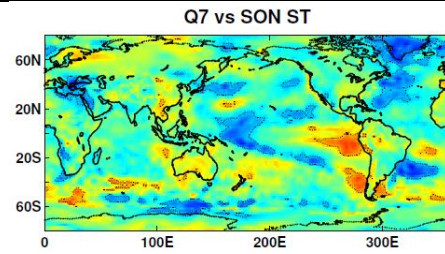
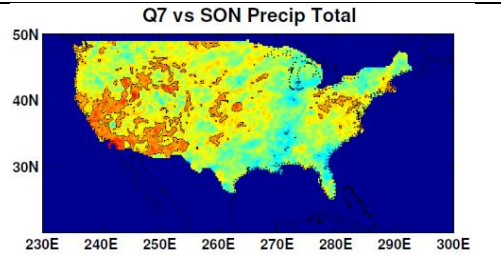
Vallecito Station



Mill Station



Fonettenel Station



Hamsfork Station

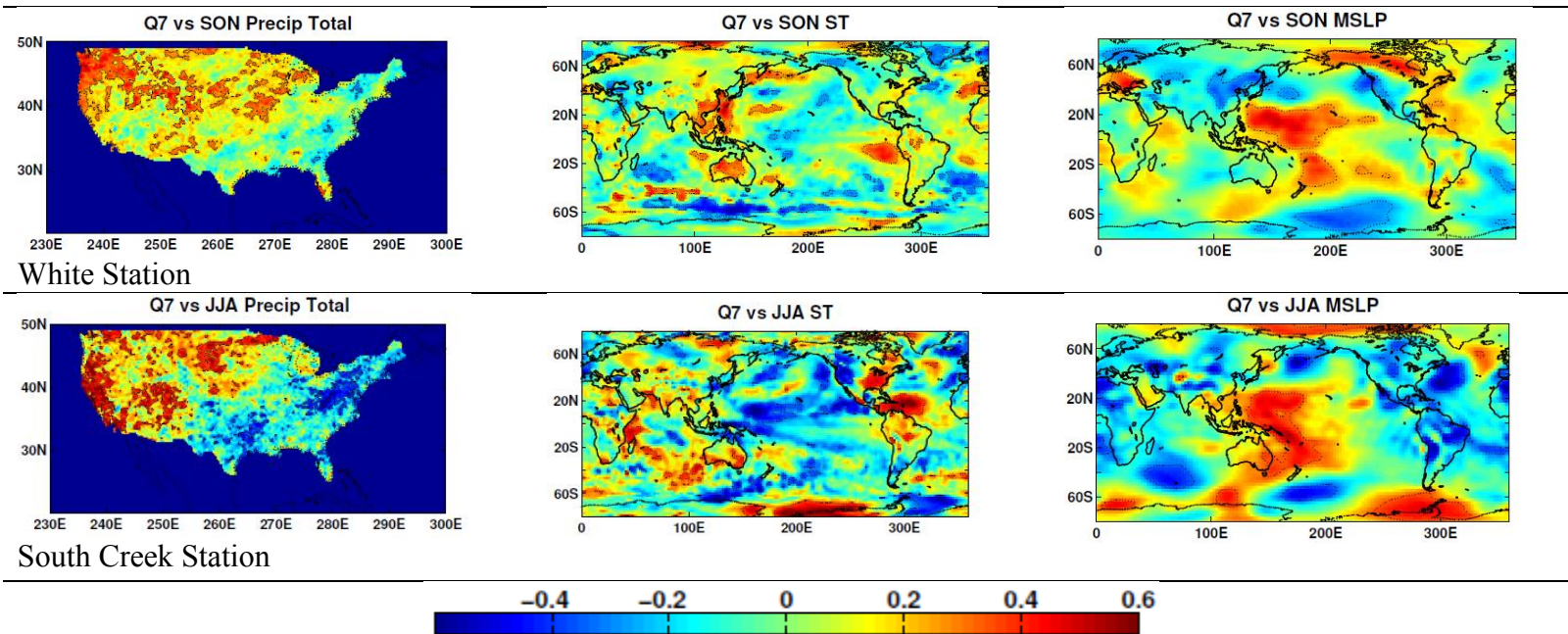


Figure S2: Correlations between seasonal low flow and climate data (95% significant regions are marked by dotted contours).

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