Supplementary material

THE ROLE OF MOISTURE TRANSPORT FOR PRECIPITATION ON THE INTERANNUAL AND INTER-DAILY FLUCTUATIONS OF THE ARCTIC SEA ICE EXTENSION

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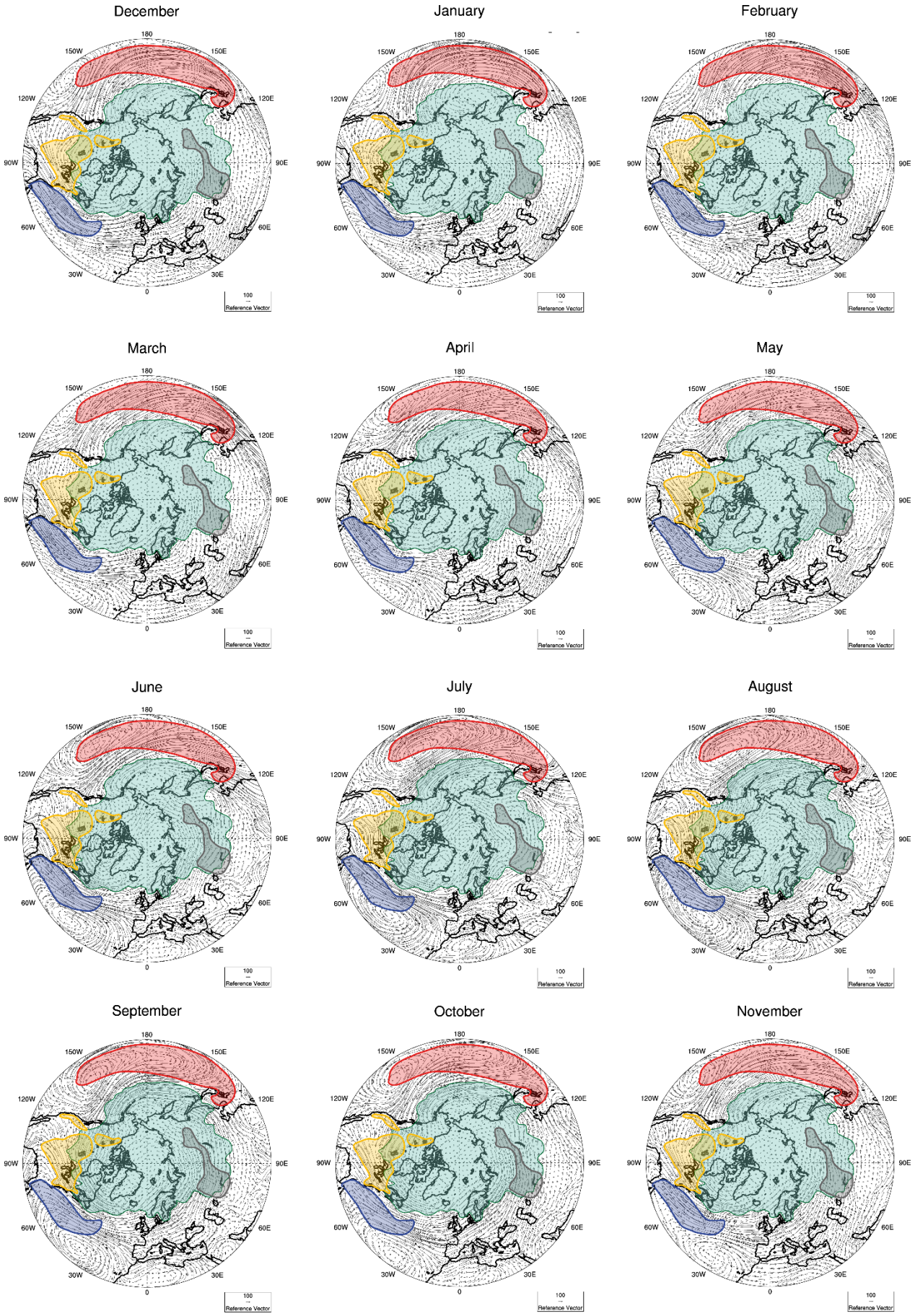
December
January
February
March
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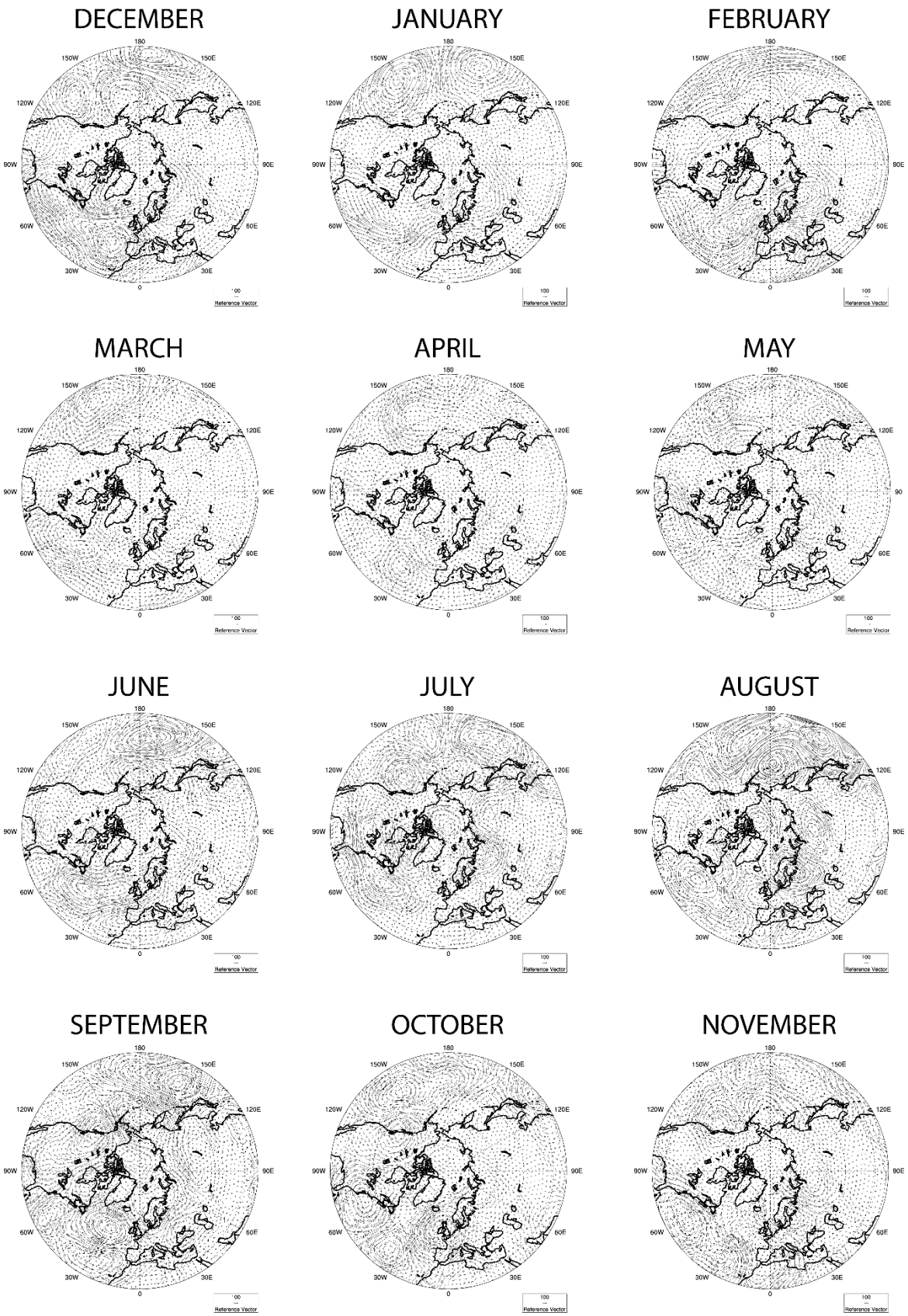
Reference Vector

Figure S1


VIMF DIFFERENCE BETWEEN MINIMUM AND MAXIMUM SIE
DECEMBER
JANUARY
FEBRUARY
MARCH
APRIL
MAY
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AUGUST
SEPTEMBER
OCTOBER
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Reference Vector

Figure S2

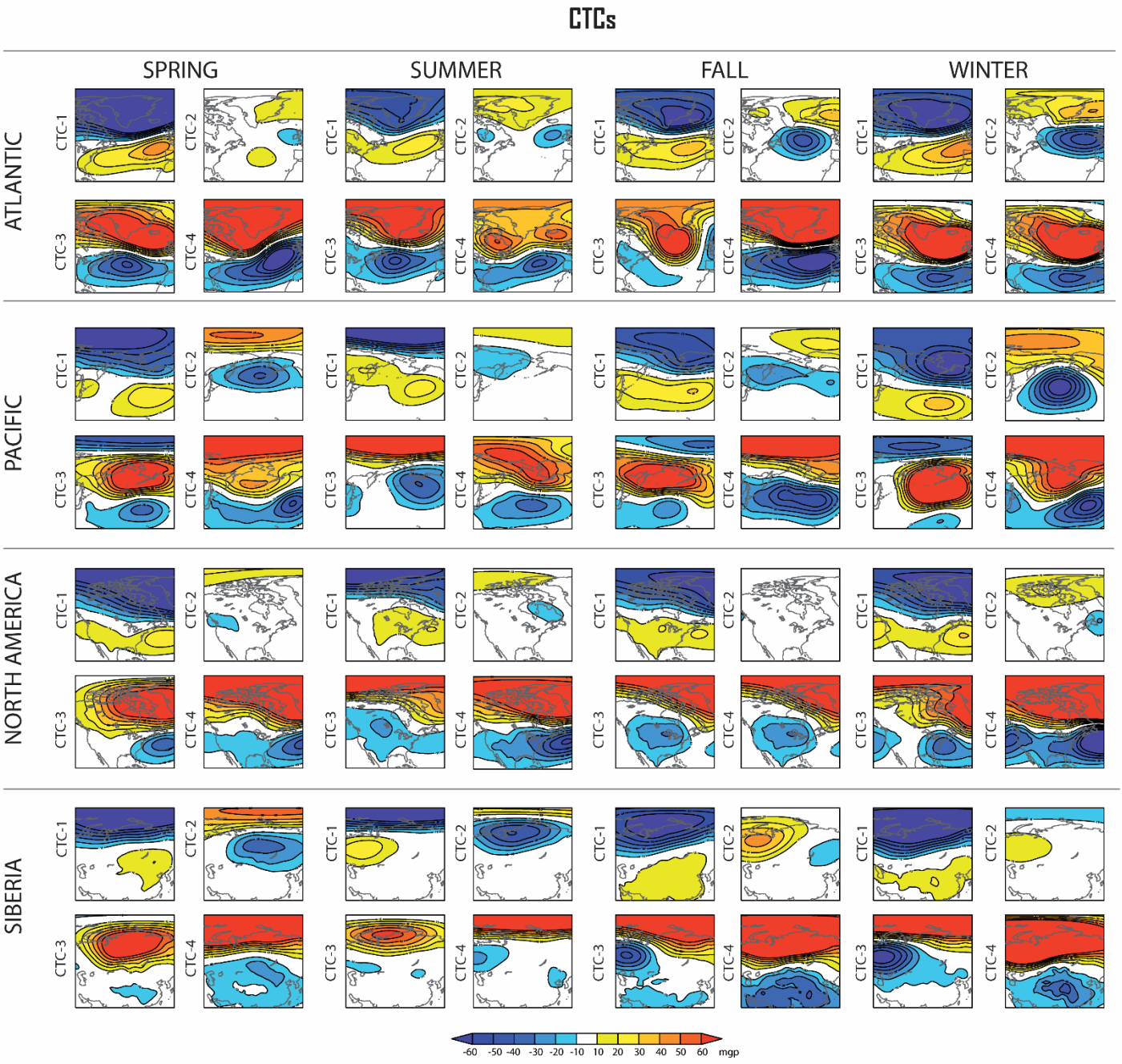
CTCs
SPRING
SUMMER
FALL
WINTER
ATLANTIC
PACIFIC
NORTH AMERICA
SIBERIA
CTC-1
CTC-2
CTC-3
CTC-4
-60 -50 -40 -30 -20 -10 10 20 30 40 50 60 mgp

Figure S3

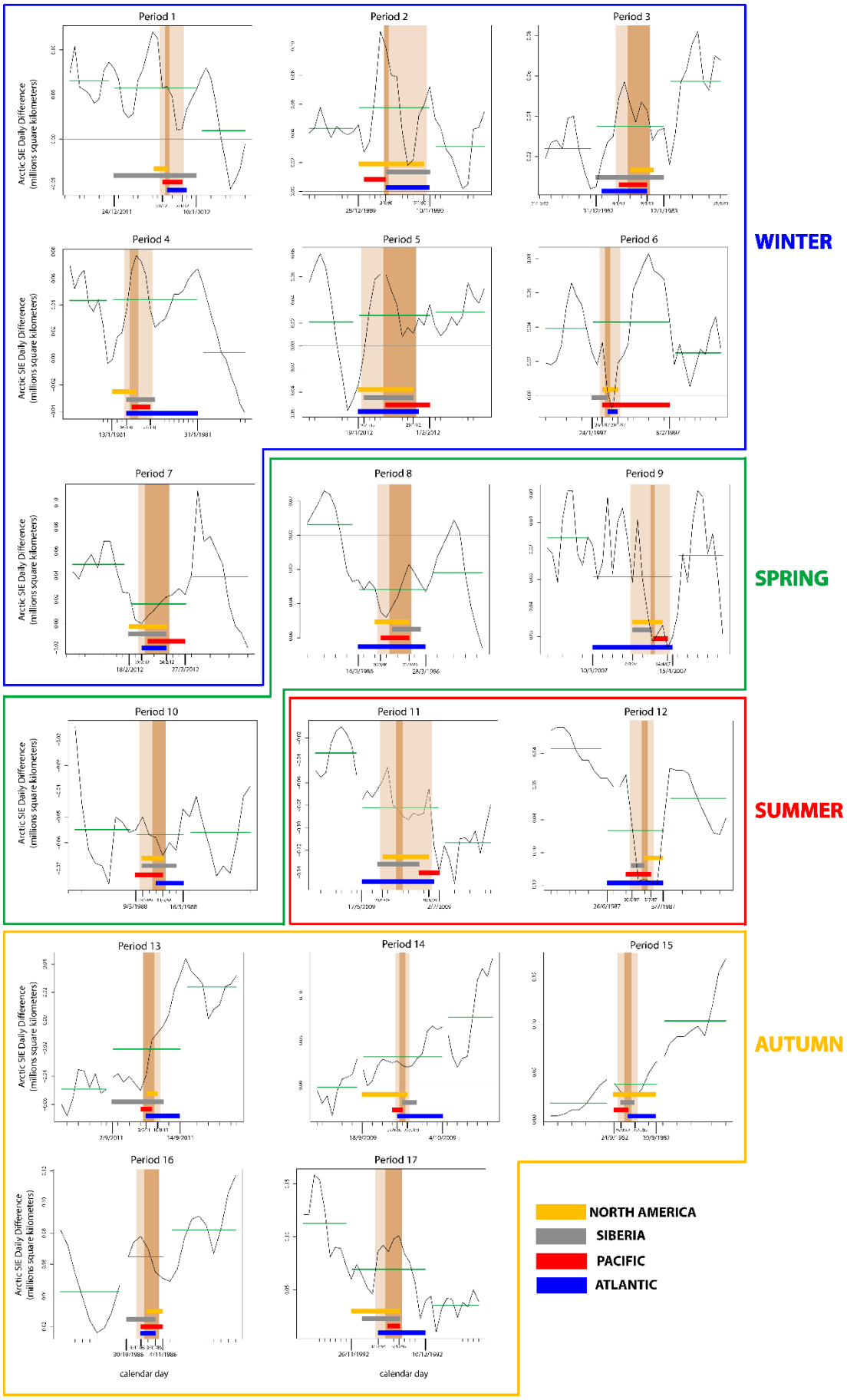
Period 1
Period 2
Period 3
Period 4
Period 5
Period 6
Period 7
Period 8
Period 9
Period 10
Period 11
Period 12
Period 13
Period 14
Period 15
Period 16
Period 17
Arctic SIE Daily Difference (millions square kilometers)
calendar day
WINTER
SPRING
SUMMER
AUTUMN
NORTH AMERICA
SIBERIA
PACIFIC
ATLANTIC

Figure S4

	ARCTIC REGION		BAFFIN		BERING		CENTRAL ARCTIC		GREENLAND	
MONTH	Mínimum	Máximum	Mínimum	Máximum	Mínimum	Máximum	Mínimum	Máximum	Mínimum	Máximur
January	1984 1991 1996 2005 2006	1993 2003	1980 1981 1982 1986 1988 1989 1997 2004 2010 2011	1983 1984 1985 1991 1993 2008 2015 2016	1984 1985 1996 1997 2001 2003 2004 2005 2014 2015 2016	1980 1981 1983 1989 1992 1995 1998 2000 2002 2006 2009 2012 2013	1985 1990 2006 2013 2016	2004 2009 2010 2011 2015	1984 1985 1991 1993 1994 1995 1999 2000 2005	1981 198 1986 198 1989 199 1998
February	1984 1991 2005 2006	1987 1998 2008	1980 1981 1986 1987 1988 1998 2004 2010 2011	1983 1984 1991 1993 1994 2008 2014 2015 2016	1982 1985 1989 1994 1996 2001 2003 2005 2007 2014 2015 2016	1980 1981 1983 1984 1990 1991 1995 1998 1999 2002 2009 2010 2012 2013	1990 2001 2005 2006 2012 2014 2016	2008 2009 2010 2011 2015	1984 1985 1990 1991 1994 1999 2000 2003 2016	1982 198 1987 198 1989 199 1998 20
March	1981 1984 1989 1996 2005 2006 2007 2015 2016	1988 1993 2001 2003 2008 2012	1980 1981 1986 1987 1988 1996 1998 2004 2005 2006 2010 2011 2013	1983 1984 1985 1993 2000 2008 2009 2012 2014 2015	1982 1987 1989 1996 2001 2003 2005 2006 2011 2015 2016	1984 1990 1992 1998 1999 2008 2010 2012 2013	1985 2012 2016	2009 2010 2011 2013 2015	1984 1985 1991 1993 1994 1999 2000 2016	1982 198 1988 198 1996 199 2001 20
April	1989 1990 1996 2004 2005 2006 2007 2015 2016	1982 1993 1999 2001 2009 2010 2012	1980 1981 1986 1988 1996 1999 2005 2006 2010 2011 2013	1983 1984 1990 1991 1993 1994 2008 2009 2014 2015	1981 1982 1989 1996 2002 2003 2004 2011 2014 2015 2016	1984 1985 1988 1991 1992 1994 1995 1999 2000 2008 2009 2010 2012	1995 2006 2012 2016	2007 2008 2009 2011 2014	1983 1984 1993 1994 1999 2004 2006 2016	1982 198 1986 198 1996 199 2001 20
May	1983 1989 1995 1996 2004 2006 2016	1982 1985 1994 1998 1999 2001 2009	1980 1981 1986 1988 1989 1995 1996 2004 2005 2006 2010 2011 2016	1983 1984 1990 1991 1992 1993 2001 2007 2009 2014 2015	1981 1983 1989 1996 1997 2002 2003 2004 2011 2014 2015 2016	1984 1985 1991 1992 1994 1999 2000 2006 2008 2010 2012 2013	2004 2006 2013 2016	2002 2003 2005 2007 2008 2011 2012 2014 2015	1980 1983 1984 1991 1993 1994 1999 2004 2006 2016	1981 198 1986 198 1995 199 1997 20 2008 20
June	1990 1995 2006 2010 2016	1982 1987 1999 2013	1980 1981 1986 1988 1995 2006 2012 2016	1982 1983 1984 1990 1991 1993 1999 2007 2013 2015	1981 1986 1988 1989 1993 1995 1997 2001 2002 2003 2007 2008 2011 2015 2016	1984 1985 1987 1992 1999 2000 2006 2012 2013	1988 2006 2010 2015 2016	2007 2008 2009 2013 2014	1980 1983 1984 1985 1991 1994 1999 2004 2010 2016	1981 198 1992 199 1997 199 2001 20 2012
July	1990 1995 2007 2011	1992 1996 2015	1981 1985 1988 2003 2012 2014	1983 1984 1993 1996 2004 2015	1980 1988 1991 1997 2008 2010 2011	1983 1992 1996 2006 2016	1984 1994 2004 2006 2010 2012 2013 2016	2002 2003 2005 2008 2009 2014	1985 1991 1999 2002 2004 2009 2010 2013 2016	1981 198 1989 199 1997 199 2000 20 2012 20
August	1990 1995 2007 2012	1996	1981 1985 1990 1991 1994 1997 2001	1983 1986 1992 1993 1996 1999 2015	2012 2013 2014 2015	2016	1984 1985 1995 1999 2004 2007 2012 2013	1980 1981 1982 1989 1997 2002 2003 2008 2009 2010 2014	1984 1985 1991 1996 2002 2003 2004 2013 2016	1981 198 1989 199 1995 199 1998 20 2005 20 2011
September	1990 1995 2007 2012	1992 1996	1980 1981 1985 1987 1988 1991 1994 2014	1982 1983 1992 1996 2013 2015	1984 1985 1990 1998 2003 2004	1980 1981 1982 1994 1995 2005 2006 2007	1984 1985 2001 2007 2012 2013	2002 2003 2006 2008 2009 2010 2015	1984 1985 1990 1991 1996 2001 2002 2003 2004 2013	1980 198 1982 198 1989 199 1993 199 1995 199 1999 20 2005 20
October	1984 1985 2007 2016	1982 1986 2008 2013 2014	1981 1984 1985 1988 1991 1992 1998 2002 2012	1982 1983 1986 1990 1996 1997 2011	1981 1987 1988 1997 1998	1983 1985 1992 1994 1996 2004 2016	1984 1990 1995 2001 2007 2009 2012 2013	2002 2003 2005 2006 2008 2010 2014	1984 1985 1990 1991 1996 2001 2002 2004 2010 2013	1981 198 1988 199 1993 199 1999 20 2006 20 2012
November	1981 1996 2006 2016	1982 1992 1993 2008 2014	1984 1985 1988 1994 2002 2003 2006 2010 2012 2016	1982 1983 1986 1990 1993 1996 1999 2007 2008 2009 2011 2015	1980 1984 1986 1987 1990 1993 1997 1998 2000 2002 2003 2004 2006 2007 2010 2014 2016	1981 1983 1988 1992 1994 1999 2001 2005 2009 2011 2012	1984 2009 2012 2016	2005 2008 2010 2011 2014	1984 1985 1986 1990 1991 1993 2002 2003 2004 2016	1980 198 1987 198 1994 199 1997 20 2007
December	1984 1985 2010 2016	1982 1988	1980 1981 1985 1988 1989 1997 2010	1982 1983 1984 1986 1992 1993 2007 2008 2015	1983 1984 1985 1986 1991 1995 1996 2000 2002 2006 2007 2010 2013 2014	1980 1981 1987 1988 1992 1994 1999 2001 2005 2009 2011 2012	1984 2006 2009 2012 2015 2016	2010 2011 2013 2014	1984 1986 1990 1991 1992 1993 2002 2016	1980 198 1987 198 1989 199 1997

Table SI. Minimum and maximum SIE years by month and Ocean Arctic subregion. In bold those most extreme years using one standard desviation, the rest of the years using the half of one standard desviation

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	Atlantic		Pacific		North American		Siberian	
MONTH	Mínimum Mean *SD*	Máximum Mean *SD*	Mínimum Mean *SD*	Máximum Mean *SD*	Mínimum Mean *SD*	Máximum Mean *SD*	Mínimum Mean *SD*	Máximum Mean *SD*
January	3418 *2001*	2924 *1682*	6009 *2789*	7480 *3101*	5568 *1806*	5284 *1521*	3369 *1040*	3067 *878*
February	3880 *1959*	3206 *1705*	5937 *2773*	6831 *3488*	5473 *1887*	5405 *1625*	3279 *1003*	3092 *859*
March	3102 *1431*	3173 *1653*	6373 *3149*	7206 *2388*	5056 *1527*	5418 *1590*	3767 *1592*	3452 *1164*
April	3998 *2108*	3842 *1559*	8265 *3153*	8123 *2593*	5736 *1727*	6215 *1741*	4085 *1182*	4609 *1711*
May	2878 *1364*	3554 *1443*	9236 *3297*	9709 *3509*	7339 *2001*	8157 *2213*	5650 *2146*	5923 *1650*
June	3789 *1466*	3331 *1879*	9540 *3420*	10133 *4619*	9785 *2871*	9465 *3006*	8066 *2989*	8240 *2441*
July	4177 *2383*	3450 *1757*	12484 *4902*	14646 *5209*	12283 *2958*	11498 *2431*	9325 *3494*	9780 *3709*
August	4562 *2500*	3615 *1696*	15164 *5906*	15503 *4620*	12709 *3293*	12142 *2509*	10183 *4364*	10438 *3415*
September	4552 *2048*	4659 *2357*	11685 *5018*	11733 *4867*	1257 *2805*	11515 *2991*	8900 *2685*	8308 *2367*
October	4454 *2507*	4206 *2237*	7911 *3674*	7887 *3621*	9395 *2464*	9361 *3172*	6545 *1654*	6807 *1555*
November	4978 *2605*	4305 *2475*	6434 *2635*	6744 *2806*	6631 *2183*	6552 *1903*	4635 *1889*	4285 *1306*
December	3795 *1819*	3136 *1394*	6811 *3247*	6177 *2675*	6217 *1664*	5979 *1643*	4315 *1202*	3698 *988*

Table SII. Mean and standard desviation of Moisture transport for precipitation (MTP) in mm/day for minimum and maximum SIE years by month

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	Atlantic							
MONTH	CTC1		CTC2		CTC3		CTC4	
	Minimum MTP (% days)	*Maximum MTP (% days)*	*Minimum MTP (% days)*	*Maximum MTP (% days)*	*Minimum MTP (% days)*	*Maximum MTP (% days)*	*Minimum MTP (% days)*	*Maximum MTP (% days)*
January	*3787.55 51.6%*	*3162.51 59.7%*	*3482.77 32.9%*	*2701.19 27.4%*	*3234.39 14.2%*	*3489.43 9.7%*	*883.31 1.3%*	*2840.80 3.2%*
February	4023.38 27.7%	2793.80 42.9%	*3736.06 33.9%*	3396.76 22.6%	*3846.58 27.7%*	*3583.27 23.8%*	*3231.25 10.7%*	*3271.24 10.7%*
March	*3238.71 31.2%*	*3272.96 37.6%*	*2904.72 33.7%*	*2745.04 38.7%*	*2902.46 20.1%*	*2838.40 16.1%*	*2668.22 15.0%*	*1910.13 7.5%*
April	*3135.33 20.7%*	*4635.51 16.7%*	*4066.06 47.8%*	*4162.66 60.9%*	*3694.50 20%*	*3482.88 19.0%*	*2934.99 11.5%*	*4853.62 3.3%*
May	*3431.05 10,1%*	*3621.75 16,1%*	*2828.17 64%*	*3806.68 58.5%*	*2331.59 14.3%*	*2816.89 12.9%*	*3353.99 11.5%*	*3050.06 12.4%*
June	*4266.28 30.0%*	2752.03 35.8%	3943.31 44.7%	3395.75 37.5%	4058.04 18.0%	2455.90 18.3%	3828.43 7.3%	2720.04 8.3%
July	*3488.69 27.4%*	*3553.77 37.6%*	*3907.42 54.8%*	*3227.08 43.0%*	*3377.09 10.5%*	*2549.83 19.4%*	*4092.94 7.3%*	
August	*4455.81 37.1%*	*3084.94 83.9%*	*4243.38 41.1%*	*4971.53 16.1%*	*4293.70 12.9%*		*4211.59 8.9%*	
September	*5377.96 49.2%*	*4193.98 26.7%*	*5348.82 23.3%*	*4193.23 61.7%*	*4898.87 26.7%*	*3809.38 8.3%*	*8236.77 0.8%*	*4495.81 3.3%*
October	*4023.90 37.9%*	*3450.67 45.1%*	*4018.23 51.6%*	*2970.79 38.7%*	*4697.64 6.4%*	*4421.52 10.3%*	*4280.59 4.0%*	*3317.37 5.8%*
November	*5278.35 32.5%*	*3336.36 49.3%*	*4326.46 31.6%*	*3180.29 33.3%*	*3765.35 35.0%*	*3581.52 15.3%*	*2064.46 0.8%*	*2922.36 2.0%*
December	*2562.12 35.5%*	*3430.99 9.7%*	*3398.73 46.0%*	*3838.93 54.8%*	*1929.66 4.8%*	*2867.38 12.9%*	*5046.37 13.7%*	*3534.09 22.6%*

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	Pacific							
MONTH	CTC1		CTC2		CTC3		CTC4	
	Minimum MTP (% days)	*Maximum MTP (% days)*	*Minimum MTP (% days)*	*Maximum MTP (% days)*	*Minimum MTP (% days)*	*Maximum MTP (% days)*	*Minimum MTP (% days)*	*Maximum MTP (% days)*
January	*6443.08 26.5%*	*7693.79 22.6%*	*7185.12 48.4%*	*7155.20 32.3%*	*6934.64 22.6%*	*4364.03 33.9%*	*7300.61 2.6%*	*6533.42 11.3%*

February	*5614.33 39.3%*	*4894.68 60.7%*	*6831.95 31.2%*	*5579.81 27.4%*	*6109.63 20.5%*	*6011.46 11.9%*	*7342.88 8.9%*	
March	*6550.63 25.8%*	*5929.06 32.8%*	*5959.32 34.8%*	*6114.91 39.8%*	*6705.84 26.5%*	*6077.74 18.3%*	*6988.60 12.9%*	*6410.80 9.1%*
April	*8777.30 19.6%*	*7612.12 40.5%*	*7201.23 53.0%*	*6730.55 41.9%*	*7917.73 15.9%*	*7640.35 11.9%*	*7019.46 11.5%*	*6724.62 5.7%*
May	*9570.52 24.0%*	*10010.9 33.6%*	*9371.96 41.5%*	*9095.30 41.9%*	*8409.27 26.3%*	*10966.8 19.4%*	*10214.3 8.3%*	*7983.17 5.1%*
June	*9937.83 28.0%*	*9297.08 20.8%*	*9949.03 52.7%*	*9837.18 45.8%*	*7630.47 12.7%*	*10125.2 25%*	*10534.0 6.7%*	*8993.76 8.3%*
July	*11802.5 19.4%*	*13891.2 37.6%*	*10668.1 53.2%*	*9393.85 40.9%*	*12830.9 26.6%*	*8301.77 18.3%*	*9156.12 0.8%*	*4255.96 3.2%*
August	*15882.2 23.4%*	*15894.9 32.3%*	*14935.4 62.1%*	*14869.5 38.7%*	*15068.6 9.7%*	*13836.7 6.5%*	*13552.1 4.8%*	*11611.9 22.6%*
September	*12733.6 34.2%*	*16766.0 10.0%*	*12526.0 53.3%*	*12235.0 18.3%*	*8867.43 4.2%*	*13371.8 51.7%*	*7750.71 8.3%*	*11459.7 20.0%*
October	*9424.24 28.2%*	*8592.36 38.7%*	*6617.64 52.4%*	*7695.57 37.4%*	*9500.09 8.1%*	*8232.94 12.3%*	*6174.59 11.3%*	*6492.60 11.6%*
November	*5086.95 11.7%*	*6518.55 28.0%*	*5470.15 50.8%*	*5865.47 54.0%*	*8530.19 16.7%*	*8291.72 2.7%*	*7985.45 20.8%*	*5027.67 15.3%*
December	*6804.05 41.1%*	*8215.79 61.3%*	*7885.77 32.3%*	*7156.56 8.1%*	*9317.63 18.5%*	*7284.42 12.9%*	*9067.25 8.1%*	*6462.37 17.8%*

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	North America							
MONTH	CTC1		CTC2		CTC3		CTC4	
	Minimum MTP (% days)	*Maximum MTP (% days)*	*Minimum MTP (% days)*	*Maximum MTP (% days)*	*Minimum MTP (% days)*	*Maximum MTP (% days)*	*Minimum MTP (% days)*	*Maximum MTP (% days)*
January	*6468.58 58.7%*	*6220.54 43.5%*	*5967.46 35.5%*	*5598.85 45.2%*	*5099.64 4.5%*	*3450.73 3.2%*	*3501.54 1.3%*	*3914.19 8.1%*
February	*5128.88 30.4%*	*5128.51 36.9%*	*5356.18 46.4%*	*5717.72 34.5%*	*5662.53 18.7%*	*4475.36 16.7%*	*5512.24 4.5%*	*5410.97 11.9%*
March	*5608.35 40.5%*	*5721.74 41.4%*	*4831.23 34.1%*	*5378.87 41.4%*	*4857.55 14.0%*	*5026.67 15.0%*	*4210.56 11.5%*	*4505.82 2.2%*
April	*6987.56 26.7%*	*7102.86 24.3%*	*6274.94 39.3%*	*6270.81 46.7%*	*5969.62 20.7%*	*6298.47 24.8%*	*5362.54 13.3*	*6335.90 4.3%*
May	*7603.92 17.1%*	*8355.18 24.9%*	*7542.51 48.4%*	*8204.47 45.6%*	*6999.44 21.7%*	*7852.73 21.7%*	*6803.12 12.9%*	*8103.97 7.8%*
June	*9460.53 30.7%*	*11397.1 20.8%*	*9981.03 52%*	*10267.6 55%*	*10466.4 11.3%*	*9447.06 20%*	*9820.00 6.0%*	*5864.61 4.2%*

July	*13274.6 17.8%*	*11584.4 32.3%*	*12167.4 54.0%*	*10598.4 44.1%*	*12836.1 28.2%*	*13143.6 19.4%*		*9185.05 4.3%*
August	*13350.0 23.4%*	*14613.3 71.0%*	*12589.1 63.7%*	*10544.4 29.0%*	*12142.0 12.9%*			
September	*12805.1 30.8%*	*11949.0 6.7%*	*11565.4 58.3%*	*12906.3 68.3%*	*13520.3 9.2%*	*13581.9 13.3%*	*11355.6 1.7%*	*14979.5 11.7%*
October	*10868.9 21.0%*	*8475.68 34.2%*	*10166.3 62.1%*	*8974.49 47.8%*	*11026.1 10.5%*	*10073.9 14.2%*	*8796.34 6.5%*	*12164.1 3.9%*
November	*7105.91 25%*	*6876.66 38.0%*	*6259.72 50.8%*	*7229.27 48.7%*	*6772.31 14.2%*	*5870.16 9.3%*	*5411.81 10%*	*7718.03 4.0%*
December	*5503.79 26.6%*	*7692.54 11.3%*	*6651.83 48.4%*	*6335.86 46.8%*	*5790.68 14.5%*	*5623.42 27.4%*	*7275.68 10.5%*	*5311.53 14.5%*

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	Siberia							
MONTH	CTC1		CTC2		CTC3		CTC4	
	Minimum MTP (% days)	*Maximum MTP (% days)*	*Minimum MTP (% days)*	*Maximum MTP (% days)*	*Minimum MTP (% days)*	*Maximum MTP (% days)*	*Minimum MTP (% days)*	*Maximum MTP (% days)*
January	*3242.07 18.7%*	*3827.27 51.6%*	*2892.82 41.9%*	*3380.71 40.3%*	*3805.39 19.4%*	*3218.08 8.1%*	*2477.25 20%*	
February	*3820.52 8.0%*	*3545.24 23.8%*	*2670.36 67.9%*	*3172.80 63.1%*	*2253.14 6.2%*	*2895.52 13.1%*	*2493.91 17.9%*	
March	*3723.26 45.2%*	*3687.61 53.2%*	*3641.15 32.6%*	*3976.11 22.6%*	*2959.88 17.6%*	*3557.75 22.6%*	*3493.46 4.7%*	*5155.09 1.6%*
April	*5161.72 30.7%*	*5099.48 53.3%*	*4149.49 31.5%*	*4425.08 31.9%*	*4697.69 19.6%*	*4590.18 11.4%*	*3962.57 18.1%*	*3523.43 3.3%*
May	*5924.61 24.4%*	*6700.40 29.0%*	*5565.92 44.7%*	*5544.10 46.5%*	*5717.82 22.1%*	*5537.79 15.2%*	*5148.66 8.8%*	*6023.88 9.2%*
June	*8065.88 40.7%*	*6668.11 35.8%*	*8318.70 34.7%*	*7843.54 37.5%*	*7979.85 14.0%*	*7080.78 16.7%*	*9586.02 10.7%*	*8499.43 10.0%*
July	*8691.27 17.8%*	*8047.46 39.8%*	*9394.21 21.8%*	*9321.64 21.5%*	*9342.75 33.9%*	*9160.71 16.1%*	*11426.3 26.6%*	*9759.74 22.6%*
August	*8420.09 39.5%*	*8278.63 45.2%*	*10039.2 36.3%*	*9340.10 38.7%*	*9959.05 11.3%*	*14082.8 9.7%*	*11746.7 12.9%*	*14052.5 6.5%*
September	*7429.51 15.8%*	*7627.31 10%*	*7483.54 33.3%*	*5949.92 26.7%*	*7693.30 40.0%*	*7448.58 33.3%*	*9214.99 10.8%*	*5421.27 30%*
October	*5980.44 33.9%*	*6975.68 56.8%*	*6145.97 46.0%*	*7192.62 26.5%*	*6575.69 12.9%*	*6269.56 16.8%*	*6403.63 7.3%*	
November	*3993.39 15.8%*	*4964.31 44.7%*	*4271.06 69.2%*	*3680.47 41.3%*	*4301.23 13.3%*	*4383.59 14%*	*3025.90 1.7%*	

December	*4360.41* *29.0%*	*5458.12* *21.0%*	*4043.97* *49.2%*	*4745.69* *54.8%*	*3298.96* *16.9%*	*4040.08* *21.0%*	*3753.79* *4.8%*	*3394.28* *3.2%*

Table SIII. Mean Moisture transport for precipitation (MTP) in mm/day for days grouped in every of the CTCs considering minimum and maximum SIE years by month; and percentage of days gruped on every CTC.

391 **Captions (Supplementary Material)**

392 **Figure S1** As for Figure 2 for all months

393 **Figure S2** As for Figure 5 for all months

394 **Figure S3** Anomalies of geopotential height at 850 hPa (Z850) for the four types of circulation centred on the
395 four source sectors (classes CTC1 to CTC4) for the four seasons

396 **Figure S4** As for Figure 9 but for the seventeen detected Ext-MTPs

397