Predictability of weather-climate anomalies in the North Eurasian regions for different ENSO transitions during last decades

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The impact of the El Niño / Southern Oscillation (ENSO) processes is significant on a global scale, including North Eurasian regions (Mokhov, Timazhev, 2015, 2016, 2018). In (Mokhov, Timazhev, 2016) estimates of possible anomalies in Russian regions in May-July, 2016 are obtained, taking into account the El Niño phase corresponding to the beginning of the year and its forecasted transformation by the end of the year. Here we analyze observations only for the last decades (since 1980) and present estimates for the predictability of regional climate anomalies in 2019, which begins during the El Niño phase (with positive anomalies of sea surface temperature, SST, in equatorial regions of the Pacific Ocean). According to early-April CPC/IRI official probabilistic ENSO forecast on the basis of ensemble model simulations the probability of the El Niño (*E*) phase continuation to the end of 2019 is about 50%. The corresponding probabilities for neutral (*N*) phase and La Niña (*L*) phase to the end of 2019 are about 40% and 10%, correspondingly.

We analyzed the spring-summer (May-July) anomalies of surface air temperature (SAT) δT and precipitation δP, and also drought (*D*) and excessive moisture (*M*) indices for European (ER) and Asian (AR) parts of Russia in mid-latitudes from observations for the period 1980-2015 according to extended data from (Meshcherskaya et al., 2011). We used different indices of the El Niño / La Niña effects characterized by the sea surface temperature (SST) in the Niño3 and Nino4 regions in the equatorial latitudes of the Pacific Ocean. The El Niño (*E*), La Niña (*L*) and neutral (*N*) phases are defined similar to (Mokhov, Timazhev, 2015, 2016, 2018).

Table 1. Probability of positive and negative surface air temperature anomalies (δT) in the ER (and AR) in May-July for different ENSO phase transitions (characterized by the Niño3 index) from observations since 1980 for ER and AR (in brackets).

δT, K / **Niño3**		**Neutral phase (N) at the beginning of the year** *n=22*			**El-Nino phase (E) at the beginning of the year** *n=9*			**La-Nina phase at the beginning of the year** *n=5*		
		N→E *n=8*	***N→L*** *n=0*	***N→N*** *n=14*	***E→E*** *n=2*	***E→L*** *n=4*	***E→N*** *n=3*	***L→E*** *n=0*	***L→L*** *n=1*	***L→N*** *n=4*
>0	>0	6/8 (4/8)	0/0 (0/0)	8/14 (11/14)	2/2 (2/2)	4/4 (3/4)	1/3 (2/3)	0/0 (0/0)	1/1 (1/1)	2/4 (4/4)
	>1K	3/8 (3/8)	0/0 (0/0)	6/14 (7/14)	1/2 (2/2)	4/4 (1/4)	0/3 (1/3)	0/0 (0/0)	0/1 (1/1)	2/4 (2/4)
≤0	≤0	2/8 (4/8)	0/0 (0/0)	6/14 (3/14)	0/2 (0/2)	0/4 (1/4)	2/3 (1/3)	0/0 (0/0)	0/1 (0/1)	2/4 (0/4)
	≤-1K	1/8 (1/8)	0/0 (0/0)	2/14 (1/14)	0/2 (0/2)	0/4 (0/4)	1/3 (0/3)	0/0 (0/0)	0/1 (0/1)	0/4 (0/4)

Tables 1,2 show the estimates for probability of spring–summer temperature anomalies δT in the ER for different ENSO with the use different index in the Niño3 and Nino4 regions in the equatorial latitudes of the Pacific Ocean. According to Tables 1,2 for the more probable $E \rightarrow E$ transition in 2019 there is a high probability for extreme positive temperature anomaly δT in May-July for AR. For the less probable $E \rightarrow N$ transition in 2019 there is a relatively small probability for extreme temperature anomalies for ER and AR in May-July (especially for extreme negative temperature anomalies for AR). For the least probable $E \rightarrow L$ transition in 2019 there is a large probability for extreme positive temperature anomalies for ER in May-July.

Table 2. Probability of positive and negative surface air temperature anomalies (δT) in the ER (and AR) in May-July for different ENSO phase transitions (characterized by the Nino4 index) from observations since 1980 for ER and AR (in brackets).

δT, K		**Neutral phase (N) at the beginning of the year** *n=15*			**El-Nino phase (E) at the beginning of the year** *n=14*			**La-Nina phase at the beginning of the year** *n=7*		
Niño4		***N→E*** *n=9*	***N→L*** *n=0*	***N→N*** *n=6*	***E→E*** *n=6*	***E→L*** *n=5*	***E→N*** *n=3*	***L→E*** *n=0*	***L→L*** *n=2*	***L→N*** *n=5*
>0	>0	5/9 (5/9)	0/0 (0/0)	5/6 (5/6)	3/6 (6/6)	5/5 (4/5)	2/3 (2/3)	0/0 (0/0)	2/2 (1/2)	2/5 (4/5)
	>1K	2/9 (3/9)	0/0 (0/0)	4/6 (3/6)	2/6 (6/6)	4/5 (1/5)	1/3 (1/3)	0/0 (0/0)	1/2 (1/2)	2/5 (2/5)
≤0	≤0	4/9 (4/9)	0/0 (0/0)	1/6 (1/6)	3/6 (0/6)	0/5 (1/5)	1/3 (1/3)	0/0 (0/0)	0/2 (1/2)	3/5 (1/5)
	≤-1K	2/9 (1/9)	0/0 (0/0)	0/6 (0/6)	1/6 (0/6)	0/5 (0/5)	1/3 (0/3)	0/0 (0/0)	0/2 (0/2)	0/5 (1/5)

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