Intercomparison of NCEP and ERA reanalyses in terms of characteristics of surface air temperature annual cycle

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Climatology and interannual variability of the amplitude-phase characteristics (APC) of the annual cycle (AC) for surface air temperature (SAT) are studied here using the data of NCEP/NCAR [3] and ERA [2] reanalyses for 1958–1998 and 1979–1993 respectively. The APC studied are amplitudes of the annual and semiannual AC harmonics, moments of 0– and π–phases (when SAT equals its annual mean value in spring and autumn, respectively) and interval of exceeding (the period when SAT is higher than its annual mean value) [1]. The two studied reanalyses were compared in terms of the Taylor's diagrams [4] and in terms of the spatial standard deviations.

Table 1 shows the area averaged SAT AC APC for 1979-1993 obtained from the two studied reanalyses together with Taylor's amplitude and spatial correlation coefficients and spatial standard deviation between them. These values are very robust to the particular choice of time intervals to study and change only insignificantly when other intervals are considered. Generally, the two studied reanalyses agree to each other reasonably well. An agreement is better over the Northern Hemisphere in comparison to the Southern Hemisphere. Strong dissimilarities between the reanalyses are found over the polar latitudes (not shown). For 0– and π–phase moments and interval of exceeding the largest deviations are found over the tropics, where these variables are poorly defined. These deviations decrease when only the extratropical areas are considered (Table 1).

Similar (but much wider) intercomparison for atmospheric and climate models is planned nearest future.

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References

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Table 1: SAT AC amplitude–phase characteristics obtained from the data of reanalyses for 1979–1993. The notations are: $T_{s,1}$ and $T_{s,2}$ — amplitudes of annual and semiannual SAT harmonics respectively, $t_s^{(\uparrow)}$ and $t_s^{(\downarrow)}$ — moments of 0– and π–phases correspondingly, $t_s^{(+)}$ — interval of exceeding. In every cell upper line shows the climatological value (for $T_{s,1}$ and $T_{s,2}$ — in Kelvins, for $t_s^{(\uparrow)}$ and $t_s^{(\downarrow)}$ and $t_s^{(+)}$ — in days since the beginning of the year, for $t_s^{(+)}$ — in days) from the NCEP and ERA data, respectively (separated by commas). Middle line presents Taylor's amplitude and spatial correlation coefficient correspondingly. Bottom line shows spatial standard deviations between the two reanalyses data for $T_{s,1}$ and $T_{s,2}$ — in Kelvins, for $t_s^{(\uparrow)}$, $t_s^{(\downarrow)}$ and $t_s^{(+)}$ — in days).

		$T_{s,1}$	$T_{s,2}$	$t_s^{(\uparrow)}$	$t_s^{(\downarrow)}$	$t_s^{(+)}$
Northern Hemisphere	total	6.9, 7.5 0.87, 0.98 1.8	1.0, 1.1 0.95, 0.82 0.5	110, 114 0.97, 0.69 36	270, 273 0.96, 0.90 22	178, 182 0.96, 0.77 13
	land	11.6, 13.1 0.79, 0.97 2.9	1.5, 1.8 0.90, 0.70 0.7	94, 103 0.88, 0.44 50	258, 263 0.92, 0.87 24	180, 186 1.04, 0.51 17
	ocean	4.0, 4.0 1.05, 0.99 0.6	0.7, 0.7 1.29, 0.85 0.4	120, 121 1.01, 0.85 23	278, 278 0.97, 0.92 21	176, 179 0.94, 0.89 9
Southern Hemisphere	total	3.6, 3.3 1.19, 0.93 1.6	0.9, 0.8 1.29, 0.96 0.5	288, 288 1.02, 0.93 26	126, 128 1.16, 0.78 23	179, 182 1.07, 0.73 13
	land	7.0, 7.1 0.79, 0.97 1.8	2.2, 2.1 0.90, 0.70 0.7	247, 250 0.88, 0.44 33	104, 106 0.92, 0.87 50	172, 182 1.04, 0.51 29
	ocean	2.8, 2.5 1.77, 0.94 1.6	0.5, 0.5 1.98, 0.94 0.4	284, 284 1.03, 0.95 24	131, 133 1.01, 0.90 10	181, 182 1.04, 0.90 6
Northern extratropics (30–90N)	total	11.3, 12.4 0.82, 0.96 2.5	1.4, 1.5 1.01, 0.71 0.7	110, 111 0.98, 0.97 5	285, 289 1.17, 0.95 6	175, 178 0.91, 0.86 7
	land	15.2, 17.6 0.71, 0.93 3.4	1.7, 1.9 0.98, 0.62 0.7	94, 95 0.80, 0.73 6	273, 279 1.10, 0.68 8	179, 184 0.93, 0.71 9
	ocean	7.5, 7.3 1.07, 0.99 0.9	1.2, 1.1 1.32, 0.77 0.6	125, 126 0.94, 0.98 4	296, 298 1.22, 0.96 5	171, 173 0.92, 0.91 5
Southern extratropics (30–90S)	total	5.1, 4.5 1.20, 0.92 2.2	1.3, 1.0 1.29, 0.96 0.7	302, 302 1.04, 0.95 5	114, 115 1.14, 0.97 6	177, 178 1.16, 0.95 5
	land	13.0, 13.0 1.11, 0.90 2.2	4.3, 3.7 1.26, 0.96 1.1	275, 278 0.75, 0.47 7	70, 76 1.33, 0.88 10	161, 163 1.22, 0.95 7
	ocean	3.9, 3.1 1.92, 0.94 2.2	0.8, 0.6 2.03, 0.95 0.6	306, 305 0.97, 0.93 5	122, 122 1.14, 0.95 5	180, 180 1.16, 0.94 5