AN 11-YEAR CYCLE IN MATERNAL MORTALITY?

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Abstract. The detection of cycles in us, corresponding to the known average length of cycles around us, is an indispensable, but in itself insufficient step for the study of shared frequencies and of their possibly corresponding behavior. With the qualification that even similar cycles in and around us, in themselves, are not evidence for an association, we here report a hint that human pregnancy, like the human baby, may be influenced by interplanetary and/or terrestrial magnetism, a probability deserving further investigation by examining, when the opportunity arises, whether an amplification, damping or disappearance of an environmental spectral component, is associated (perhaps with a lag) with the amplification or damping of the biospheric component.

The fourteen areas of the Republic of Kazakhstan provided, via the program "Motherhood and childhood" of its Ministry of Health, data on maternal mortality, that is on the rate of death among women during pregnancy or within 42 days after the end of any pathological condition associated with pregnancy, excluding accident-related causes. The data were yearly, and each series covered 11 consecutive years, Figure 1. A decreasing trend in the data, Table 1, was removed, as shown in Figure 2. (Before attributing this trend to improved care, longer series will have to examine the possibility that the trend is at least in part contributed by a cycle with a period, τ, longer than the length of the available time series.)

Method. The detrended data were analyzed by single cosinor, first as separate series fitted to a 11-year cosine curve and its harmonics. The amplitudes and acrophases thus obtained were summarized by population-mean cosinor (1–3).

Results. The no-undecennian-rhythm assumption was rejected (P=0.007), as seen from Figure 3, displaying the average data from the 14 areas, together with the 11-year cosine curve, its characteristics being obtained by population-mean cosinor. The second harmonic, with a 5.5-year period, was also found to be statistically significant (P=0.024). The corresponding composite model is shown with the data in Figure 4, providing an improved approximation of the data.

Discussion. It has previously been reported that the human baby is a very sensitive magnetometer, exhibiting, for instance, putative solar periods, Figure 5 (4; cf. 5, 6). Figures 6A and 6B show the time course of Wolf's sunspot numbers during the span for which data on maternal mortality are available. It appears to the naked eye that the fit of an 11-year cycle alone reflects an as-yet also putative cosmic effect better than the added fit of a harmonic. Whether the harmonic reflects an alteration of the waveform and, if so, the factor(s) underlying this alteration are questions warranting further analyses on longer series. Whether the pregnant mother is also influenced by the cosmos, perhaps by factors related, among others, to the about 11-year Horrebow (7)-Schwabe (8) sunspot cycle, must be established by longer series that allow more than cross-correlation and cross-spectra or cross-wavelets, but the fact that short series, of the length analyzed herein, can provide results validated by longer ones, has been documented (9). Long time series covering several decades will be essential to see whether any environmental cycles from space or terrestrial weather influence maternal mortality, among other human affairs (10, 11). Amplifications, damping or lack of detection of the environmental cycles could then be tested for corresponding changes in the biospheric component(s), with the possibility that in the case of disappearance of an environmental cycle, the biospheric component may be damped, but may persist if it is genetically coded (12, 13) and surfaces above the noise level,

as it did in Figures 3, 4 and 6 (while the naked eye fails to reliably detect any cycle in the original or detrended data, shown in Figures 1 and 2).

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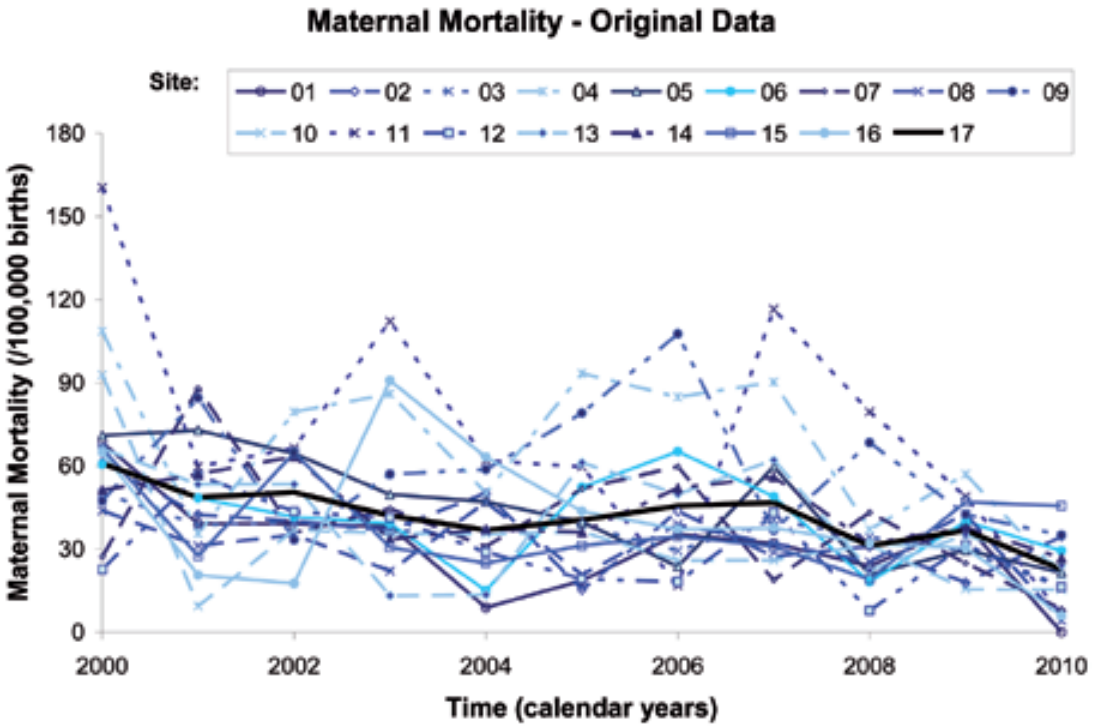

Figure 1. Original yearly data (2000–2010) on maternal mortality from 14 areas of Kazakhstan, for two towns and for the country as a whole. © Halberg.

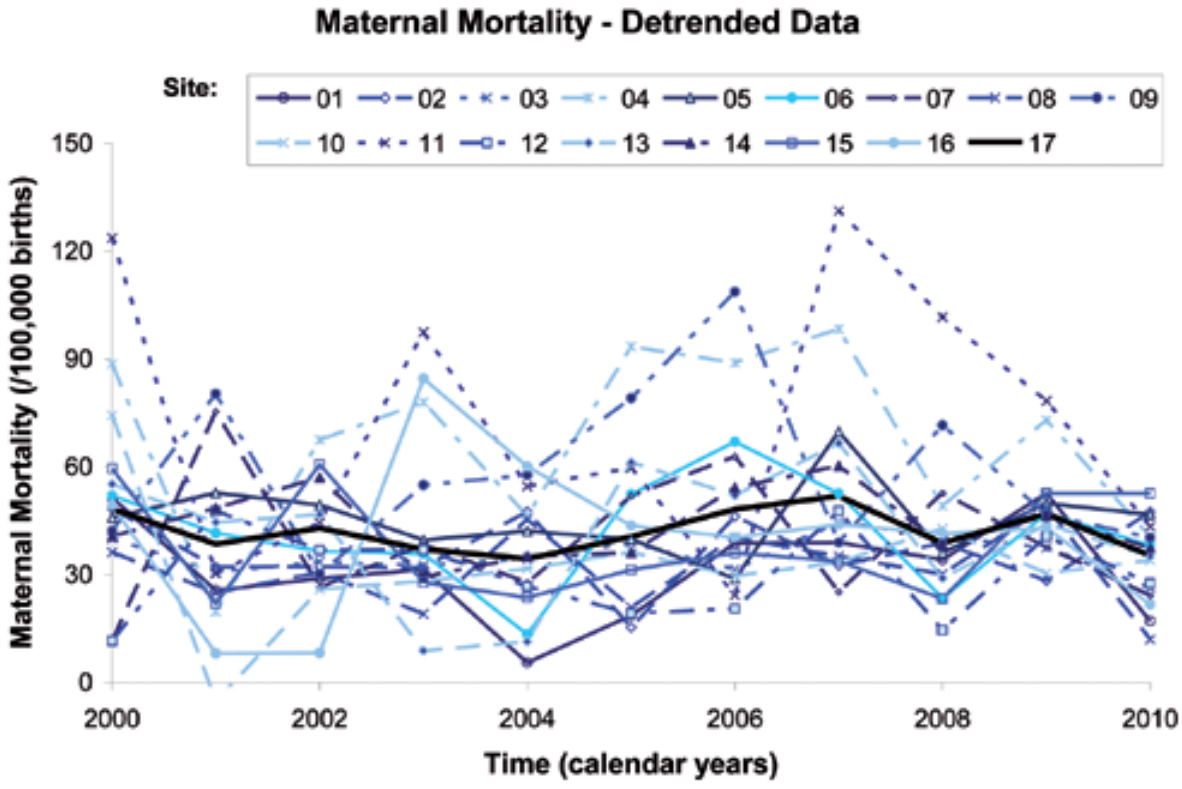

Figure 2. Since maternal mortality decreases numerically in all 16 sites investigated and, with statistical significance, in Kazakhstan as a whole (see Table 1), yearly data were detrended prior to analysis. © Halberg.

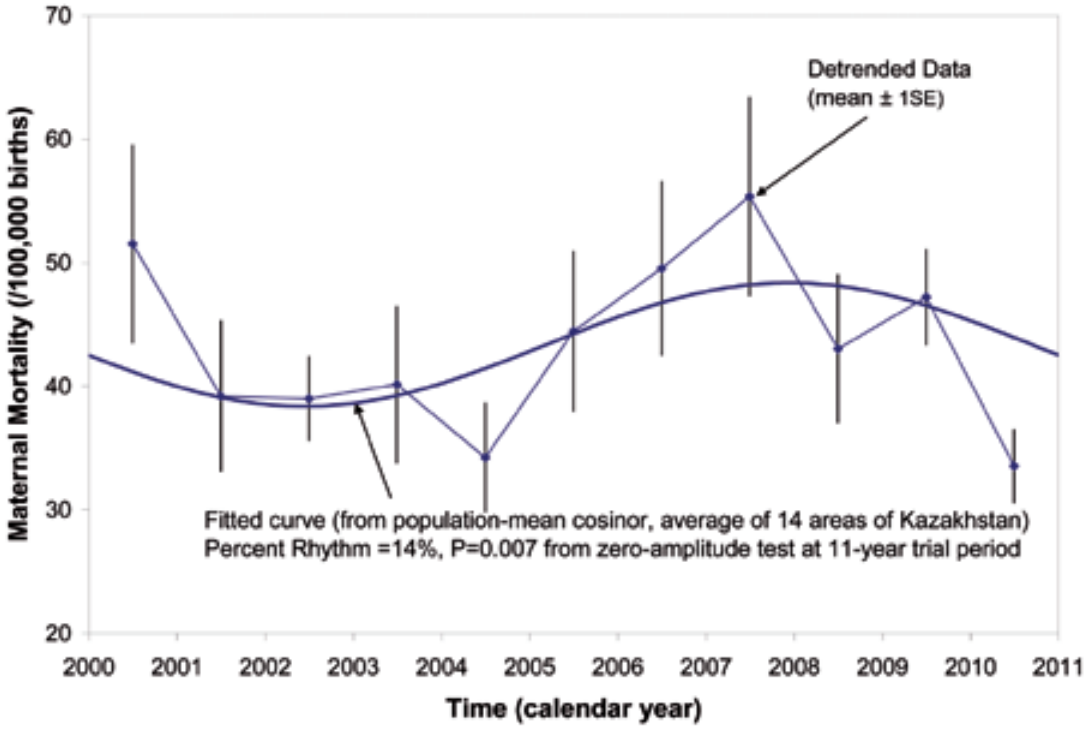

Figure 3. Yearly means and standard errors (SE) of maternal mortality for the 14 areas of Kazakhstan are fitted with a 11-year cosine curve detected with statistical significance by population-mean cosinor. © Halberg.

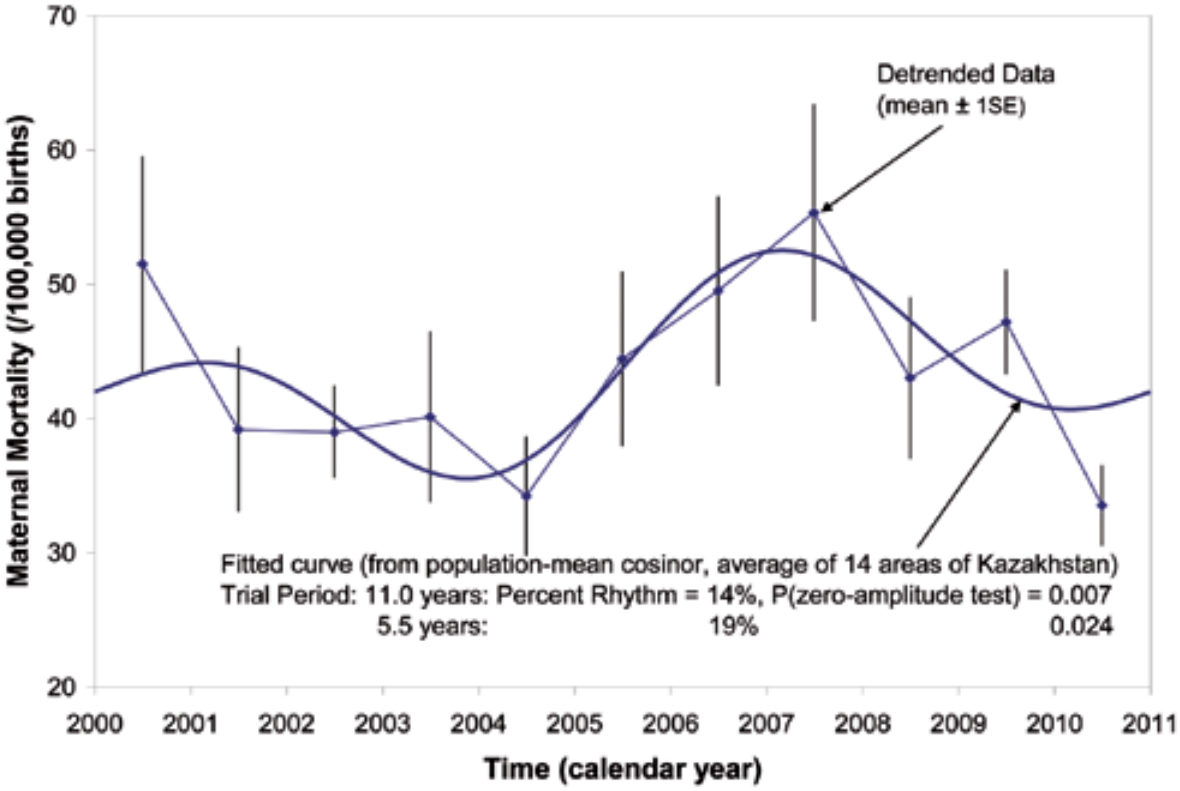

Figure 4. By population-mean cosinor, the second harmonic with a period of 5.5 years was also detected with statistical significance. Accordingly, the yearly means are fitted with the composite model, including cosine curves with periods of 11.0 and 5.5 years. © Halberg.

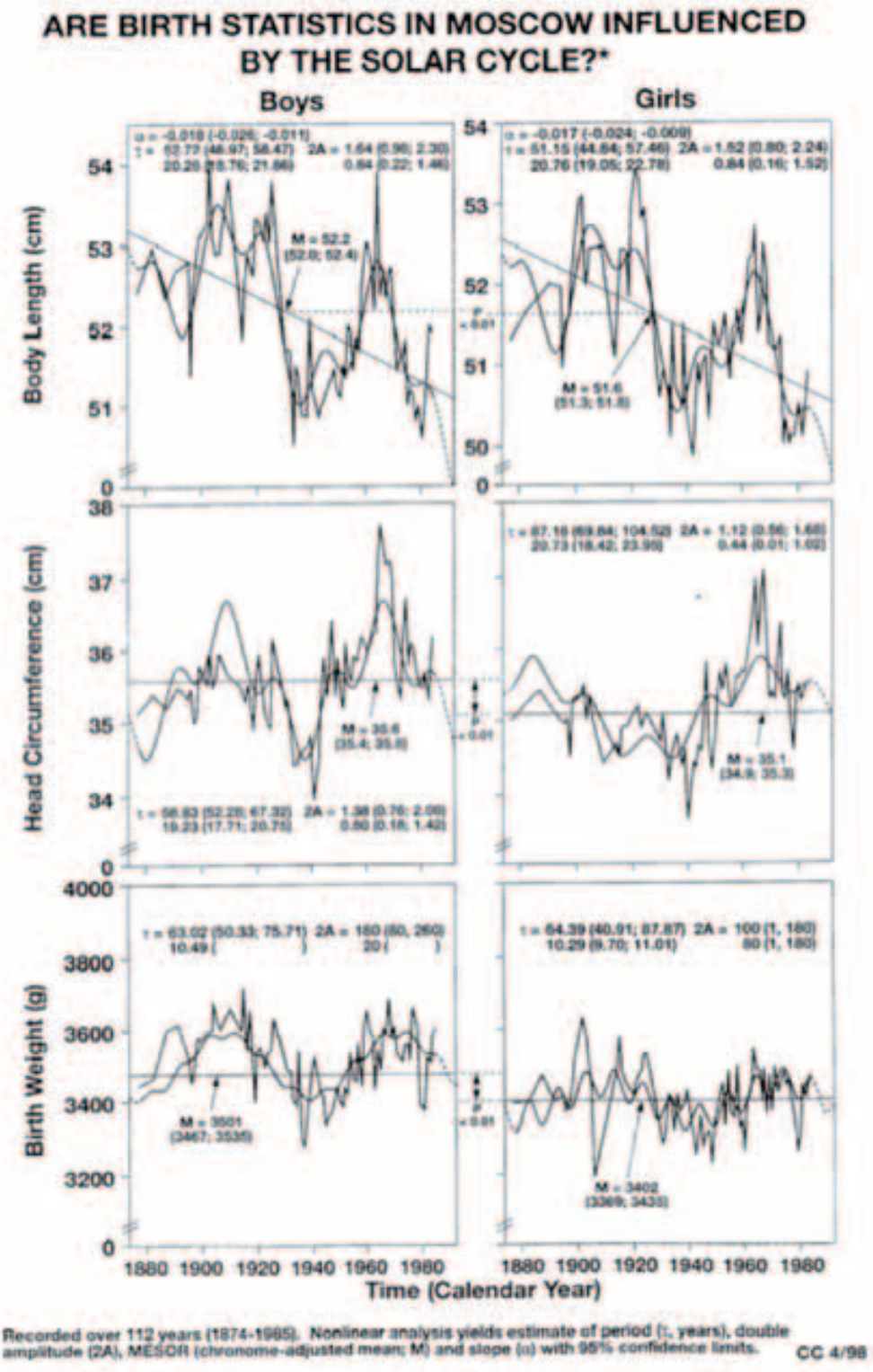

Figure 5. Body length, head circumference and weight at birth in Moscow, Russia, measured between 1874 and 1985 (112 years), is characterized by about 10.5- and/or 21.0-year cycles, which are in keeping with a possible modulation of human morphology by the solar activity cycle. Not shown herein is a para-tridecadal cycle detected by wavelets and validated with the 95% confidence interval of its period (13). © Halberg.

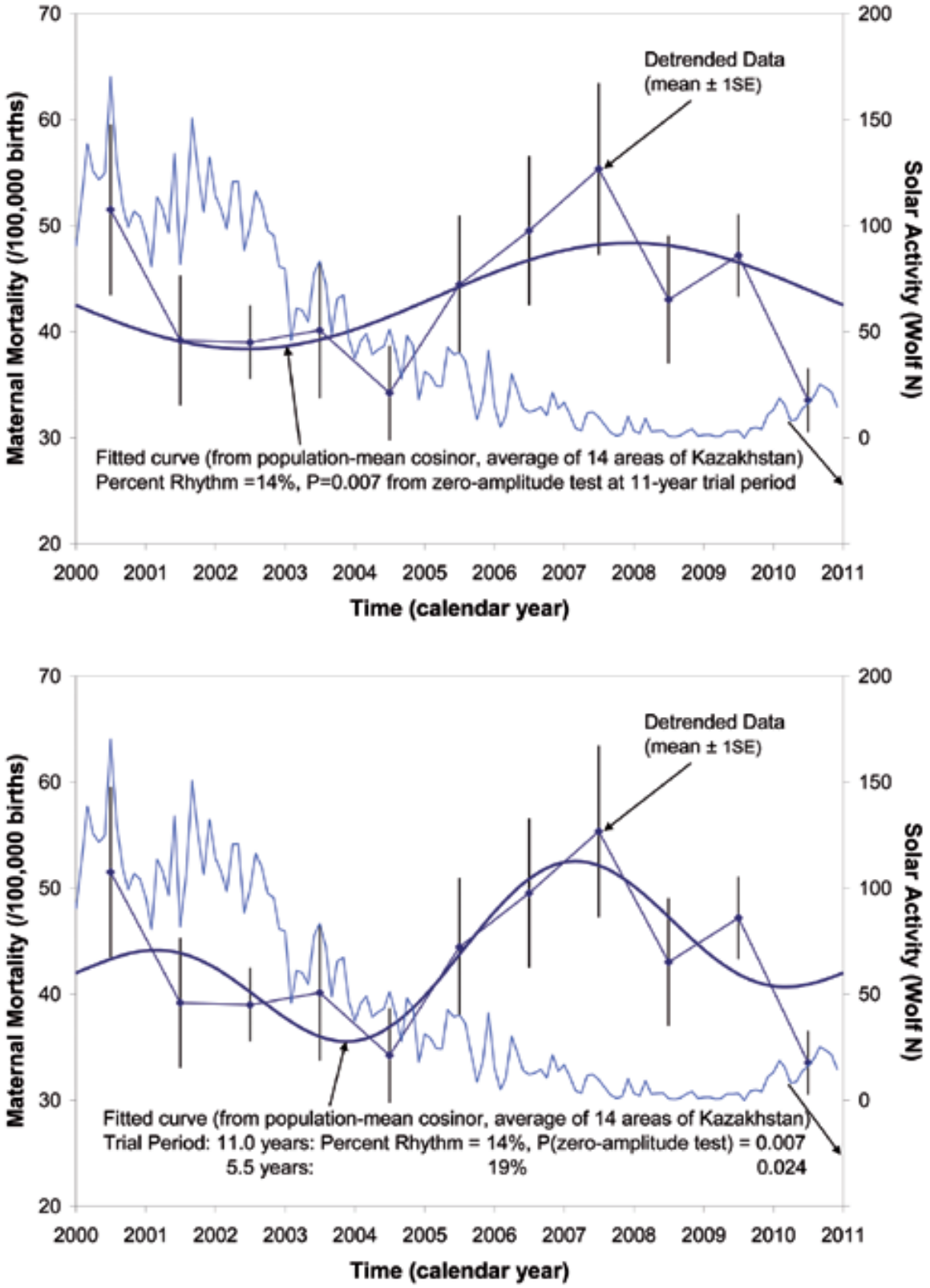

Figure 6. Yearly means of maternal mortality fitted with the 11-year cosine curve are plotted together with monthly Wolf numbers during the same 11-year span. A reverse relation is suggested (A). Validation of this finding will require analysis of similar data over longer spans. The negative relation between maternal mortality and solar activity is less obvious when Wolf numbers are displayed with the composite model including cosine curves with periods of 11.0 and 5.5 years (B). © Halberg.

Table 1: The decreasing trend in maternal mortality in different provinces and two cities (with the status od State importance) of Kazakhstan and periods detected in detrended data*

Geographic location	Site N	r	P	Period (years)
Akmola	01	-0.619	0.042	
Aktobe	02	-0.639	0.034	~2.2
Almaty Province	03	-0.786	0.004	
Atyrau	04	-0.462	0.152	
East Kazakhstan	05	-0.845	0.001	
Jambyl	06	-0.361	0.276	
West Kazakhstan	07	-0.478	0.137	
Karaganda	08	-0.411	0.210	~2.2
Kyzyl-Orda	09	-0.147	0.665	
Kostanay	10	-0.556	0.076	
Mangistau	11	-0.550	0.080	
Pavlodar	12	0.502	0.116	
North Kazakhstan	13	-0.363	0.272	~5.5
South Kazakhstan	14	-0.576	0.063	~5.5
Almaty city	15	-0.294	0.380	
Astana city	16	-0.426	0.191	
KAZAKHSTAN	17	-0.817	0.002	

*Periods from rhythmometric summary revealed 2nd and 5th harmonics of 11 years, each to be statistically significant in two areas, albeit without correction for multiple testing. Note that 8 of the first 14 correlation coefficients (r) are above 0.5 (11 are above 0.4 and 12 are above 0.35).

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