MASARYK UNIVERSITY • FACULTY OF MEDICINE
BRNO • CZECH REPUBLIC

NONINVASIVE METHODS IN CARDIOLOGY 2012

Edited by: HALBERG F., KENNER T., SIEGELOVÁ J., DOBŠÁK P.

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SUN'S AND EARTH'S MAGNETISM: FEATURES OF COMMUNICABLE DISEASE ETIOLOGY

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KEYWORDS:

diphtheria, helio- and geomagnetism, infectious diseases, space weather, wavelet analysis

Running head: Cycles in communicable disease incidence

INTRODUCTION

The association of human health and disease with space weather was the topic of a long series of presentations at a recent meeting in Moscow and was also dealt with at earlier conferences (1, 2), with focus on non-communicable diseases.

METHODS

By meta-analyses of data published by Alexander Leonidovich Chizhevsky in the 20th century dating back to the span from 1860 to 1910 (3), we here add evidence (from cross-wavelet coherence) (4) for an association of terrestrial and solar magnetism with several infectious diseases that were common in the past.

RESULTS

Figure 1 (top) shows a wavelet of the incidence pattern of diphtheria and croup (pooled) in Denmark from 1860–1910. An about 12.4-year component is seen to characterize the incidence pattern; it is within the cone of influence. Another component with a period (τ) of about 29.5 years is outside this cone. Both components are validated and are within the CIs (95% confidence intervals) of the nonlinearly extended cosinor, applied to the same time series on diphtheria and croup (not shown) and, earlier to many other records on human affairs in health and disease (5).

Wavelets of Wolf numbers, WN (Figure 1, middle), and of the antipodal geomagnetic index aa (Figure 1, bottom) show maxima corresponding to the anticipated ~11.7-year cycle, also seen from the spectra plotted vertically next to the color key. The numbers indicate the period length (in years) corresponding to local maxima in amplitudes; but the color code matters most. The wavelet of aa also reveals the presence of an about 22.1-year component differing from the smaller about 19.7-year peaklet observed for WN. Both these peaks are less prominent than the about 29.5-year peak found for diphtheria and croup.

Figure 2 shows cross-wavelet transforms (left) and coherence displays (right) of WN (top) and aa (bottom) with diphtheria and croup. The 11.7-year τ within the cone of influence stands out in association with both WN and aa in the cross-wavelets. An added large peak at 24.2 years is seen in association with aa. Peaklets are seen at ~23 and ~44 years in association with WN. Strong coherences around 10.4 (WN) or 11.0 (aa) years inside the cone of influence and additional strong coherences outside this cone around 23.4 (aa) or less intensely around 22.1 (WN) years are interesting. Added coherences around 5.5 years and at still shorter τs in association with WN are intermittently

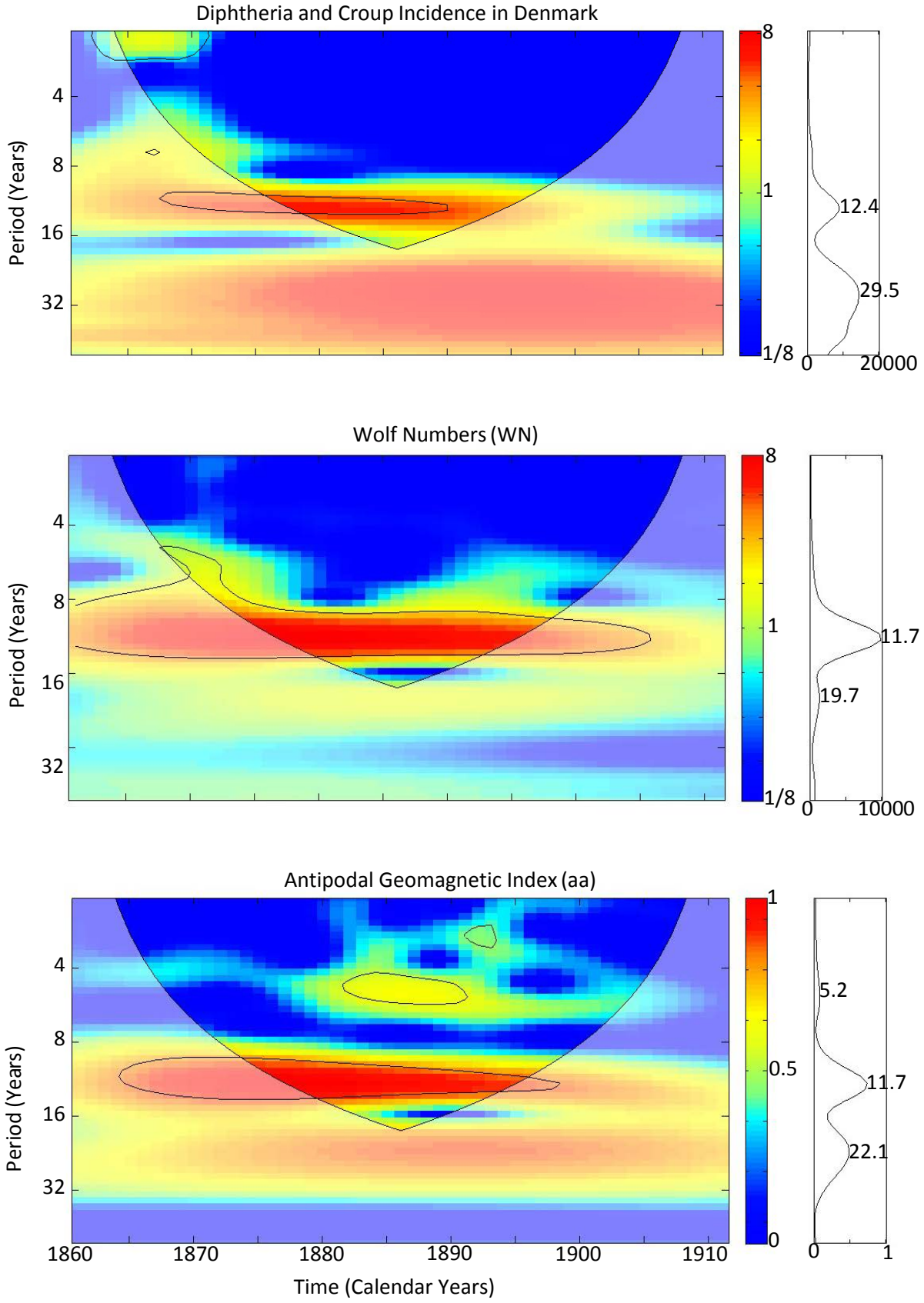

Figure 1. Wavelet analyses of incidence pattern of two infectious diseases (pooled) centuries ago (top row), of Wolf sunspot numbers (middle), and of the antipodal geomagnetic index aa (bottom), with peaks indicated by color (key), and by numbers at the maxima in the spectrum (right, next to the color key) show a putative reflection of past and/or present solar variability. © Halberg.

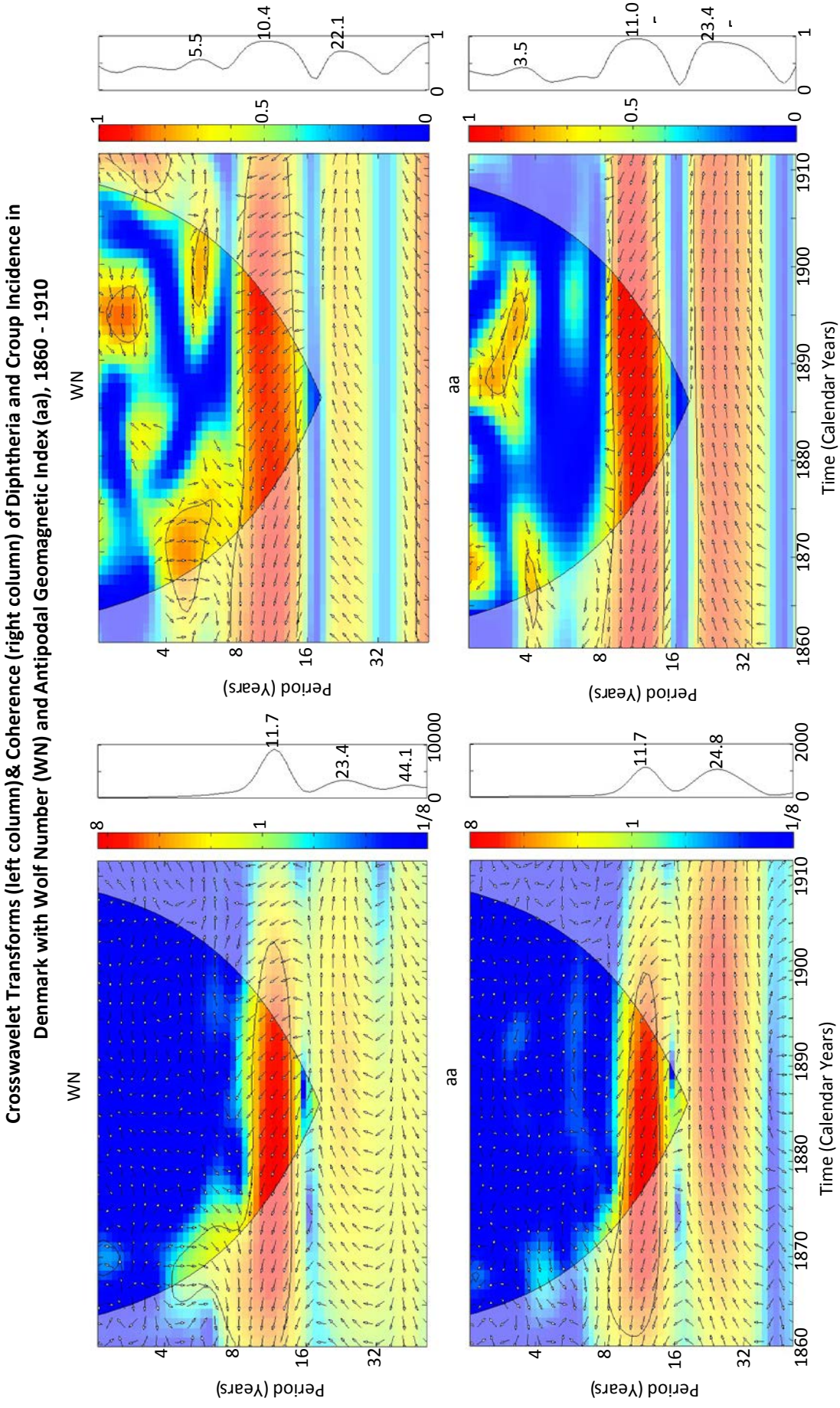

Figure 2. Cross-wavelet transforms show a strong association of the incidence of two infectious diseases (pooled) with WN and aa at a period, τ, of 11.7 years within the cone of influence. Coherence (right) is also found within the cone of influence at 10.4 and 11.0 years. These τs are also near those validated for the incidence of diphtheria and croup by the extended nonlinear cosinor (not shown) that suggests the statistical significance of differences among the two aspects of solar and earth magnetism's association with rampant pandemics, some within the cone of influence. © Halberg.

statistically significant (as seen from black contours). Again, there is a difference in spectral location between WN and aa, the overall peak occurring around 3.5 years for aa.

COMMENT

Among para-annual components, solar wind speed, a measure of interplanetary magnetism, and aa share some frequencies but differ at others (6). Here we find that, in the decadal range, both WN and aa, gauging solar and terrestrial magnetism, respectively, shared coherence (within the cone of influence) with the main cycle characterizing communicable diseases, such as diphtheria and croup, in the past when they were pandemic. Just as helio-, interplanetary or geomagnetism can influence sudden cardiac death (6), they also influenced communicable diseases, probably via the host, whose steroidal defense shows a proven decadal cycle (6) and by the invading microorganism, whose mutations can also undergo a similar cycle mirroring that of sunspots (6). Cycles in the sun's and the earth's magnetism are features of both communicable and noncommunicable disease etiology and, in both cases, are geographically, selectively assorted, shown elsewhere (6).

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