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Do heliogeomagnetics override the effect of a harsh winter? No calendar year but non-photic transyear and cishalfyear components characterize sudden cardiac death (SCD) in Minnesota

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SCD (ICD10 code I46.1) does not include death from myocardial infarction (MI) since 1999 in Minnesota. The incidence patterns of the two conditions can differ in the same geographic location, namely Minnesota, USA. There, MIs (1968-1996, 29 years) are characterized by a prominent calendar-year, not detected for SCD. Instead, SCDs (1999-2003, 5 years) are characterized by an about 1.3-year transyear similar to variations in the solar wind speed, a component found invariably in all 46 longitudinal records of blood pressure and heart rate analyzed thus far. A transyear was also found for SCDs in Tokyo, in Arkansas and in the Czech Republic but not in South Carolina, Hungary, Latvia, Lithuania, the Republic of Georgia or Hong Kong. Daily incidences of SCD in Minnesota are now analyzed for the longer record from 1999-2005 (7 years) by cosinor in the frequency range of one cycle in 7 years to one cycle in about 2 months, using a 0.2 harmonic increment. Point and CI (95% confidence interval) estimates of the periods (τ) corresponding to spectral peaks were determined by nonlinear least squares (NL). The 469 SCDs in 1999-2005 were characterized by a transyear with an about 1.3-year period (NL: τ = 1,275y; 95% CI: 1.126, 1.425y) and a cis-half-year with an about 0.42-year period (NL: τ = 0.409y; 95% CI: 0.396, 0.422y). By contrast, the 9,648 cardiac arrests in 1979-1998 were characterized by a 1.0-year synchronized component, the about 1.3-year transyear being much less prominent, reaching only borderline statistical significance. The results for SCD in Minnesota resemble those in Tokyo. They are also in keeping with an about 1.3-year component

detected in a 10-year long record of atrial fibrillations, potentially fatal arrhythmia that may underlie SCD. These results imply the possible influence of non-photic as well as of photic solar effects, at least in some geographic locations. This possibility is in keeping with the finding of an about 10.5-year cycle characterizing the incidence of MI in Minnesota (1968-1996), accounting for a 5% difference in mortality between years of maximal vs. minimal solar activity. The fact that non-photic (e.g., magnetic) effects are latitude-dependent may account in part for geographic differences observed in the patterns of incidence of SCD. Non-photic influences may also stem from several sources, such as cosmic rays, solar flares, the solar wind, the interplanetary magnetic field, and/or geomagnetic disturbances as measured on earth, to name but a few. Even for a cycle as prominent as the solar activity cycle averaging about 11 years, it is not invariably found for all variables related to the Sun-Earth physical environment. For instance, in the OMNI 2 data during 1963-2003 (41 years), Wolf numbers have an about 10.90-year cycle (95% CI: 10.72, 11.07 years), but solar wind speed is characterized by an about 8.39-year cycle (95% CI: 8.07, 8.72 years), statistically significantly shorter than the cycle characterizing Wolf numbers, as shown by non-overlapping 95% CIs of their periods. Similar differences are observed among all 40 variables recorded by OMNI 2 for the about 1.3-year component. Congruences in time-varying spectra and cross-spectra between mortality statistics from different causes and natural physical environmental variables may help determine more precisely what factors may trigger an undesired effect or be protective. For SCD, when data are pooled from all 9 available geographic locations, totaling 5,503 cases during 1998-2003, high geomagnetic activity is associated with a decreased incidence of SCD. For SCD, underlying factors may be explored in pertinent markers such as the incidence of potentially lethal arrhythmia recorded in some pacemaker-cardioverter-defibrillators, monitored longitudinally for the individual patient, before an untoward event occurs.