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GLOBAL SURFACE AIR TEMPERATURE AND SOLAR ACTIVITY IMPRINTS IN A δ18O RECORD OF DRONNING MAUD LAND/EAST ANTARCTICA SINCE 1860

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Only during the past decade have satellite performed solar irradiation measurements revealed the variability of the "solar constant". During last centuries, maxima and minima in solar activity have occurred around approximately 11 yr. The long-standing suggestion that variations in the Sun's total irradiance (the "solar constant") on time scales of decades to millennia may have been the cause of long-term climate variations, has been revived in recent years by spacecraft radiometric measurements showing that the Sun's total irradiance has varied more or less in phase with solar magnetic activity as measured by the sunspot number since peak of solar cycle 21 in 1980.

Herein, a combined Morlet-wavelet analysis, FFT and multi-resolution spectral analysis was applied to $\delta^{18}O$ time series obtained from a deep ice-core from Dronning Maud Land/East Antarctica. The analysis showed significant cyclicities for 11 yr, 22 yr, 80 yr and 200 yr, all representative of solar activity. A frequency decomposition of $\delta^{18}O$ and sun spot number (SSN) time series and the correlation of their cycles at all significant levels followed. The coefficient of correlation found was of 0.90 with 2 yr-lag (level D_3), 0.66 with 1 yr-lag (level D_4), -0.60 with 4 yr-lag (level D_5), 0.80 with -9 yr-lag (level D_6), 0.99 with -3 yr-lag (level D_7), 1.0 with 0 yr-lag (level D_8). This technique allowed the reconstruction of $\delta^{18}O$ as a function of SSN. The same was applied to global surface air temperature (GSAT). Correlation between the original $\delta^{18}O$ time series and the reconstructed $\delta^{18}O$ time series as a function of SSN was 0.76 and 0.71 as a function of GSAT.