Geophysical Research Abstracts
Vol. 21, EGU2019-2699-1, 2019
EGU General Assembly 2019

Reconstruction of late Holocene climate based on a high resolution stalagmite record from an unnamed cave in SE Jilin of NE China

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A 9-cm long stalagmite (S1S) from an unnamed cave (41.82^{o}N, 126.15^{o}E) located near Tonghua City has been studied to understand forcing factors of the climate in Northeast China. Owing to low U contents, ^{230}Th/U dating on the stalagmite was not successful. According to AMS ^{14}C and ^{210}Pb dating results, Stalagmite S1S covers a positional record of the past 2800 years with the modern surface (after 1950 AD). Although dead carbon influence (DCI) affects the AMS ^{14}C dating results, we minimize the DCI by deducting an initial age of 530-year in AMS ^{14}C dates, and then calibrate the ^{14}C ages with INTCAL 13. The chronology of S1S is established by the Ager program fitting of nine calibrated AMS ^{14}C dates. A total of 861 subsamples from S1S were measured δ^{18}O and δ^{13}C. Comparison of the δ^{18}O record of S1S with Total Solar Irradiance (TSI) records exhibits negative correlations - When TSI is lower, the δ^{18}O is heavier; and vice versa. During four TSI minimum periods (Mauder, Sporer, Wolf and Oort minimum), the δ^{18}O and δ^{13}C of S1S were enriched. We interpret that the temperature difference between continent and ocean is decreasing when TSI is low, leading EASM intensity to be weaker. Then, the water vapor transported from western Pacific Ocean to Northeastern China is less, resulting heavier δ^{18}O value (dominated by amount effect). On the other hand, due to low precipitation, vegetation coverage is sparse under dry climates, resulting heavier δ^{13}C trend. Furthermore, both power spectral and wavelet analyses of the δ^{18}O record of S1S show clearly a 210-year cycle, which is one of the most famous cycle of solar activity, named “Suess cycle” as known as “de Vries cycle”. This study indicates that the S1S record not only helps us to reconstruct the climate change during the past 2800 years in Northeastern China, but also illustrate the controlling factors such as TSI of the regional climate.