

Reconstructing past ultraviolet irradiance using pollen and spores chemistry.

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Ultraviolet (UV) irradiance from the Sun is a key driver of climatic and biotic change. UV irradiance influences the biosphere from ecosystem-level through to the largest scale patterns of diversification and extinction. Yet our understanding of UV irradiance is limited to the present; no validated empirical method exists to reconstruct UV flux over long, geologically relevant timescales. Here, we show a recently developed proxy for UV irradiance based on spore and pollen chemistry applied over long (100,000 years) timescales. First, we demonstrate spatial variation in spore and pollen chemistry correlate with known latitudinal solar irradiance gradients. Second, using this relationship we provide a reconstruction of past changes in solar irradiance based on the pollen record obtained from Lake Bosumtwi in Ghana. By providing a unique, local proxy for solar irradiance, the chemical analysis of spores and pollen offers unprecedented opportunities to decouple solar variability, climate and vegetation change through geological time.