

Vegetation dynamics and their contribution to the Little Ice Age

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Abstract

Causes of the Little Ice Age (LIA) have remained a subject of intensive research due to its significance. Recent studies suggest that plant and vegetation growth may be a possible contributing factor to this cooling period. From an Earth system perspective, this opens an additional conceptual pathway in which biological activity interacts with climate variability. The LIA period coincided with an ecological encounter, as humans from the Old and New Worlds exchanged goods and diseases. A significant portion of the global population was decimated, leading to the abandonment of farmlands, which nature subsequently reclaimed. This shift in vegetation dynamics and interaction with their environment is analyzed. One example is the thermodynamic cycle of aquatic photosynthesis, which requires a flow of seawater as a medium for heat transfer. The flow interacts with ocean currents that connect the deep ocean to surface waters. As plants and vegetation grow, cold deep-ocean water is brought to the surface, leading to a decrease in surface temperature. This cooling effect is time-dependent: the longer the vegetation grows, the cooler the surface becomes. In this framework, even small amounts of vegetation growth over extended periods could, in principle, contribute to ice-age-like conditions. Such ice ages can be devastating for global ecosystems, and their future occurrence, particularly in low-carbon economies, remains a possibility. Therefore, climate management should be a priority for human society.

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