

Late Pleistocene and Holocene Climatic and Environmental Changes (Abstract)

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1. The past 20.000 years – a small fracture of the 35-million-year Ice Age

The main driving forces of climatic change are the Earth's plate tectonical movements. The distribution pattern of the oceans and continents on the Globe surface directly determine the glacial and ice-free periods. Ice ages develop when a large-surface continent (such as Antarctica) stay at the Polar region for several millions of years. In the past 35 million years, Antarctica has been remained at the South Pole, and thus we are experiencing Ice Age conditions. This situation will continue for the next ca. fifty million years.

During the last 2 million years (which is the Quaternary, including the Pleistocene and Holocene), at least 22–26 glacial and interglacial periods followed. The climate of the last interglacial 130,000–115,000 years ago (Eemian or Riss-Wurm) was warmer than that of today. The previous glacial before the Eemian (Weichselian or Wurm), characterized by several short stadial-interstadial periods, terminated 18–20,000 years ago with a strong glacial event. At that time, continental ice covered the northern part of Europe, and the sea level was lower than today by 60–80 meters. Land bridges were established between Eurasia and North America, between South Asia and Australia, and the British terrain formed a peninsula of Europe. In the Carpathian Basin, tundra-like environment dominated for the next thousands of years.

Following the last glacial peak at about 10,000 years ago, after a global warming event, a new interglacial period, had set in, the Holocene. The volume of the Ice Caps diminished, the sea level raised, the intercontinental bridges became flooded again, and temperate climatic conditions re-established in the Carpathian Basin.

During the Holocene (6–8 ky BP), there was a climatic optimum with annual main temperatures higher by 2–3 °C than today. The Little Ice Age ended in the middle of the 19th century. During the past 150 years, the global warming process has intensified, and human influence accelerates the natural climatic cycle.

2. Climatic changes and environmental sensitivity

The climatic events of different order induce several different changes of the environment. A simple plate tectonical movement of some millions of years (Antarctica arrived to the South Pole) caused a 35-million-year global Ice Age. The Earth's ecliptical cycles of several hundred thousands of years continue to fuel the glacial and interglacial changes. The periodic climatic changes of this magnitude caused faunal extinctions in the past, resulted in animal migrations, and forced the biota for new adaptations. A single cycle (interglacial + glacial) could turn over entire ecosystems. The climatic changes on the order of thousands of years (such as the climatic optimum of the Holocene) caused new soil types to develop, initiated animal and human migrations, determined human activities, and were able to drive the evolutionary speed of civilization. Climatic variations of hundred years cause economic crises, technical adaptations, and the rise or fall of civilizations. The global warming process since the middle of the 19th century lets us predict a less significant increase in temperature than it was the case with the Holocene climatic optimum, but it nevertheless raises several serious problems to humankind.

3. Proxy data and the interpretation of interactions

Today, several well-controlled natural scientific, and historical methods exist to collect primary (proxy) data from the climatic and environmental variations of the Earth. Well-dated, highly evaluated climatic data are known from most parts of the Earth. However, only in a few cases do we have interpreted knowledge about the real interactions between the changes of the different climatic elements and the biota, or the human activity.

