

## **Evidence and forcing mechanisms of past climatic changes**

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In the last few years, outstanding proxy records relating to the interpretation of Quaternary paleoclimates and paleoenvironments have become available. The principle sources are from relatively long continuous continental sequences, better and more deep sea cores, and more and higher resolution data from Greenland and Antarctic ice cores. This has led to a better understanding of the climatic forcing mechanisms involved. Highlights supporting orbital induced variations of

insolation (Milankovitch forcing) are long loess-paleosol records from China and pollen records from South America and other areas. At least 37 major climatic events have been identified over the last 2.5 m years. Antarctic ice cores, and new, high resolution ice cores from Greenland have allowed us to understand conditions and identify changes during the last glacial-interglacial period (last 125 k years) much better. For example, various proxy data (i.e.,  $^{18}\text{O}$ , deuterium, AI)

suggests major climatic changes took place world-wide at about the same time. During the last deglaciation, several abrupt climatic changes spanning short-time intervals are now able to be identified. For example, we can identify the so-called "Heinrich" events, and now believe the "Younger Dryas" event was initiated in less than 50 years. Forcing mechanisms, other than orbital variations, must be found to explain these changes. Over about the past 1000 years there

have been many short-term climatic variations such as the "Medieval Warm Period" and "Little Ice Age", explained by such mechanisms as solar variations and explosive volcanism. Much more dramatic of course, is the rise of anthropogenically induced atmospheric greenhouse gases since the last 19th century. The consequences of this for humanity and the earth in general, is an on-going debate.