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# Climatology

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**Climatology.** Paleoenvironmental reconstructions for the ancient Near East rely in part on investigating past weather patterns. These investigations are based on the presumption that a better understanding of ancient climate should help us know more about the conditions under which a number of civilizations flourished and declined. The region is one in which agriculture and animal husbandry were often marginal even under the best climatic conditions.

### Temperature and Precipitation Records.

In the Near East, where written records have existed for millennia and significant temperature and precipitation records might be expected to have been kept, there exist, in fact, very few sets of meteorological station records that cover more than one hundred years. The most extended instances of record-keeping available were begun in the nineteenth century: Samsun, Turkey (1819); Haifa, Israel (1824); Beirut, Lebanon (1842); Jerusalem (1846); Athens, Greece (1858); Kom el-Nadura, Egypt (1868); Rome, Italy (1871); Tehran, Iran (1884); Nicosia, Cyprus (1887); Baghdad, Iraq (1888); and Hebron, then Jordan (1896). Other stations have been in existence for only a few decades, so the prospect of developing a long set of gridded rcords--in which the data from each station are compared with those north, south, east, and west and then analyzed for internal accuracy--is not promising; in addition, the range in time is severely limited for most of the area. The Cyprus Meteorologist's remark about the quality of his own data might well serve as a commentary on that of the rest of the Near East: "Some gauges have been moved so often that they can fairly be described as perambulating. Details are generally, and perhaps mercifully, lacking."

A few nongovernmental records exist such as the diaries of British Residents in Smyrna, Turkey, but at best these cover only the nineteenth century. Some Ottoman archival records were sent to Berlin for analysis at about the time of World War I, but the building in which they were housed burned down. Thus, instrumental data--specifically, temperature and precipitation records--have severe temporal limitations. The data exist for little more than a century and a half at best. Even more limited in time and number of stations reporting are such records as soil moisture, soil temperature, wind speed and direction frequencies, and sunshine, or solar radiation.

### Pollen Records

Proxy records, substitutes for thermometric and rain gauge records, such as pollen analyses from stratified cores taken from geological or lake sediments are another step toward developing a climatological record. The most notable work in the Near East has been by Willem van Zeist and his coworkers (1975) in Iran and Turkey; by Aharon Horowitz (1979) in Israel; and by Donald George Sullivan (1994) in Turkey. The spatial coverage is sparse (only two cores for all of Israel, for example); yet, Van Zeist concludes that, although there have been relatively minor fluctuations, there has been no significant change in the climate over the past 7,500 years. Hans J. Nissen (1988) echoes these conclusions for Mesopotamia, Karl W. Butzer for Iran, and Richard Hodges and David Whitehouse for the Late Roman and early medieval world. The potential for pollen records can be measured in millennia, but where hundreds of cores would be desirable in order to get a complete picture of the Near East, only

a dozen or two long cores have been taken and properly published. Another problem with pollen cores is dating. Unless multiple radiocarbon determinations are made, which is not always possible with the amount of material available, the time control for each core is severely limited. Recent work by Harvey Weiss and others (1993) at Tell Leilan in Syria is a useful attempt to extract climatic information from a single site, although the method is controversial.

### Dendroclimatology

Another proxy technique only now in its initial stages of being exploited in the Near East is dendroclimatology. The work of the Aegean Dendrochronology Project (Peter I. Kuniholm et al.) has produced some six thousand years' worth of tree-ring chronologies, and the tree-ring data are being linked to the observed meteorological record for the last century and a half. The project hopes to extrapolate backward in time to the Early Bronze Age and perhaps even earlier. The potential is for several millennia of information, but limited to the areas where long tree-ring records can be built. This includes all of the Anatolian Plateau, the Taurus Mountains, the Anti-Taurus, and the Lebanon. The method is accurate to the year and sometimes to a specific season.

### Historical Climatology

The development of a historical climatology, in which the written record for several millennia is merged with other climatological observations, is the most tantalizing aspect of any consideration of Near Eastern climate. To date, no reliable corpus exists of the entire hieroglyphic, cuneiform, biblical, Greek, Roman, Byzantine, Ottoman, and other records. Once that has been built, the cause-and-effect relationship between a climatic event and a historical event will remain to be demonstrated. The record of Nile floods and their effect on the Egyptian economy is one such example (Lyons, 1905; Bell, 1971, 1975); the time spanned is four to five millennia but with a very uneven distribution of information.

Tentative steps, linking several of the methods noted above, are reported by Kuniholm (1990). For example, a four-decade-long drought in the late 1500s and early 1600s observed in the tree-ring record coincides with a long list of shortages, crop failures, and famines in the same years recorded in the Ottoman Archives in Istanbul. The same kind of linkage among proxies for an instrumental record should some day be possible for the ancient Near East as well. Significant perturbations, still under investigation and not without controversy, include a possible climatic event around 1159 BCE (probably the eruption of Hekla III) associated with the end of the Late Bronze Age; another linked to the eruption of Thera in 1627/1628 BCE that pins down the transition from Late Minoan IA to IB; and a possible event in the twenty- third century BCE that interferes with life in the Early Bronze Age in northern Syria.

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## Bibliography

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Bell, Barbara.
"The Dark Ages in Ancient History: I. The First Dark Age in Egypt," *American Journal of Archaeology* 75 (1971) 1-26.

Bell, Barbara.
"Climate and the History of Egypt: The Middle Kingdom," *American Journal of Archaeology* 79 (1975) 223-269.

Bryson, R.A., Lamb, H.H., and Donley, D.L.
"Drought and the Decline of Mycenae," *Antiquity* 47 (1974) 46-50.

Butzer, Karl W.
"Quaternary Stratigraphy and Climate in the Near East," *Bonner Geographische Abhandlungen* 24 (1958) 103-128.

Carpenter, Rhys
*Discontinuity in Greek Civilization*. New York, 1966.
Hodges, Richard and Whitehouse, David
*Mohammed, Charlemagne and the Origins of Europe: Archaeology and the Pirenne Thesis*. Ithaca, N.Y., 1983.
Horowitz, Aharon
*The Quaternary of Israel*. London, 1979, pp. 211-230.
Kuniholm, Peter Ian
"Archaeological Evidence and Non-Evidence for Climatic Change," *Philosophical Transactions of the Royal Society, London A* 330 (1990) 645-665.
Kuniholm, Peter Ian
"Overview and Assessment of the Evidence for the Date of the Eruption of Thera," *Thera and the Aegean World III*, Vol. 3. Athens, 1990, 13-18.
Le Roy Ladurie, Emmanuel
*Times of Feast, Times of Famine: A History of Climate Since the Year 1000*. Revised Edition. New York, 1988.
Lyons, Henry G.
"On the Nile Flood and Its Variation," *Geographical Journal* 26 (1905) 249-272; 395-421.
Neumann, J., and Parpola, S.
"Climatic Change and the Eleventh-Tenth-Century Eclipse of Assyria and Babylonia," *Journal of Near Eastern Studies* 46:3 (1987) 161-182.
Nissen, Hans J.
*The Early History of the Ancient Near East 9000- 2000 B.C*. Chicago, 1988.
Sullivan, Donald G.
"Palynological Evidence of Human-Induced Holocene Vegetation in Western Turkey," *Geoarcheology* (1995).
Van Zeist, Willem
"Late Quaternary Vegetation History of Western Iran," *Review of Palaeobotany and Palynology* 2 (1967) 301-311.
Van Zeist, Willem and Wright, H. E.
"Preliminary Pollen Studies at Lake Zeribar, Zagros Mountains, Southwestern Iran," *Science* 140 (1963) 65-67.
Van Zeist, W., Timmers, R.W., and Bottema, S.
"Studies on Modern and Holocene Pollen Precipitation in Southeastern Turkey," *Palaeohistoria* 17 (1968) 19-39.
Van Zeist, W., Woldring, H., and Stapert, D.
"Late Quaternary Vegetation and Climate of Southwestern Turkey," *Palaeohistoria* 17 (1975) 53-143.
Weiss, H., Courty, M.-A., Wetterstrom, W., Guichard, F., Meadow, R., Curnow, A.
"The Genesis and Collapse of Third Millennium North Mesopotamian Civilization," *Science* 261 (1993) 995-1004.

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