b23 Pleistocene ice sheets in the hemispheres

< to latitude 39º >

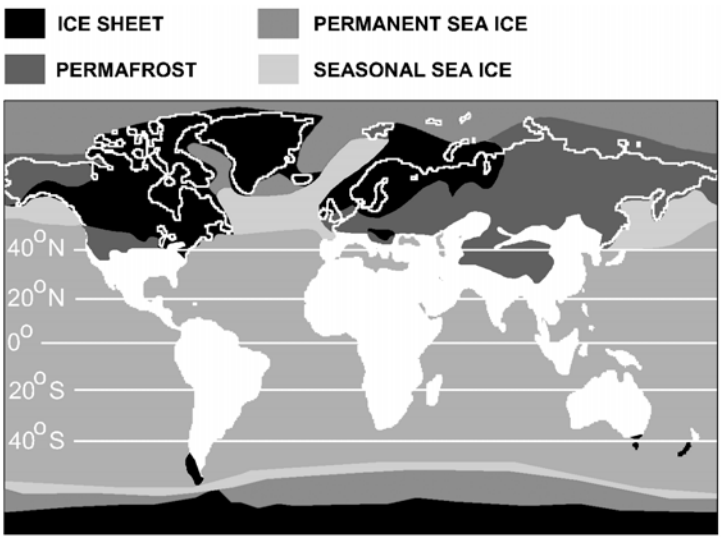
The present interglacial (Recent and Holocene) climate with ice sheets shrunken to Greenland and Antarctica began abruptly 11,800 BP (calendar years before the present) as is recorded by countable proglacial-lake varves and yearly layering seen in glacial ice cores, or, the often quoted, 10,000 YBP (*uncalibrated* radiocarbon years before 1950). Before to 1.8 million years ago, the Pleistocene Ice Age, as recorded by a wide variety of paleoclimate indicators (proxies) and cosmic-ray (method) dated tills, included 20 glacials (ice-sheet maxima) and interglacials (ice-sheet minima).[1]

In the hemispheres, times of Pleistocene glacials and interglacials were synchronous but the response to climate-changing events was asynchronous.[2] Maximum ice-sheet expansions were to latitudes as low as 39º (***Figure b23.1***). Within latitudes 90º to 39º, some northern regions were always ice free because of little snow fall (as was so for northern Alaska and much of Siberia), and because ice did not flow into an area (as was so for the dry upland of southwestern Wisconsin, known as the Driftless Area).

Mountain glaciers, wherever they exist today, were longer and more numerous during Pleistocene glacials. Ice shelves and icebergs, recorded by seafloor scours, were to thicknesses of one kilometer.[3]

During the Pleistocene, Africa remained free of ice sheets. From sediment core evidence, the Antarctic ice sheet, has waxed to completely cover Antarctica, when also were ice caps in Chile and Argentina in South America, Tasmania, southeastern Australia, and the south island of New Zealand, and waned to subpolar climate with tundra vegetation 25 million years ago after it came to be 34 million years ago (earliest Oligocene, before which Antarctica bore a tundra vegetation).[4]

Figure b23.1 [5] The maximum extent of the ice sheet near the end of the Pleistocene Ice Age at the time of the last glacial maximum (LGM) 21,000 years ago.



Sealevel will have fluctuated in sympathy with the amount of glacial ice. Records of past sealevel (***Figure b23.2***) can be inverted to determine changes in glacial ice volume. In practice, however, many of these records are incomplete or poorly dated. Drilling tropical coral reefs offers a way to develop a well-dated and relatively continuous sealevel record. Rates of sealevel rise during the last deglaciation are well recorded by corals of New Guinea, Barbados, and tectonically stable Tahiti,[6] back to 19,000 years ago but would need to be back to 21,000 years ago to include the last glacial maximum interval. ❑

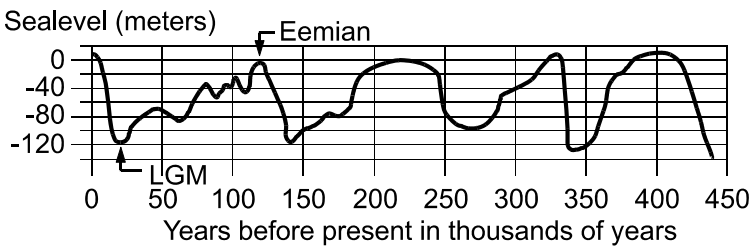


Figure b23.2 [7]
Sketch of sealevel changes due to glacier-volume variation during the last 500,000 years.