How reliable are quaternary dating methods?

The Quaternary Period is considered the last 1.8 million years (Ma) of geological time and is divided up into the Pleistocene and Recent (Holocene) epochs. (Geological time with its periods and epochs is used for communication purposes only.) The Pleistocene is the general time of the ice age, although geologists now consider the ice age in the Northern Hemisphere to have begun as early as 2.5 Ma ago in the late Pliocene. On the other hand, many thick Pleistocene sedimentary rocks, for instance near the coast of southern and central California, are not related to the ice age at all, except by presumed fossil correlations.

It has always been difficult to date Quaternary sediments beyond the range of radiocarbon,[1] and many dating systems have been developed that have promised to fill this void. The myriad of research articles employing Quaternary dating methods often provide a semblance of accuracy and consistency. However, a series of reports on a wind blown silt in the Cypress Hills of southwest Saskatchewan indicates just how subjective many of these Quaternary dating methods are.

The Cypress Hills are remarkably flat plateau erosional remnants located in southeast Alberta and southwest Saskatchewan Canada that are capped by about 30 m of gravel, cobbles and boulders (see Figure 1). The mostly quartzite clasts are exotic with the nearest source 300 km or more to the west-southwest in the Rocky Mountains of northern Montana. The slope from the Rocky Mountains to the Cypress Hills is less than 0.1°, implying widespread, rapid currents to transport boulders. The existence of percussion marks and load clasts in sand implies currents greater than 30 m/sec.[2-4] Although the Cypress Hills formation was considered early Oligocene for about 100 years, a 'further fossil analysis' indicated that the age ranges from mid Eocene to early Miocene. It is upon the east block of the Cypress Hills and upon pediments eroded against the southern Cypress Hills that the Davis Creek silt was first discovered. This silt is overlain by glacial till from the late Pleistocene and is quite patchy because of glacial and glaciofluvial erosion. The question is: how old is the Davis Creek silt, which potentially could range from early Miocene to late Pleistocene?

The Davis Creek silt was at first dated as early Pleistocene and late Pliocene because it was reversely magnetised although with weak intensity, and also because glass from the volcanic tephra layers within the silt was correlated to the Pearlette family of volcanic ashes.[5] The Pearlette volcanic ashes were once considered of one age, but due to fission track dating these ashes are now dated as 0.6, 1.3, and 2.0 Ma.[6] The correlation to the Pearlette ashes was rather indirect in that the major-element composition of the Davis Creek ash resembled the Wascana Creek ash from near Regina, Saskatchewan, and this latter ash dated by the paleomagnetic and fission track methods to 0.6 Ma.[7] The resemblance between the two ashes was, '... *a strong indication that these ashes have a similar origin.*'[8] However, since the Wascana Creek ash was normally magnetised, while the Davis creek ash was reversed, it was suggested that the Davis Creek ash actually correlated to the Mesa Falls (1.3 Ma) or the Huckleberry Ridge (2.0 Ma) ash in the Pearlette family. Hence, the conclusion that the date of the Davis Creek ash was early Pleistocene or late Pliocene.

Soon after the initial dating, the researchers discovered a second site of Davis Creek silt that contains 5 ash layers: PeA, PeX, PeB, PeC, and PeD (see Figure 2).[9-11] Furthermore, the first site in the original report has two ashes: DCA and DCB. Tephra PeX is too fine-grained to relate to any other ash. Tephra PeA and PeB are very similar to each other as are PeC and PeD. But none of the ashes from the second site resembled DCA or DCB, which differed from each other. Some of the tephras were normally magnetised, and strangely, the very similar PeC and PeD were of 'opposite' polarities.[12] Thus, there are four distinct ashes — too many and too different to relate to the Pearlette family of ashes. Moreover, fission track dating on tephra DCB gave an age of 8.3 Ma. Thus the Davis Creek silt was redated as 8.3 to 9.3 Ma, the late Miocene. The earlier obtained date of early Pleistocene and late Pliocene were said to be 'tenuous' and

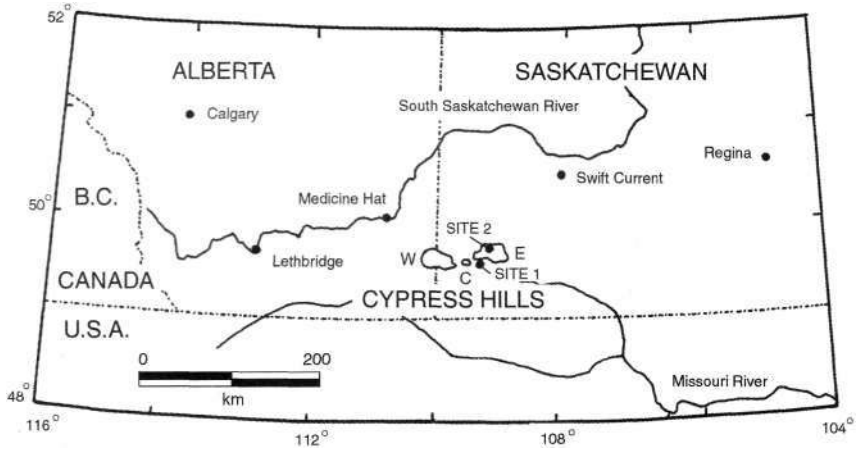

Figure 1. *Location of the Cypress Hills West Block (W), Centre Block (C) and East Block (E) (after Barendregt* et al.[11]*)*

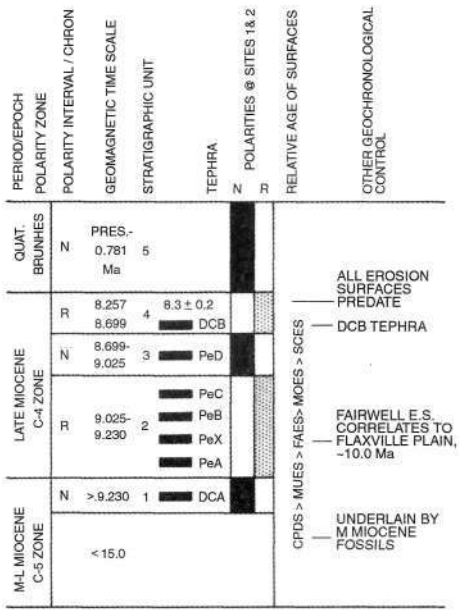

Figure 2. *Paleomagnetic measurements of the Davis Creek silt and tephras (after Barendregt* et al.[11],)

'speculative'[13] all along, despite previous statements to the contrary.

This dating switch brings up several questions as to the accuracy of Quaternary and other upper Cainozoic dating techniques. Can the dating system of tephrochronology be trusted? After all, it was the similar composition of one of the Davis Creek tephras to the Pearlette family that strongly suggested the early Pleistocene and late Pliocene date, which is now pushed back into the late Miocene. Can polarity reversals happen as fast as the deposition of one distinct tephra, such as PeC and PeD? Is fission track dating accurate? Fission track dating gave an age of 0.6 Ma for the Wascana Creek ash, which was supposedly similar to one of the Davis Creek ashes that was later fission-track dated to 8.3 Ma. Paleomagnetism supported both dates. This dating method is not an independent dating method, since it requires other dating methods to set the general time frame.[14] With the postulation of hiatuses, any paleomagnetic pattern could potentially fit any part of the standard polarity timescale. Furthermore the whole polarity timescale can be called into question, because the K-Ar dating method used to construct this time scale is likely invalid.[15-16] Thus, several Quaternary, as well as other upper Cainozoic dating methods, can be considered questionable. Other mainstream scientists view Quaternary dating methods with skepticism:

'The problems of determining the age of the fossils at this site are fundamental and common in Quaternary stratigraphy, particularly for sites older than about 40 kyr. Dating methods other than radiocarbon are not yet reliable nor widely accepted and used.'[17]

Since many creationists have either questioned or reinterpreted radiocarbon ages within a biblical time frame, especially creationist Robert Brown,[18] one can legitimately ask whether any Quaternary dating method is reliable.

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