The night that Europe died: June 8366 BC

Stuart Harris, December 2008, revised March 2012

Summary

The Middle Stone Age of Europe ended abruptly near midnight in June 8366 BC, when pieces of Comet Cluster Encke disintegrated over Europe and terminated life over much of the region. Perhaps the night in June was the solstice, which people tend to carefully follow. Afterwards began the New Stone Age, the Boreal, with new tools and a different suite of plants. Two sources concur on the year, an ammonia spike in Greenland GISP2 ice core and a plot of repeated double strikes of Comet Cluster Encke.

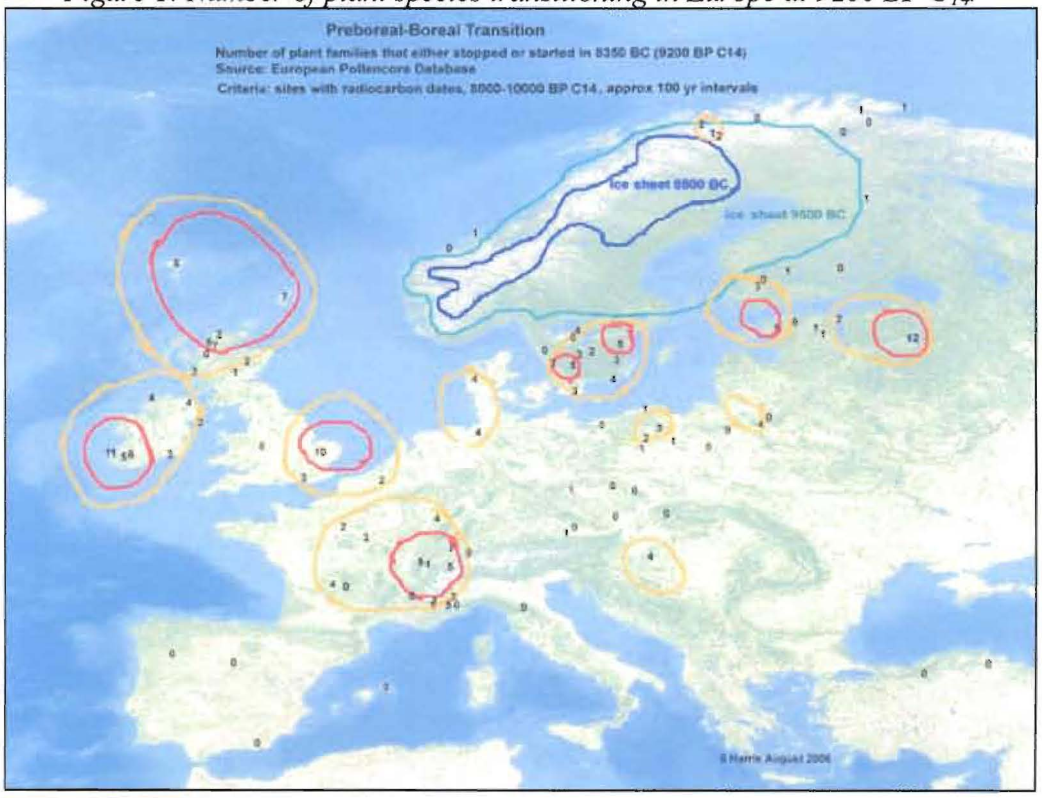
On the night that Europe died, pieces of Encke ignited forests from Russia to Ireland. Northern Europe blazed like an inferno, consumed the available oxygen, incinerated any animal not sheltered deep in a cave. Directly beneath the impacts, heat high enough to melt bricks extinguished entire plant families, baked seeds and roots deep underground. It was a comet, not a meteor, because no trace of magnetic material or iridium occurs in a closely measured deposit in Sweden. Fierce winds rushed in to fill the void. Pieces that landed in the sea spawned hurricanes. Parts of the Scandinavian ice sheet in Sweden and Norway slid into the Atlantic and Lake Ancylus, precusrsor to the Baltic Sea.

Map of Comet Cluster Encke impacts

Shown below on a map of Europe is the extinction pattern of plants, derived from pollen cores. Black numerals are the number of genera that disappeared. Red lines mark regions of maximum destruction where 5 to 12 genera disappeared, while orange lines mark lesser destruction with 2 to 4 disappearances.

The southern boundary of the ice sheet in Sweden has a notch where a piece is missing. The piece slid itno Lake Ancylus, precursor to the Baltic Sea, and generated a tsunami. Outfall carved a drainage channel in Sweden, which then lowered the lake to sea level. Two notches on the Norwegian side come from similar slides into the Atlantic.

Figure 1: Number of plant species transitioning in Europe at 9200 BP C_{14}.



Sources with approximate date of the impact

A variety of sources give approximate dates for this monumental catastrophe of 8366 BC (10316 BP, 9200 BP C_{14}).

a) abrupt replacement of species in pollen core samples throughout northern Europe, marking a sharp divide between Preboreal and Boreal;

b) abrupt extinction of large animals in northern Europe including mammoth and musk ox;

c) abrupt extinction of man in northern Europe, measured by the disappearance of Mesolithic Middle Stone Age tools, replaced with Neolithic New Stone Age tools;

d) a one-year peak in ammonia (NH4) in GISP2 ice core, implicating a comet strike;

e) a one-year peak of MSA in GISP2 ice core, correlating with extensive melting of sea ice;

f) a massive tsunami in Lithuania that appears in a sediment core;

g) a 30-year decline in global sea level as climate cooled and glaciers grew;

h) abrupt drop in the level of Ancylus Lake due to its outlet being deepened by torrential outflow from melted ice;

i) a charcoal layer in a clay matrix from incinerated forests near London;

j) abrupt increase then termination of lithic material in a pollen core from a lake in Sweden, falling all the way to zero;

Sources with exact date of the impact, May or June 8366 BC

A good estimate of the date of the comet strike, May or June 8365 BC including year 0, derives from counting snow layers in the Greenland GISP2 ice core:

- NH4 (ammonia) spiked between 8366 and 8364 BC, the smoking gun of a comet strike.
- NH4 spiked again in 8274.9 BC, 89 1/2 years after the first spike, in late fall, a hallmark of Encke.
- MSA repeated minimums every 4 1/2 years, the orbit time of the comet Encke.
- MSA spiked in 8365.5 BC due to exceptionally high evaporation of sea water in the North Atlantic with the wind blowing toward Greenland.

The date is too old to measure with tree rings from Bristlecone Pines.

In Europe, tree ring counting could not get beyond this date for many years because all the oaks were either incinerated or had yet to appear in Europe. Finally a bridge was created using pine trees from the south. These pines might show an anomaly, but I have not seen the data. Subsequent oaks may have been planted by newcomers who needed a source of food.

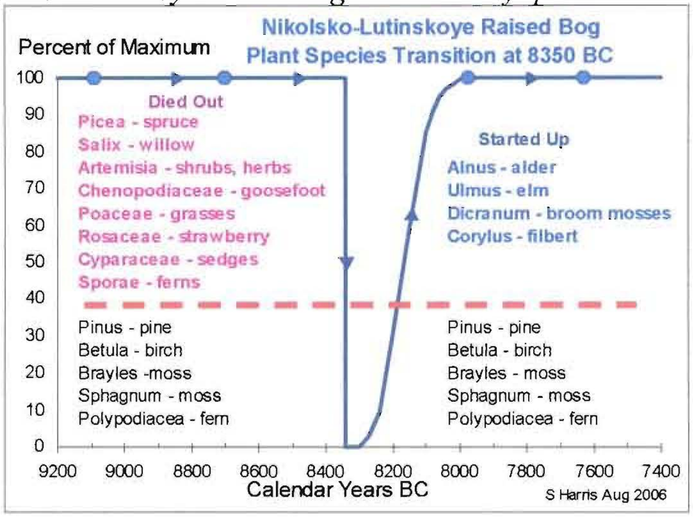
An indirect measure of the date comes from a linear curve of repeated double strikes from Comet Cluster Encke. In order to obtain a smooth curve, the comet struck in the spring of 8366 BC (with year 0), followed 89 1/2 years later by a second strike late in the fall. This date closely agrees with the ice core, and tends to be more rigorous because a change of even one year would disrupt the smooth curve. (Harris, unpublished, see below.)

Transition from Preboreal to Boreal, 9200 BP C_{14}

A dramatic transition from **Preboreal** to **Boreal** at 9200 BP C_{14} was first noticed in pollen cores from peat bogs in Denmark by Axel Blytt and Rutger Sernander, when numerous plant species disappeared, only to be replaced by other species. **Boreal** was the first of the Blytt-Sernander sequence of north European climatic phases. **Preboreal** began at the end of Younger Dryas.

An example is a core from Nikolsko-Lutinskoye Raised Bog near Lake Ilmen, 150km south of St. Petersburg. At this location, eight major plant families disappeared c. 8350 BC, after which four new families appeared. Only pine and birch bridged the gap. (Arslanov 1999).

Figure 2: Nikolsko-Lutinskoye Raised Bog: extinction of species at end of Preboreal.



In southern France, this replacement did not occur, making it difficult to correlate with Danish and Russian data. So, what was the geographic distribution of the plant extinction? The European Pollen Database supplies the answer.

Geographic distribution of plant extinctions implicate a comet

The European Pollen Database contains many pollen core studies submitted by field researchers in Europe. This interactive web site includes maps of site location, pollen diagrams, radiocarbon dates and estimated dates by depth, making it relatively easy to search large amounts of data.

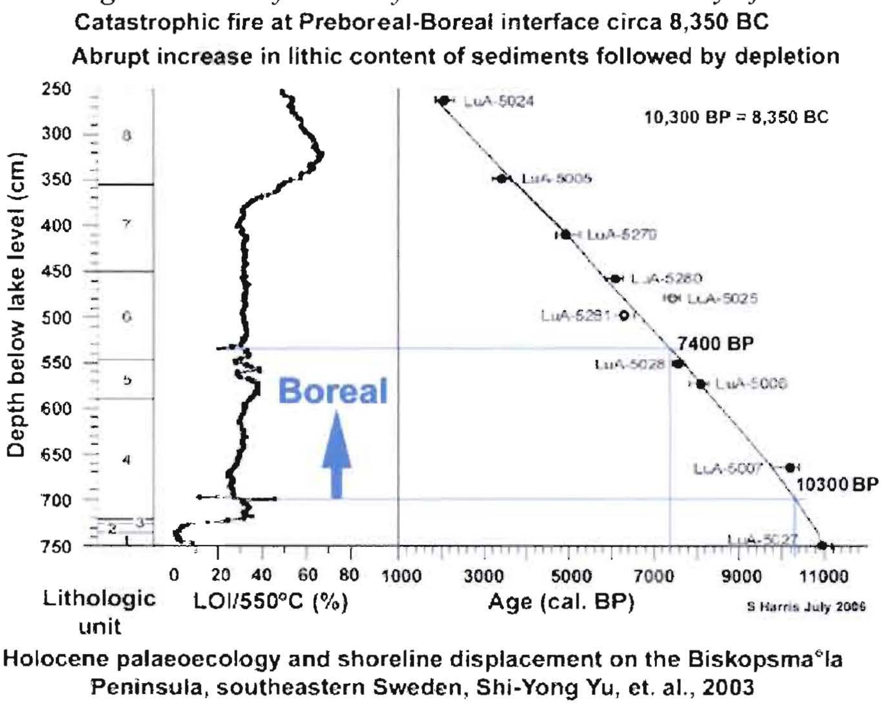
On the map of Europe in Figure 1 above are plotted the number of plant families that either disappeared or started up in 9200 BP C_{14} from among those pollen cores that were closely sampled. Red circles surround areas that lost or gained five or more species, while orange circles lost or gained two or more species. The resultant clusters occupy a swath from northwest Russia to Ireland.

The pattern of these clusters suggests a disintegrating comet. Each fragment generated intense heat as it entered the atmosphere, incinerating everything below. Due to the heat, a piece of the Scandinavian ice sheet slid into Ancylus Lake, now the Baltic Sea, while another piece slid into the North Sea north of Scotland. Each of these pieces generated a tsunami.

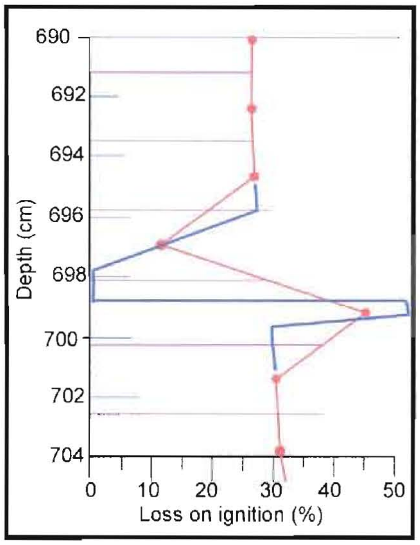
Conflagration in Sweden kills all life, c. 8350 BC

Southwest Sweden was one of the hot spots. Shiyong Yu, then at Lund University, created a high resolution profile of sediments from Lake Ryssjön on the Biskopsmåla Peninsula (Yu, 2003). His remarkable persistence captured a dramatic see-saw in the amount of plant material that settled in the lake circa 10,300 cal BP (8350 BC). The lithic fraction of sediments, normally 30%, jumped to 45%, dropped to 12%, then returned to 27%. But that is not all.

Figure 3: Lithic fraction of lake sediments at Lake Ryssjön.



These percentages are averages over several years. When converted to single years, the loss on ignition dropped to zero.



An explanation is fire, but fire quite different from ordinary forest fires, which have little impact on the general lithic content. It appears that all combustible material on the peninsula incinerated. In the firestorm, bits and pieces fell into the lake, which raised the lithic content. Afterward, nothing survived to regrow, thus lowering the lithic content to zero. Seeds and spores soon blew in to restart life, which gradually returned to nearly the same level as before.

Note that a similar event occurred circa 5450 BC (7400 cal. BP), about the time sea water from the Mediterranean flooded the Black Sea.

A comet, not a meteorite

Dr. Yu measured magnetic susceptibility on the Lake Ryssjön core and found no unusual excursions at the end of the Preboreal, thus ruling out a meteorite containing iron.

Lithuanian tsunami, 9200 BP C14

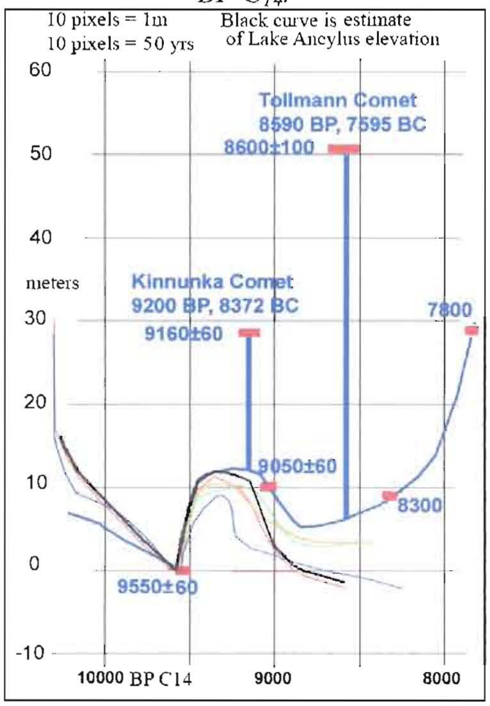
Coastal sediments from Lithuania recorded two different tsunamis, separated by 750 years.

16m in 9160±60 BP C_{14} at the end of the Preboreal, circa 8350 BC

44m in 8600±100 BP C_{14}, likely from the Tollmann Comet, circa 7600 BC.

Apparently heat from the comet loosened a large sheet of glacial ice in eastern Sweden that slid downhill into Lake Ancylus (precursor of the Baltic Sea). This sudden displacement of water generated a tsunami that measured 16m high in Lithuania. All of the meltwater poured out the exit in Sweden, which rapidly downcut to sea level.

Figure 4: Height of Lithuanian shoreline referenced to the beginning of Ancylus Lake in 9600 BP C_{14}.



Uxbridge artifacts sealed by charcoal-filled clay layer

Uxbridge lies at the north-western periphery of Greater London, adjacent to the River Colne, a major tributary of the Thames. A campsite at Uxbridge contained horse and reindeer antlers and leg bones in a grey clay radiocarbon dated to about 10,300 cal. BP (8350 BC). Overlying and sealing this horizon is a black clay containing large amounts of charcoal and organic material. (Lewis, John; 1991)

This charcoal layer never again occurs, so it was not the result of forest fires. Instead, it results from burning but not complete incineration from the comet. The black clay matrix appears to be the result of a flood that slowly subsided, leaving a clay layer mixed with charcoal.

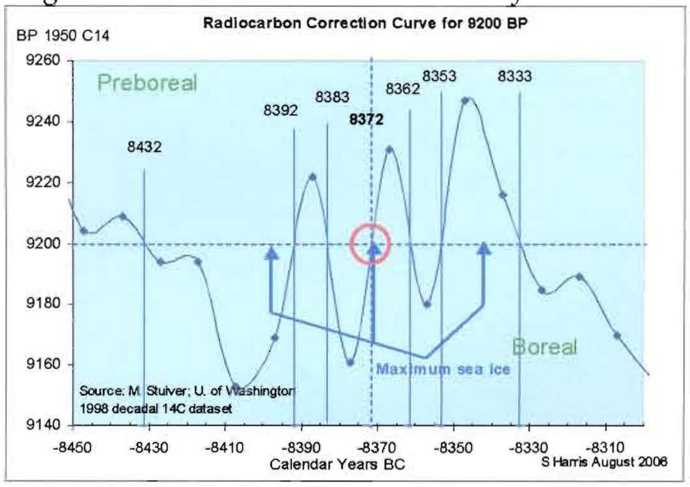
Estimate of calendar date of the comet strike

Greenland GISP2 ice core contains three measures. It shows a steep drop in average precipitation rate that implies a drop in average temperature after the strike. Even better, it shows a peak in NH4 concentration between 8366 and 8364. Mike Baillie correlated peak NH4 with comet strikes, including the 1918 Tunguska impact in Russia. Finally, Methane Sulfonic Acid (MSA) concentration has a cyclic minimum every 4 1/2 years, with an extraordinary peak instead of minimum in 8365.5 BC. The explanation is that Earth repeatedly passed through a dust-laden comet cluster tail every 4 1/2 years. In 8365.5 BC, one or more fragments struck near Greenland and melted polar ice, which in turn allowed unusually high evaporation of sea water including MSA, which winds carried to Greenland, where MSA was trapped in snowfall.

Radiocarbon Calibration Curve, 8372-8362 BC.

9200 BP C_{14} is the typical date measured for the transition between pre-Boreal and Boreal. In this period, the radiocarbon correction curve oscillates wildly, giving seven possible calendar dates. Of these seven, the closest are 8372 BC and 8362 BC, well within the published accuracy of ±16 years.

Figure 5: Radiocarbon correction curve for 9200 BP.

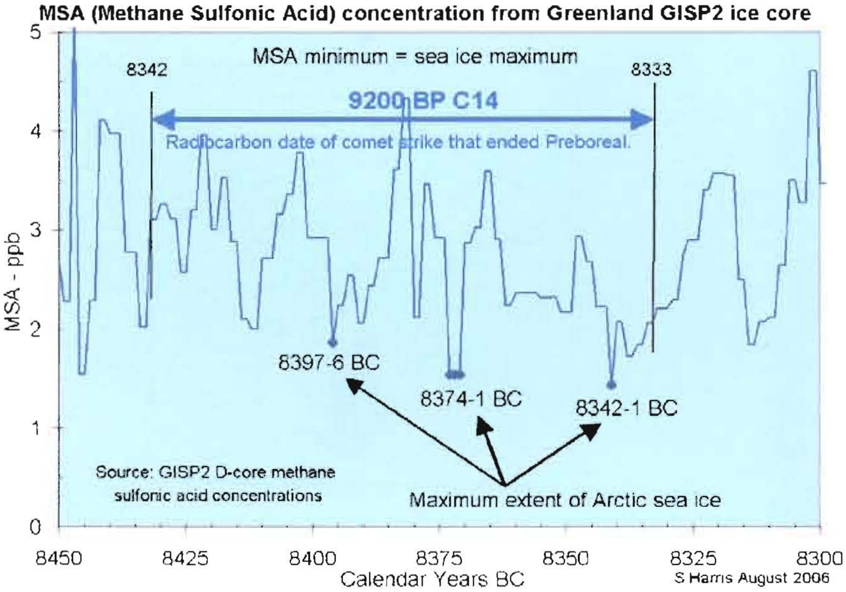


Maximum sea ice did not occur

A comet strike that triggered volcanoes would severely cloud northern skies and lower temperature, but there was no increase in the amount of volcanic sulfate measured at Greenland.

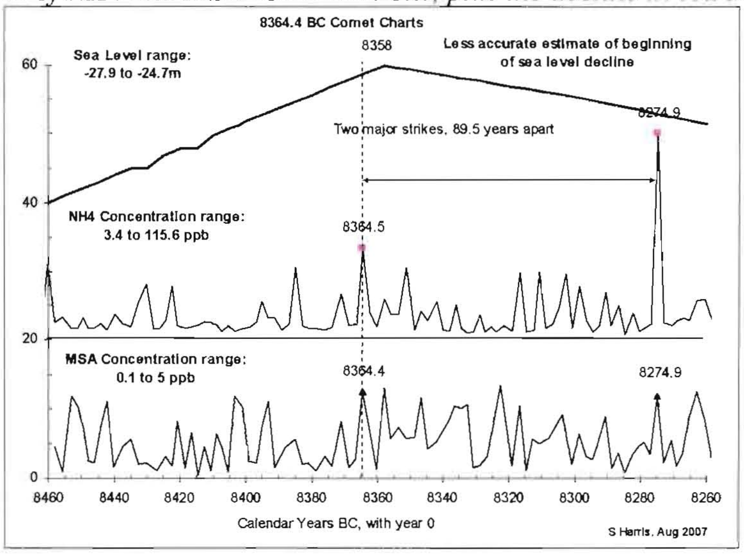
In Greenland ice cores, the concentration of Methane Sulfonic Acid (MSA) varies inversely with the extent of arctic sea ice; that is, minimum MSA correlates with maximum sea ice. At the end of the Preboreal in 9200 BP C_{14}, low MSA occurred three times, but nothing dramatic. Still, the North Atlantic gradually got colder between 8442 and 8342 BC, then warmed up. Something other than volcanic ash clouded the atmosphere. One possibility is repeated passes through the comet tail every 4 1/2 years.

Figure 6: MSA concentration in GISP2 ice core from 8300 to 8450 BC shows three periods when sea ice reached its maximum extent.



When plotted alongside NH4 concentration, MSA shows a peak at the same time as the comet strike in 8364.5 BC, not overly dramatic, but complementary.

Detail of NH4 and MSA concentrations, plus the decline in sea level.



Comet Cluster Encke strike, 8366.3 BC

A plot of the interval between every other comet strike from Comet Cluster Encke forms a smooth curve, which suggests a date of 8366.3 BC with year 0, that is, the spring of 8366 BC. If the comet still exists, the next appearance could be August-September 2012 AD. This curve is fairly rigorous - a change of one year skews the points. Why the interval increased then flattened out is unknown, but something dramatic happened at the time of Noah's flood in 3161 BC.

Figure 7: Interval between repeated strikes of Comet Cluster Encke.

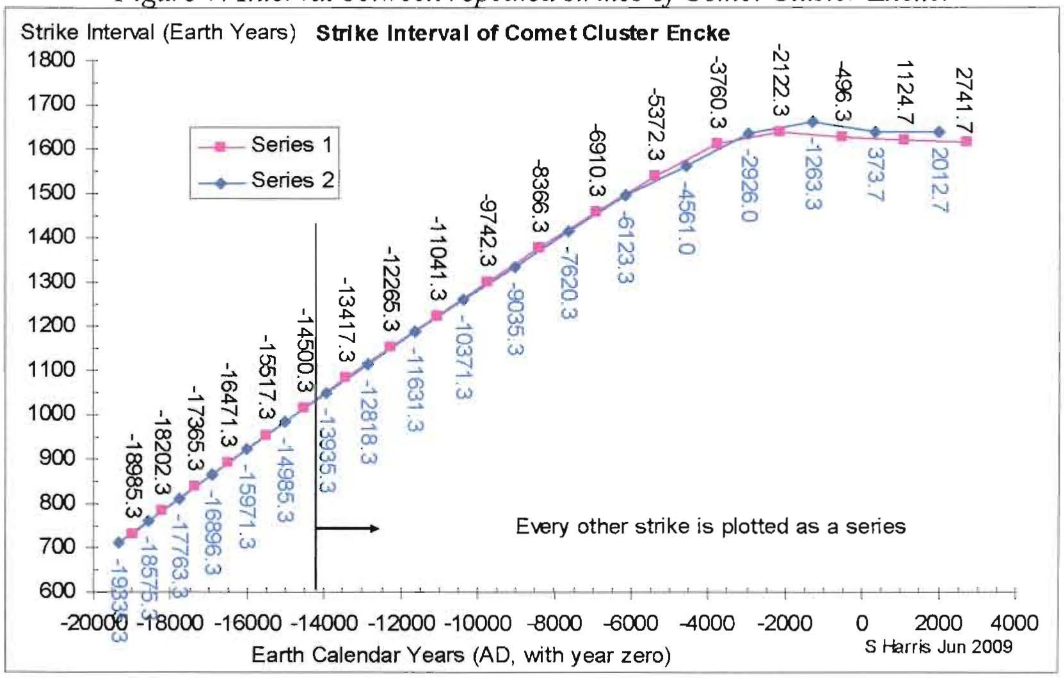
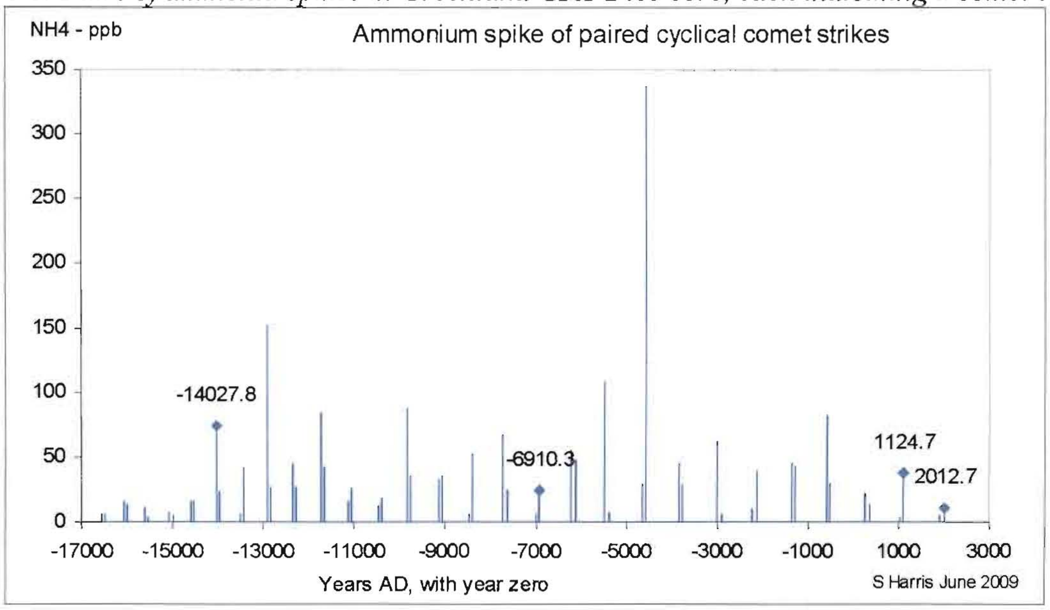


Figure 8: Pairs of ammonia spikes in Greenland GISP2 ice core, each indicating a comet strike.



German pines change to oaks, 8160 BC

The transition from Preboreal to Boreal chronozone coincides with the replacement of pine by oak in the river valleys of Southern Germany. (Kromer, 1998)

Figure 9: German trees change from pine to oak in 10,310 BP (8350 BC)

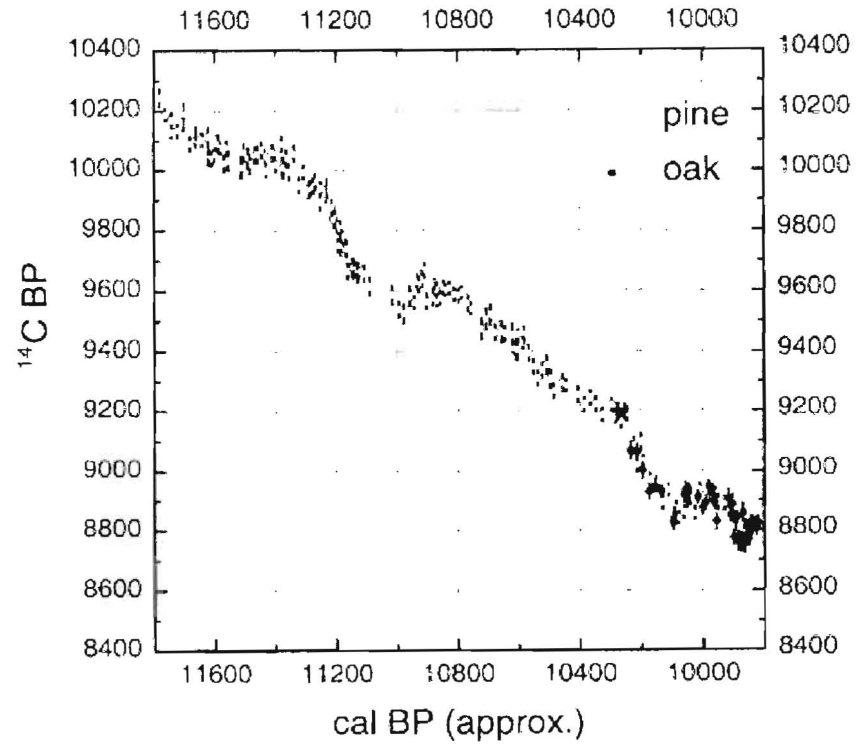


Fig. 2. ^{14}C calibration curve as derived from the German pine chronology. The uncertainty of the absolute age scale is estimated at less than ±20 yr (see text).

End of Karelia Mesolithic, 8380±160 BC

On the Karelian Isthmus, between Lake Ladoga and Finnish Bay, the Early Mesolithic ended in 8380±160 BC (9130±140 BP C14). This location is famous for its fish net, the earliest ever found. For 1500 years the Karelian Isthmus remained deserted, finally restarting with a new tool kit in 6725±325 BC (7750±180 BP C14). Among the new tools were polished mace heads, microblades and pottery. (Timofeev, 2004)

Bibliography

Arslanov, K. A, et al; 1999; Chronology of vegetation and paleoclimatic stages of northwestern Russia during the late glacial and Holocene; *Radiocarbon*, V. 41, Nr 1, 1999, p 25–45.

England: Interim report; *The Late Glacial in north-west Europe*, Council for British Archaeology, INST ARCH DAA Qto Series COU 77.

Kromer, Bernd and Spurk, Marco; 1998; Revision and tentative extension of the tree-ring based 14C calibration, 9200-11,855 cal BP; Radiocarbon, V40, No 3, p 1117-11251.

Lewis, John; 1991; A Late Glacial and early Postglacial site at Three Ways Wharf, Uxbridge,

Timofeev, V.I. et. al, 2004, The Radiocarbon dating of the Stone Age – Early Metal Period on the Karelian Isthmus, Geochronometria V23, pp 93-99. Table 1: Antrea-Korpilahti, Lab no. Hel-1303, 9130±140 BP C14; and Bol'shoye Zavetnoye 4, Lab. No. Le-6556, 7750±180 BP C14.

Yu, Shi-Yong, et al; 2003; Holocene palaeoecology and shoreline displacement on the Biskopsmåla Peninsula, southeastern Sweden; *Boreas*, Vol. 32, pp. 578–589.

You are invited to contact Stuart Harris about this or other archaeological questions at
PO Box 60281, Palo Alto, CA, 94306; Stuart.Harris @ sbcglobal.net; 650-888-1859