CLIMATE PATTERN RECOGNITION IN THE MID-TO-LATE HOLOCENE (2900 BC TO 1650 BC, PART 4)

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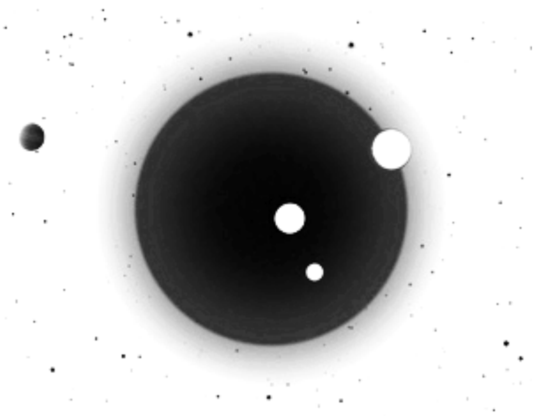

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Abstract. We analyze each spike of the temperature evolution within this 2900-1650 BC time frame, using the GISP2 Holocene temperature series. The analysis applies our pattern recognition grid, as explained in the first Holocene paper, commencing 8500 BC. The grid consists of vertical and horizontal lines, placed on this selected Holocene time span. The distances between vertical grid lines, demonstrating Earth orbital periodicity, augment by 6.95 years for each successive periodicity cycle. There are 3 horizontal grid lines, the central line is the Milankovitch line, signifying the GISP2 borehole core temperature, if all other climate drivers were excluded. The two other horizontal lines are the upper and the lower Earth orbital oscillation line, within which the Earth climate varies, if not impacted by large cosmic bolides. As we demonstrate, the Holocene temperature evolution does not remain confined within these upper and lower horizontal lines, because strong cosmic impacts always and necessarily produce a strong temperature down-spin spike, followed by a strong upward temperature rebound spike, regressing thereafter. This is the so-called Z-shaped temperature pattern of each cosmic impact on Earth. The 2900-1650 BC time frame contains two important cosmic impacts, which cause the so-called "Bond-events" or "Millennium cycles". The very large cosmic Burckle impact into the Indian ocean sent global temperatures steep down, thus one Bond event. A smallish impact, the Sumerian K8538 impact in Iraq, in combination with a down-moving periodicity curve produced the second temperature drop, another Bond event, also called "4.2 kyr event". Both, the Burckle event at 4.8 kyr, and the "4.2 kyr event" caused steeply declining temperatures with a drying atmosphere, resulting in severe and century long drought conditions on Earth. Large agricultural societies, which developed since 3000 BC, such as in Sumer, Egypt, China and India collapsed. The Sumerian-Akkadian culture with its capital city Agade was wiped off the map by a direct bolide hit. Details of bolide impacts, drought and society demise are provided.

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1. INTRODUCTION

The first three papers of our Holocene analysis series span the time period from 8500 BC to 2900 BC. This fourth paper explains each temperature spike from 2900 BC until 1650 BC. The fifth paper of this series, will cover the time span until 1 AD, a sixth paper 1 AD to 1150 AD, the seventh and eighth will cover the time until today and beyond.

In figure 1, the GISP2 temperature time series (Alley, 2000), transformed into equidistant time steps, and the selected time span of this paper is shown.

The GISP2 borehole values have the great advantage of high accuracy, because annual borehole cores are 20 cm in length, 1 meter core length represents 5 years, thus ample ice samples for exact annual measurement data are available.

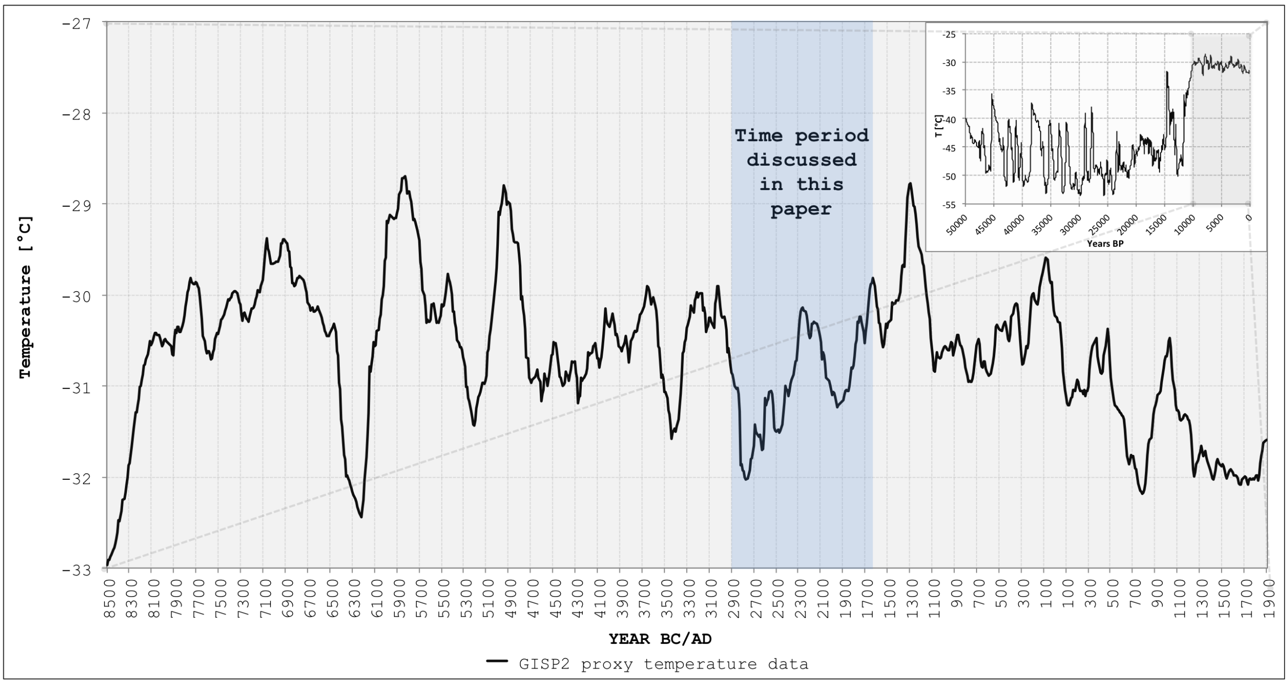

Figure 1. The Holocene GISP2 data (transformed into equidistant time steps) and the period discussed in this paper

At first, we place the vertical periodicity lines onto the time span. All vertical lines of the time before 2900 BC can be found in the Holocene part 1 - 3 papers. As pointed out before, the periodicity lines grow in their distance to each other by 6.95 years, the resulting vertical line dates are 3081 BC, 2726 BC, 2364 BC, 1994 BC and 1619 BC. Furthermore, we extend the horizontal Milankovitch line from the previous paper, Holocene part 3, across the graph. The two other lines, the upper EOO boundary line and the lower EOO boundary line, are also continued from the left to the right. The upper EEO line signifies the maximum possible temperature, undisturbed by cosmic bolide impacts; the lower EOO line indicates the lowest possible undisturbed temperature for each Holocene date. Since temperatures go up and down within those upper and lower boundaries, we add a sine shaped curve connecting the upper and the lower temperature boundaries with the vertical periodicity lines thus setting up the pattern recognition grid. The EOO sine wave grows in its length by 6.95 years each wave period. At the same time, the sine amplitude grows simultaneously in linear relation to the period length (fig. 2). This linear dependence is explained and calculated in detail in (Seifert, 2010).

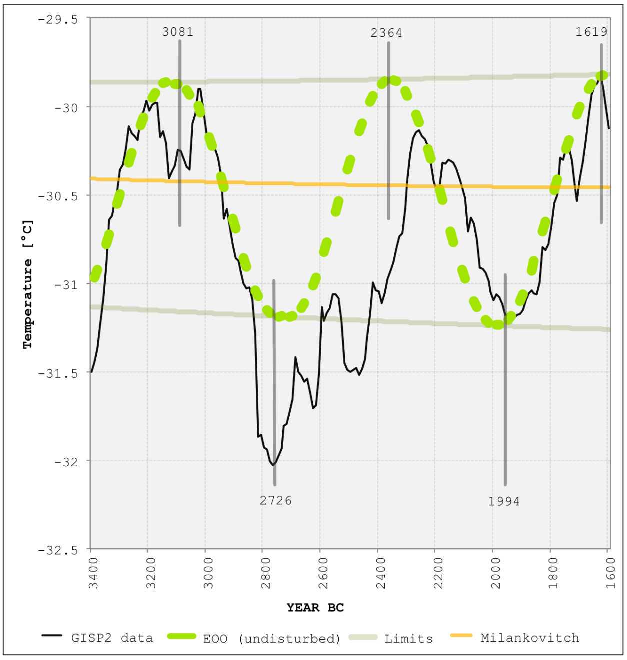

Figure 2. Millennial and centennial cosmic climate drivers: Milankovitch and Earth Orbit Oscillation (EOO)

Analysis: The grid system with the sine wave of maximum and minimum temperatures constitutes an evaluation system, showing, at first, the normal periodic temperature course and secondly, the anomalous, Z-shaped temperature spikes (Seifert, 2012).

2. TEMPERATURE EVOLUTION ALONG THE EOO SINE WAVE

At first, we focus on the temperature evolution, which exactly follows the course of the EOO sine wave, as shown in figure 3.

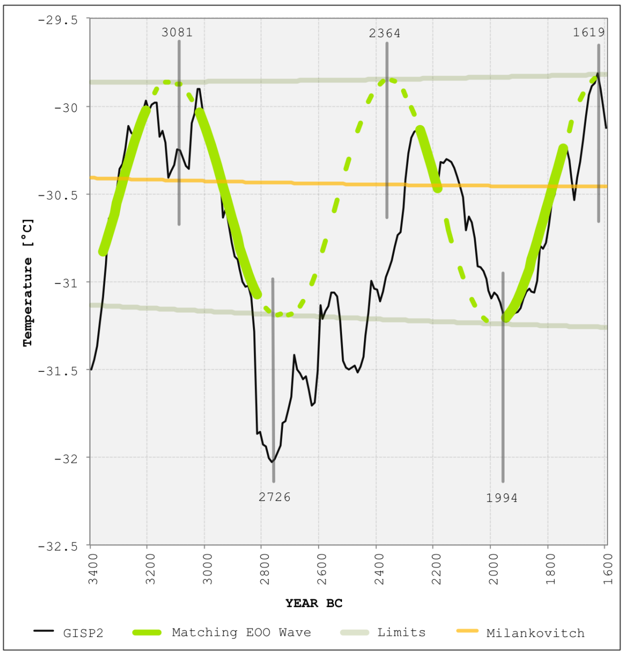

Figure 3. Undisturbed periods where temperature follows EOO wave

The temperature evolution shows various intervals, with the temperature remaining exactly on the EOO sine wave. These are periods which are not disturbed by cosmic impacts.

3. BOND EVENTS AFTER COSMIC IMPACTS AND DESCENDING EOO SINE WAVE

In figure 4, the Z-shaped descend and rebound pattern of one large cosmic impact shown in red color, and three more small scale impacts, all producing Z-shaped patterns. All of impact patterns delay the normal EOO course of temperature.

It takes centuries for the temperature line to approach and unite again with the regular sine wave EOO pattern. On the picture, the first cosmic impact is the Andaman Gulf ("Piora") impact of 3200 BC. We see a small impact Z pattern, which at 2950 BC unites again with the sine curve.

The second impact, a deep Bond event, follows 2807 BC. The great cosmic Burckle impact (Gusiakov, 2010) into the Indian ocean moved mega-tsunami waves towards Madagaskar to the West, towards India in the North and even backward against the bolide flight direction towards Thailand (Neubauer, 2011) and West Australia. This huge impact can also clearly be detected on the GISP2 graph: It is the sine wave point, at which the graph line bents into a

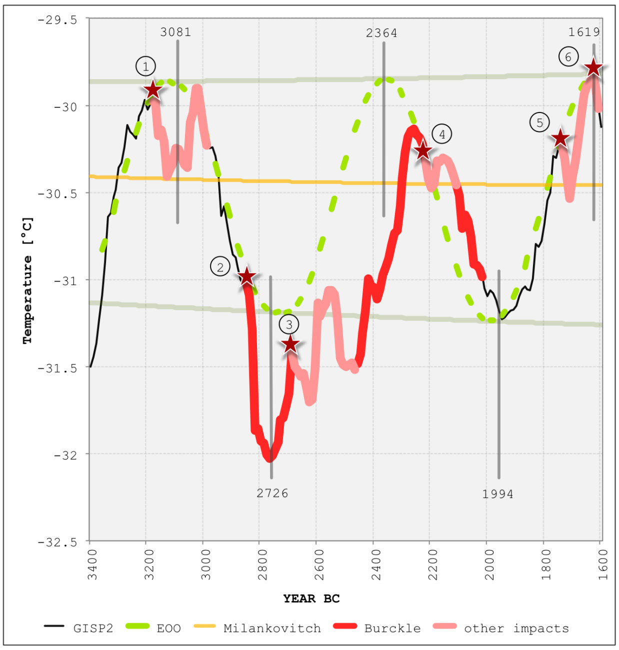

Figure 4. Deviating course of temperatures from regular EOO wave caused by cosmic impacts
① *Andaman*, ② *Burckle*, ③ *Campo de Cielo*, ④ *Sumerian K8538*, ⑤ *Henbury*, ⑥ *Atlantic EWE-1*

free fall of temperatures. Three more cosmic impacts are only small to medium scale: one is the Campo de Cielo impact in Argentina at around 2700 BC, followed by the fourth impact, the small Mesopotamian impact near Ahmara, Iraq (Umm-al-Bini impact) at 2193 BC. A fifth impact is the Central Australian Henbury impact at 1750 BC. A large impact into the Atlantic ocean follows at 1628 BC, explained later in part 5 of the Holocene paper series.

We continue with further discussion of impact details:

- The first, the Andaman Gulf impact, is dealt with in the Holocene paper, part 3.
- The second impact, plotted in red color in figure 4, is the greatest impact of this period, 2900-1650 BC, called the Burckle impact (Gusiakov, 2010; Abbott, 2006). The date 2807 BC is given in Chinese celestial observation records. This impact was enormous in size and effect, the impact crater is 20 km in diameter. This impact sent global temperatures instantly deep down, the enormous fall-out of atmospheric moisture produced widespread global inundations, known as the Great Deluge of Noah. Historical flood myths were analyzed by (Masse, 2006). The relation of cosmic impact and immediate flooding was proven in the previous paper, Holocene part 3. Temperatures continuously declined in a sine curve from 3000-2700 BC, and this period of temperature decline signifies a simultaneous drought mode. Therefore, within this drought period, only the cosmic Burckle impact is capable to generate a huge impact flood within this historical time window, 3000 to 2700 BC. After 2700 BC, temperatures rebounded and joined the EOO sine line in 2250 BC, but delayed by 114 years from the regular sine peak of 2364 BC.
- The third impact is the Campo de Cielo impact at 2700 BC. The literature (Barrientos, 2014) actually sets a time frame of 2840-2146 BC, but the only impact date remaining is at 2700 BC. This impact is small to medium, delaying the temperature recovery after the Burckle event by one century.
- The fourth impact is the Sumerian K8538 impact, with a small impact crater of 3 km in diameter at the Umm-al-Bini location in Iraq (Seifert, 2014). The approach of the bolide over 3 weeks and the subsequent impact on Earth from a distance of 100 km by an ancient astronomer on his observation platform is preserved as Babylonian tablet K8538 in the British Museum. The course of the comet, described on the K8538 clay tablet is this of Northern Taurids comet showers (Bashewa Weather, 2016), coming out from the Pleiades, crossing over to Orion and impacting thereafter on Earth, after being visible in its approach for 20 days. In 2193 BC, the direct hit of the comet into shallow waters and into the abyssal sediments of the Persian Gulf produced immense fire columns of hot sediment dust, mixed with salty steam out of Gulf waters, arising as dust impact plume above the impact site and covering large parts of Southern Mesopotamia with hot dust (Seifert, 2013). This impact and the impact dust layer was archaeologically discovered in 1998 (Courty, 1998; Courty, 2001), 20 cm thick in Northern Mesopotamia, in large distance to the impact site. This salty airborne dust-clay layer increases to several meter thickness with shorter distances to the Umm-al-Bini impact. Archaeological profiles from excavations conducted at Nippur show this airborne dust-clay layer 1 m thick in between the Akkadian horizon and the Ur III horizon, only 70 years later.
- The fifth impact took place in Henbury, Central Australia (Buhl, 2015). We set the date to 1750 BC, filling in remaining Z-shapes of impacts in the GISP2 graph. The authors estimated the impact at 2200 BC, but with high uncertainty. Unfortunately, no better date is available. The impact is small to medium, consisting of a group of 12 impact craters. The impact effects are a short dip in global temperatures.

4. THE ROLE OF VOLCANIC MEGA-ERUPTIONS

As we recognized in earlier papers, climate change due to volcanic eruptions is confined to a few small scale and short temperature intervals. Blue dots in figure 5 show possible dates for volcanic eruptions on Earth with a global temperature decreasing effect of short durations.

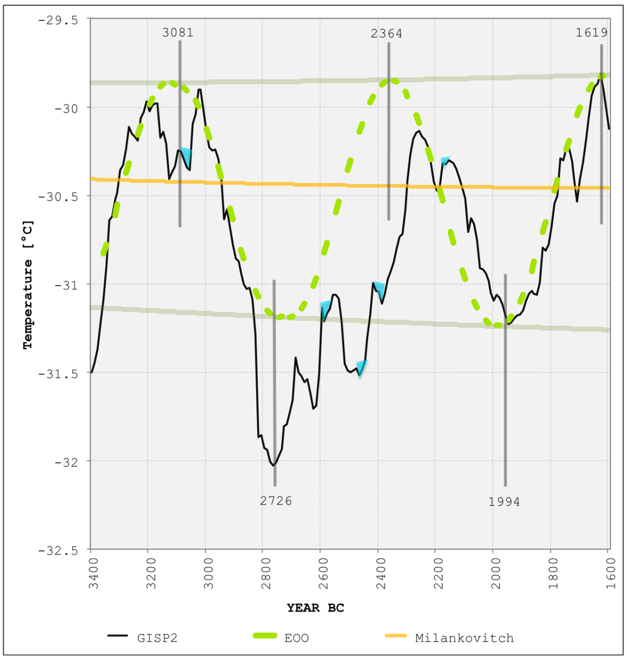

Figure 5. Possible volcanic mega eruptions

5. SOCIO-ECONOMIC EFFECTS

Two catastrophic events in human societies occurred within this 2900 BC - 1650 BC time interval: The first, the EOO temperature sine curve decline, starting 3000 BC, led to the onset of a two century-long drought, 3000 BC until 2800 BC, which was prolonged by additional 100 years to 2700 BC by the strong cosmic Burckle impact.

The second EOO sine curve decline, 2250 BC - 2000 BC, repeated 250 year long drought conditions once again. The Mesopotamian K8538 cosmic impact aggravated this drought to some extent by steepening the temperature decline.

Focussing on Mesopotamia: The first cooling and aridification interval led to a fast collapse of the proto-historical Jemdet Nasr culture after 100 years at 2900 BC.

Irrigation cultures continued, but new strong dynasties thrived again in Mesopotamia only after 2600 BC, after an upward rebound of temperatures and resuming higher precipitation. Better documented, due to upcoming of writing, is the collapse of civilizations after the second drought event, the so-called “4.2 kyr-event”: Severe drought conditions set in with the downturn of the EOO-sine curve in 2250 BC. In Northern Mesopotamia, human settlements of rain-based agriculture without irrigation were totally abandoned after 50 years in 2200 BC (Weiss, 2012). Other civilizations worldwide suffered catastrophically, until the descending EOO-wave ended in 2000 BC, and temperatures and precipitations picked up again. Southern Mesopotamia suffered specifically, because the cosmic bolide scored a direct hit in 2193 BC, wiping the capital Agade and the Akkadian empire from the map. Therefore, no historical records from the Akkad society of any kind for the next 50 years after the cosmic impact exist. Life had to start anew in this Southern Mesopotamia region 50 years later: Survivors formed a small kingdom of Lagash, which was, after only 3 decades, taken into a somewhat larger kingdom, known as Ur-III, which, weak as well, was finished by nomadic invaders, 100 years later, thus the end of Sumerian culture in Southern Mesopotamia. After the mega-drought ended in 2000 BC, and with new favorable agricultural conditions, new civilizations arose in the centuries thereafter.

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