

The Barrier Canyon style pictographs: WHY, WHERE, WHAT,
and WHEN they were painted.

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ABSTRACT

Assume the Barrier Canyon style artists were animists. From their probable knowledge of astronomy, meteorology and climatology they painted pictographs as invocations to the immortal rain spirits that resided within the canyon walls (when not in the sky) to bring rain for their crops. Certain types of features on canyon walls were thought to indicate the favored location where the rain spirits were in residence when not in the sky. Their paintings on the canyon walls envision the artists' conception of the appearance of the rain spirits within. Ceremonial invocations to the rain spirits probably were timed to occur just before the summer monsoon season started, to assure there would be rain for a successful harvest.

INTRODUCTION.

One of the contemporary Native American ceremonies in Northern Arizona involves sending live rattlesnakes with invocations to rain spirits that reside underground to insure a successful harvest. The shaman by observing the annual appearance of a certain cloud form on a nearby mountain range determines the timing of the ceremony to coincide with the beginning of the monsoon season.

In the Buckhorn Wash pictograph panel can be found pictograph portrayals of rattlesnakes in supplication to what are probably rain spirits. It is possible the contemporary ceremony may have had its origin in the ceremonies portrayed hundreds of years ago.

There are also pictographs of individuals, possibly the shaman himself, in supplication to rain spirits. At Buckhorn Wash is a human figure in supplication to a rain spirit represented as a cumulonimbus cloud. In Barrier Canyon there is a figure with what appears to be a musical horn in supplication to a rain spirit in the form of an altocumulus lenticularis cloud, with rain and lightning symbols for decoration.

WHY?

A clue to WHY the inhabitants of southeastern Utah painted the Barrier Canyon style pictographs may be found in an examination of the general circulation of the earth's atmosphere.

In a diagram, Figure 1, found in several standard meteorology text books [1], [2] the sun is over the equator, at the time of the equinox. At the equator there is maximum heating of air at the surface. The heated air rises, aided by the addition of the heat of vaporization from condensation of water that forms clouds. Fall out of rain dries the air. The air rises to a very high level. There the updraft splits, part flowing northward. The air cools by radiation, and at about 30° north latitude, sinks to the ground.

The subsiding air is dry and has been warmed by compression when it reaches the surface. In the area of subsidence is found warm and dry weather as characterized by high atmospheric pressure. The down flow when over the ocean occurs at what is known as the "horse latitudes". The downward air flow reaching the surface splits, part flowing south to the equator, the other part flowing north to about 60° north latitude.

At the north pole the air aloft cools, subsides then flows southward behind the polar front. At about 60° north latitude the cold air meets and lifts the northward flowing warm air. The uplifted air cools, clouds form above the cold front, releasing the heat of vaporization and enhancing the lift of air to high altitudes. Part of the upward flow moves south, meets the air moving north, and joins the down flow to the surface.

Figure 1 represents the status of atmospheric circulation at the time of the equinox. This would be a stationary pattern for atmospheric circulation over the earth's surface, except that the earth's axis has a tilt of about 23° with respect to the plane of its orbit around the sun. From the time of the vernal equinox the pattern of global circulation shown in Figure 1 moves northward with the apparent movement of the sun to the north.

The inhabitants of southeast Utah, a thousand years ago, had a knowledge of those movements of the sun during the various seasons of the year. There are found in the region, where Barrier Canyon pictographs are extant, solar markers denoting the position of the sun on the horizon at the vernal equinox, the summer solstice, the autumnal equinox and the winter equinox. They knew the length of the year, and the type of weather that was to be expected after the sun passed each of the solar markers.

To assess the effect of the apparent sun's position on precipitation refer first to Figure 2, it shows the areas of Arizona and Utah referred to in Figure 3 as S AZ, NE AZ and SE UT [3]. It also shows the mean monthly precipitation (in inches) for those areas in August, the wettest month of the year in those areas.

Figure 3 is a graph showing the mean monthly precipitation in the three areas, S AZ, NE AZ and SE UT averaged over the years 1931 to 1960 [3]. The left edge of the graph is essentially the time of the winter solstice. At this time the north pole is tilted away from the sun. Southeastern Utah, at about 40° north latitude is under the influence of winter, with the polar front passing and retreating across the land. At that time the northern "horse latitude" down flow of air (refer to Figure 1) is in the vicinity of the equator. The precipitation (snowfall measurements are reduced to their water content) is about constant in the Arizona-Utah region during December, January, February and March.

At the vernal equinox the general circulation conditions of Figure 1 are in effect. The polar front has moved north. The vernal equinox (March 21) is near the last day of killing frost for most of the Colorado Plateau region (point A on Figure 1). It may not have been used as an exact date for planting crops, but could have been used to indicate that it was the beginning of the crop planting season. Climatic data from current records indicate that the last day of a 32° minimum temperature is generally after April 30 in the southeastern Utah region [3]. The last day of freezing temperature for the year is behind. It is time for planting crops. The region of subsidence of air from aloft has moved north over the area and subsidence is beginning to make the atmosphere more warm, dry, and the weather is generally "good".

By the first of July the crops that were planted about the first of May have used up the ground water deposited by snow and rain from passage of the polar front through the region.

Figure 3 indicates that warm, dry conditions would exist in Utah as the seasons proceeded from the summer solstice (June 21), through the summer to the autumnal equinox (September 21), and almost to the winter solstice (December 21). At this time the polar front begins to penetrate to the south, bringing winter to Utah.

Except: With advent of the summer solstice solar heating of the desert Southwest increases, and a thermal low develops over the southwest corner of Arizona, Figure 4 [3]. Counterclockwise circulation around the thermal low causes a flow of moist air from the Gulf of California and the Pacific Ocean known as the monsoon season, characterized by rain showers from thunderstorms, to move inland over Arizona and into Utah. The rain showers normally enhance the precipitation during the months of July, August, September, and minimally in October. Should the monsoon season not develop in a summer season, the monthly precipitation would be near one half inch per month, or less.

The inhabitants planted their corn crops, late April, or early May. Then comes the dry season, May, June, and the

crops have used all the ground water within reach of the roots from the previous winter's snows, and spring rain showers. If by some variation of climate, the monsoon is delayed or does not develop, a critical shortage of rain showers from thunderstorms will result in a drought and crop failure.

It can be hypothesized that they knew that the monsoon season followed closely after the summer solstice. From climatic records, from about 750 AD to 950 AD the monsoon seasons provided less than normal precipitation for some reason (Figure 5), and a protracted drought occurred [4]. This extended drought may have provided the impetus to develop a ceremony of invocations to the rain spirits to bring rain for their crops.

WHERE?

The area WHERE the Barrier Canyon style pictographs were painted is shown in Figure 6, delineated on the rainfall map for June, derived from a distribution by Steve Manning [5]. Note the coincidence of the Barrier Canyon style pictograph distribution with low level rainfall amounts on the Colorado Plateau during June.

This region is bounded on all four sides by mountain ranges, the Uintas to the north, the Continental Divide to the east, the Mogollon Rim to the south and the Wasatch Plateau to the west. The result is that the region is in a rain shadow of some mountain range, no matter from which direction moist air traverses the region, resulting in low climatic rainfall amounts throughout the year.

Of additional interest, it can be noted that the distribution of the Kokopelli petroglyphs [6] in general is located in regions of low summer rainfall amounts.

Their pictographs gives evidence that they were animists, believing that all objects had a spirit, including clouds. When clouds were not in the sky, the spirits, being immortal, had to reside someplace, probably behind the cliff faces that were identified by natural symbols that suggested rain showers: Natural arches, like the swelling of cumulus clouds; water stains on a cliff face; water seepage from a cliff face (water from a geological discontinuity on the cliff face, as at Buckhorn), etc. [7].

Courthouse Wash pictographs, near Moab, are painted on a cliff face that is just under a horizontal discontinuity in the cliff face. After a rainfall, and for some time thereafter, it appears that water flows down through a vertical crack from above to this discontinuity and the water emerges from within the cliff (a white deposit of what is probably calcium carbonate at the discontinuity attests to occasional seepage). This would

be an indication that the rain spirits resided within the cliff walls when not in the sky.

The Old Woman Wash pictograph panel gives us the clue that arches on canyon walls were considered to be symbols of cumulus clouds, and where rain spirits dwelt within. An arch near the panel has had petroglyphed on a ledge below it a series of anthropomorphic rain showers. This panel is also located below a hole in the canyon wall well above the panel that would be a source of water runoff of what is probably surface water. The runoff has left prominent water stains on the cliff at the panel site.

The "lower" Barrier Canyon pictograph panel is painted on a wall with runoff water stains. Similarly, for Calf Canyon pictographs, about 3.3 miles east-northeast of Buckhorn, and a panel in Crescent Wash.

The "middle" Barrier Canyon panel, the panel with geometric triangular body forms, has above it a smooth curved portion of the cliff that could be construed as representing a cloud, and a symbol for the cliff being a location for rain spirits that dwell within the cliffs.

At the Grand Gallery panel of the "upper" Barrier Canyon, the portion of the panel known as the "Holy Ghost and Attendants" is located within an arch.

And my favorite subject: Buckhorn Wash. An arched "cloud" concretion is 83 feet above the panel. A discontinuity, 77 feet above ground level, was a source of water that left water stains on the cliff below the "cloud" concretion. Interpretation would have been "rain showers" from the "cloud" above, a positive symbol that the rain spirits dwelt within the cliff [7].

WHAT?

The primary design of WHAT the Barrier Canyon artists painted is based on the altocumulus lenticular cloud. This cloud is the forerunner, a meteorological forecasting tool, of the influx of moisture into a region that may later result in rain. Data indicates these clouds precede rain about one third of the time [8].

In the Barrier Canyon pictograph region there are many mountain ranges and peaks where such clouds may be observed. The Aquarius Plateau, the Wasatch Plateau, the Mogollon Rim, and isolated mountain ranges as the La Sal, the Abajo, the Henry. Even such a low profile mountain as Cedar Mountain can be the source of an uplift to the air that produces such clouds.

A basic cloud form appears in many panels, patterned after an altocumulus lenticularis. It is a mountain wave cloud, rounded on the upwind end toward the mountain, and a thinning streamer of cloud on the downwind end [7]. Simple pictograph representation of such a cloud can be found on nearly every pictograph panel, a figure with no arms, no legs, and with little or no additional decorations. Usually the artists adds a head to the top of the representation of the altocumulus lenticularis cloud to anthropomorphize the painting, resulting in what has been termed the Barrier Canyon style. Such mountain wave clouds have been observed, apparently having a "head" on its "shoulders", but such a configuration is rather rare.

Figure 7 is two Barrier Canyon pictographs, located on the Grand Gallery panel. There are weather symbols within the body of each of the paintings.

Figure 7A. A rain spirit painting. Within the anthropomorphized altocumulus lenticularis pattern are rain showers, and cloud to cloud lightning. Outside the cloud are depicted on either side cloud to ground lightning.

Figure 7B. Within the anthropomorphized cloud figure are rain showers, cloud to cloud lightning, and just below "shoulder" level are two fighting dogs--growling to represent thunder [9].

Other pictograph designs depict crepuscular rays (Doll House), parhelia (Buckhorn Wash), halo (Buckhorn Wash), curved altocumulus lenticularis over a mountain such as seen when viewed from the side (Doll House and Buckhorn Wash). These are all cloud types that can be forerunners of an episode of rainy weather.

Another of the subjects for paintings is a rendition of the thunderstorm, usually anthropomorphized, paintings that have lightning and/or showers depicted (Barrier Canyon, Buckhorn Wash, etc.).

WHEN?

The Barrier Canyon style pictographs were probably ritual paintings, in response to the drought of 750-950 A. D. as invocations to the rain spirits to get out of their within-the-cliff residence, to get up in the sky and bring rain for their crops. This would have been just before the onset of the summer monsoon season. The beginning of that season could be marked by the summer solstice. So if markers can be found on the pictograph panels that can be related to the summer solstice, it may indicate the natives at that time had a ceremony to petition their rain spirits to favor their crops with rain.

Sego Canyon. A small notch in the downward moving cliff's shadow centers on the chest of one of the major pictographs at the summer solstice. Is this significant?

Courthouse Wash. The contour of the upward moving shadow on the cliff frames the heads of two of the anthropomorphic Barrier Canyon style pictographs at the time of the summer solstice. Is this significant?

Barrier Canyon. It has been reported that at the summer solstice date the "Holy Ghost and Attendants" are confined and framed by the descending shadow of the arch containing the panel [10].

Buckhorn Wash. A dominant figure about 37 feet from the left end of the panel has obviously been painted later, since it overlays a red pictograph to its left. All the other pictographs are oriented vertically, the dominant figure leans to the left. This is the only pictograph on the entire Buckhorn Wash panel that has a belt, with attached what is possibly a shaman's pouch containing his "medicine".

Figure 8 is a diagrammatic presentation of how the shadow of the cliff progresses downward, at an angle that matches the left leaning tilt of the belted pictograph. The figures below the shadowed pictograph denote the time of the interaction of the shadow and the pictograph. The time figures are slightly tilted, they are actually level, the figure itself is tilted slightly to the left. The final ray of sunlight illuminating the pictograph falls ONLY on the belt. The lower curve depicted is where the descending shadow is "caught" by an inverted arch, about 18 inches deep, below the pictograph.

About 100 feet east of the belted figure are three horizontal rows of dots, about 90 dots per row. About 250 feet farther east between two arches is the site of petroglyphed dots, two horizontal rows of about 45 dots on each row.

Assuming the top left dot represents the summer solstice (or it could be top right, bottom left, or bottom right), then by progression the three 90 count rows of dots we have:

Summer solstice	to	Autumnal equinox.
Autumnal equinox	to	Winter solstice.
Winter solstice	to	Vernal equinox.

By progression on the two 45 count rows of dots we have:

Vernal equinox	to	Cross quarter date A.
Cross quarter date A	to	Summer solstice.

Date A is the cross quarter date midway between the vernal equinox and the summer solstice, May 6.

Point A, on Figure 3, is the mean date of last 32° temperature in SE Utah on the mean total monthly precipitation graph; it is about May 1, or somewhat thereafter. The actual date of the last freeze would vary according to geographical location and seasonal variations. However, the two dates, cross quarter date and last day of spring freezing temperature are nearly coincidental.

Possibly the shaman used these two sets of dots as a calendar. The first set of three rows of dots would start with the summer solstice at the time of ceremonial invocations to the rain spirits, just before the monsoon season arrives. Continuing with the second set of two rows of dots to the east he could calculate the timing of the planting date the following spring to avoid frost kill of their sprouting crops. Why he put it off to one side of the main gallery is a puzzle--did he maintain a degree of secrecy for his forecasting magic?

Black Dragon. At the Black Dragon site is a calendar consisting of six rows of 60 dots. The top and bottom row of 60 dots are gray paint, the four middle rows, a total of 240 dots, are red paint. There is a natural winter solstice marker at the Black Dragon; noted when the sun shines into the far reaches of a nearby cave. If this is the starting point for counting the days, starting at any corner, it could merely be the artist's observation that the next 60 days (gray dots, 2 months) are going to be a period of gray, cold days. The following 240 days (red dots, 8 months) will be full of light and delightful for being alive. And again, the final 60 days (gray dots, 2 months) are dull and dreary. If so, It is not apparent how this calendar would be used to determine the time of rituals associated with the planting crops and for timing invocations to the rain spirits. However, there is one Barrier Canyon style pictograph and several rain shower symbols at the site.

CONCLUSION.

The culture that nurtured the Barrier Canyon style artists understood astronomy, the timing of the solstices, equinoxes and cross quarter dates midway between the solstices and equinoxes.

They had a knowledge of short term weather forecasting based on observations of weather phenomena that forecast the advent of periods of rain.

They combined the two fields of knowledge as is evidenced by their summer/winter solstice markers. This implies they were also aware of climatic variation of the average weather with changing of the seasons.

Their paintings portraying meteorological parameters are probably associated with what was most important to them, timing invocational ceremonies to assure the advent of the seasonal monsoon rain for their crops, and forage for the game animals so necessary to their survival.

With only observations of their painted pictographs available to us, we can infer that they had knowledge of astronomy, meteorology and climatology in planning and adjusting their activities to cope with their environment.

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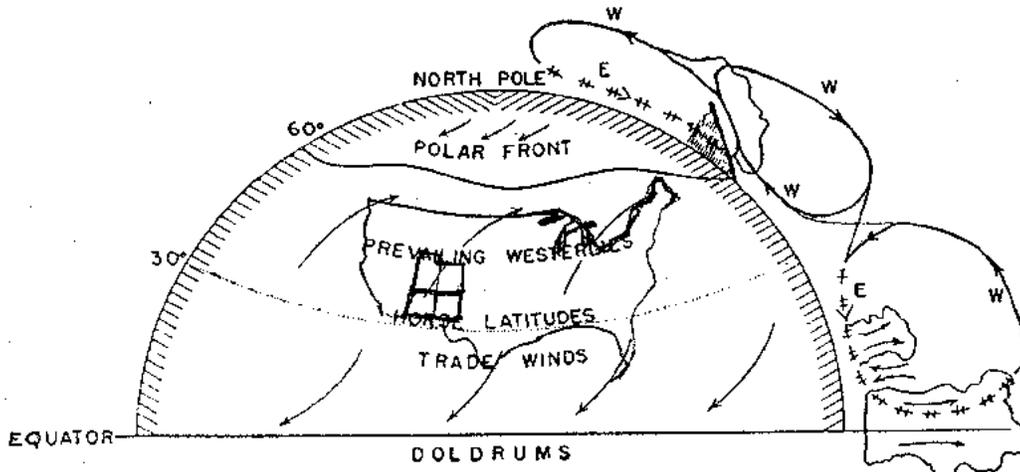


Figure 1. General circulation of the northern hemisphere.

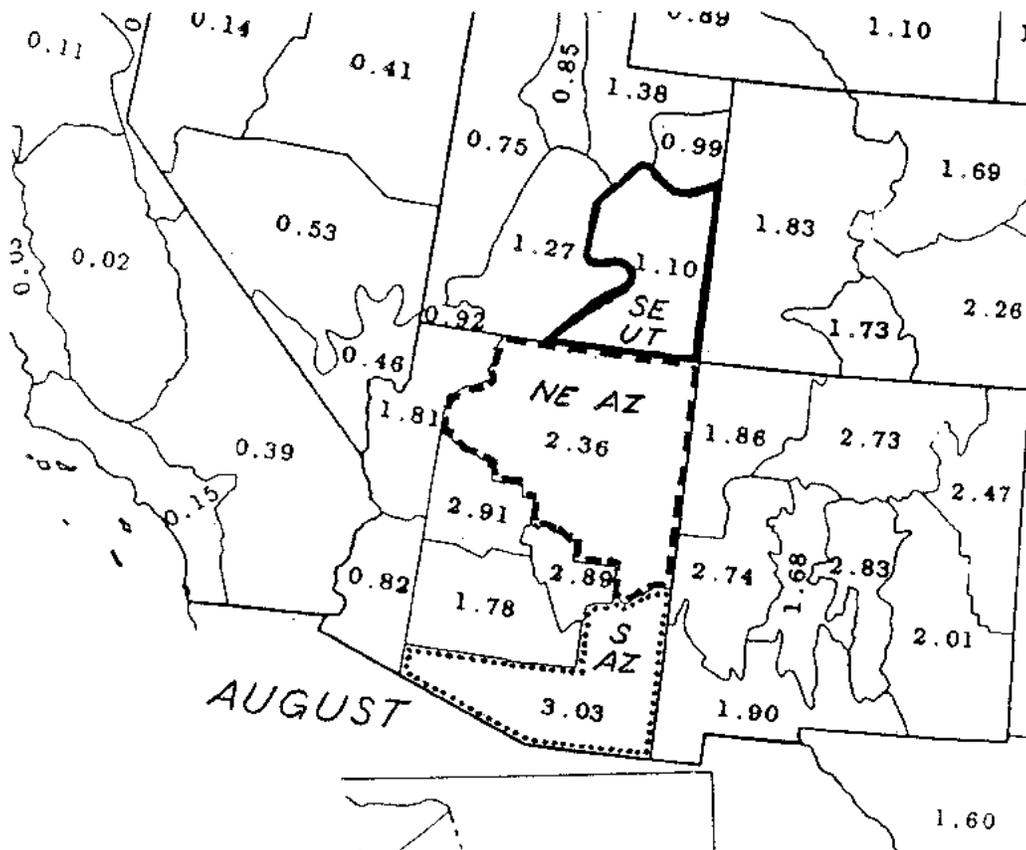


Figure 2. State Climatic Divisions referenced in Figure 3.

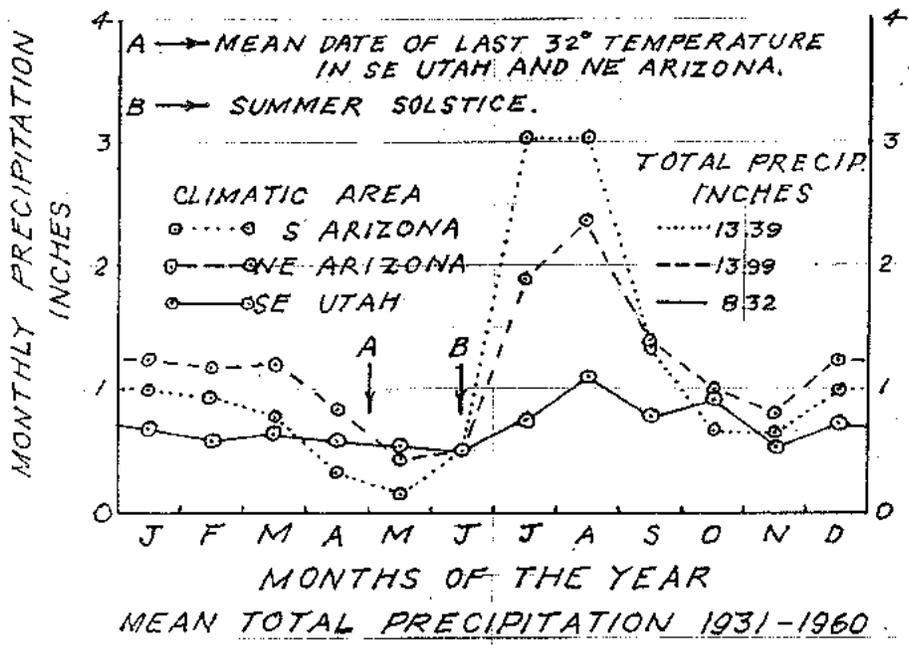


Figure 3.

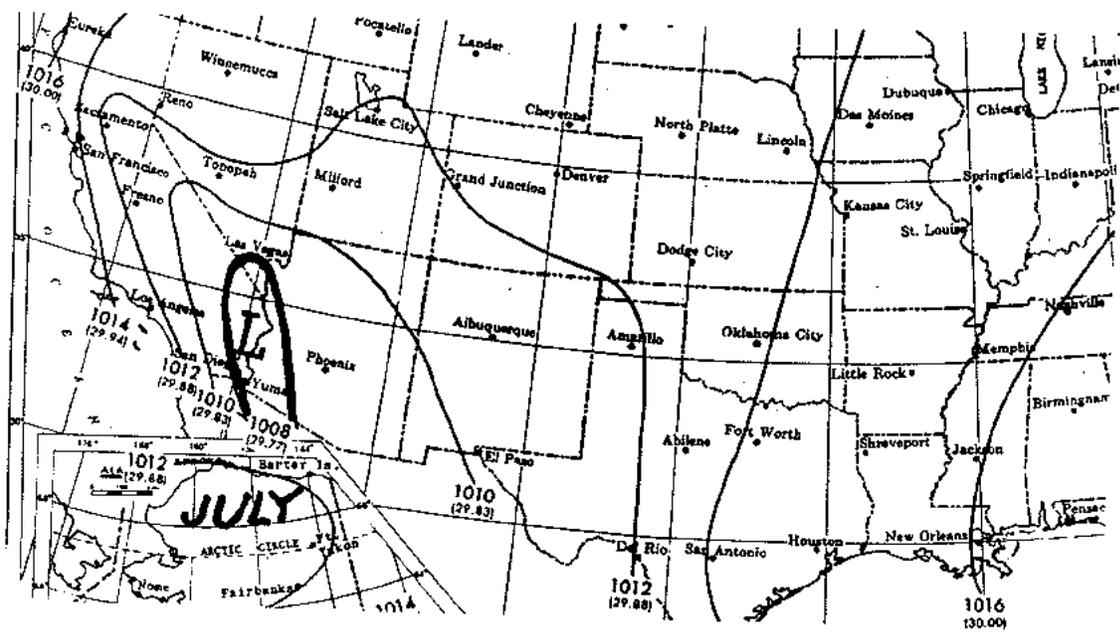
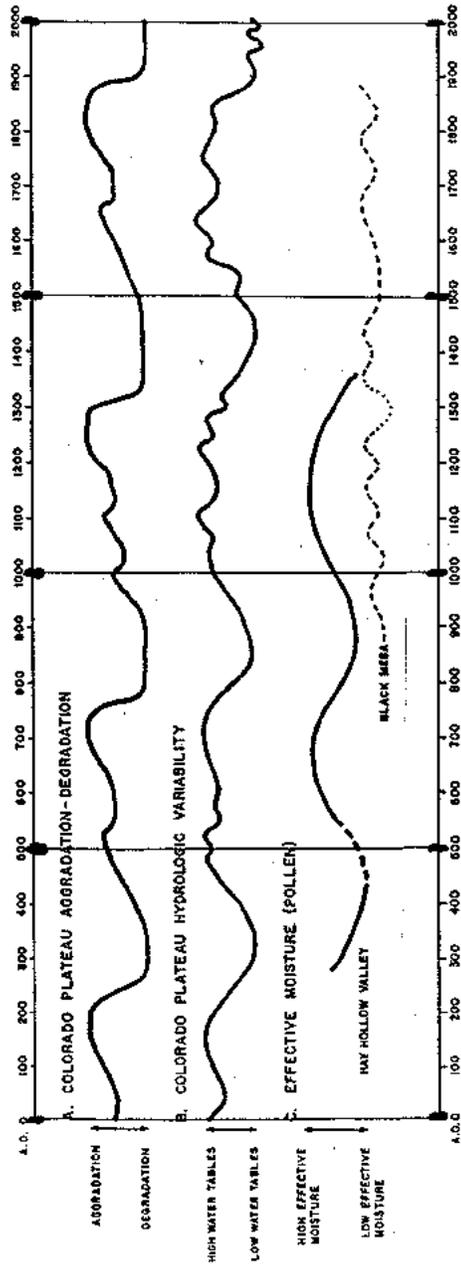


Figure 4. Normal sea level pressure, July, with a thermal low evident over the lower Colorado River.



Environmental variability on the southern Colorado Plateau during the last 2000 years.

Figure 5. Environmental variability on the southern Colorado Plateau during the last 2000 years. Aggradation refers to the buildup and degradation refers to the removal of stream bed deposits by water action.

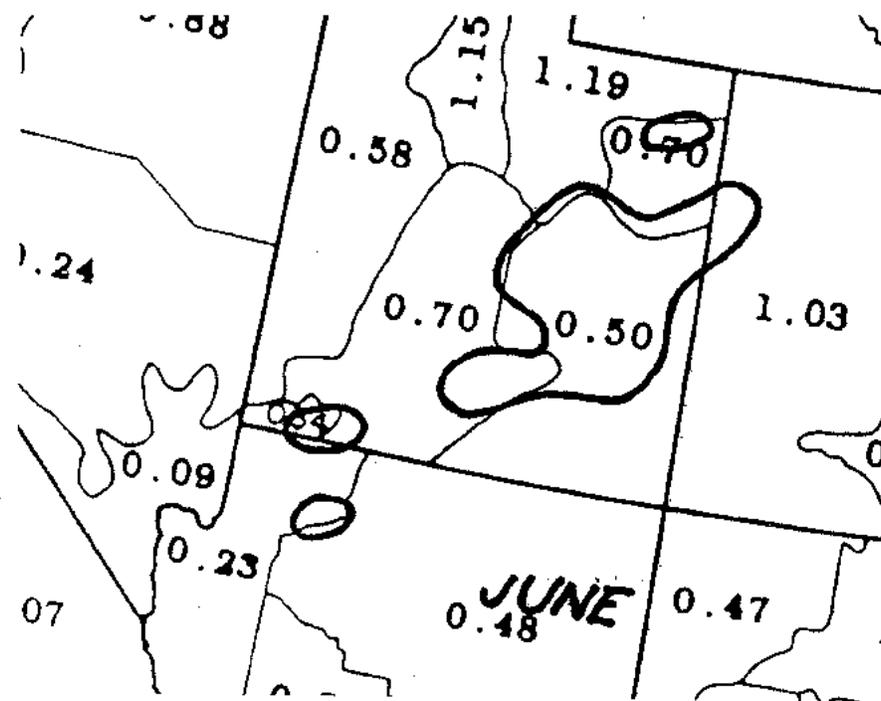


Figure 6. Location of Barrier Canyon style pictographs on mean total precipitation State Climatic Division map.

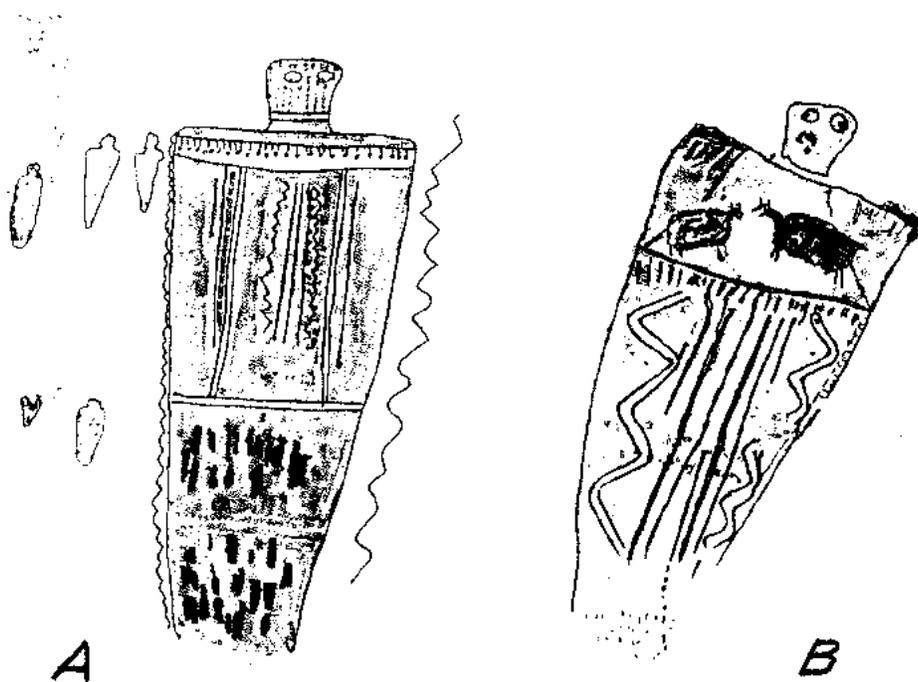
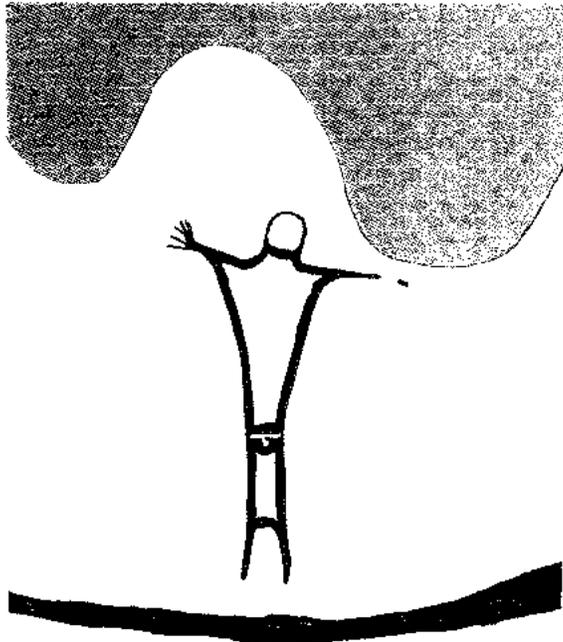
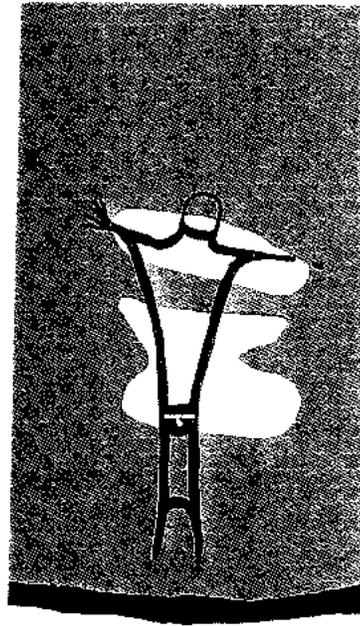


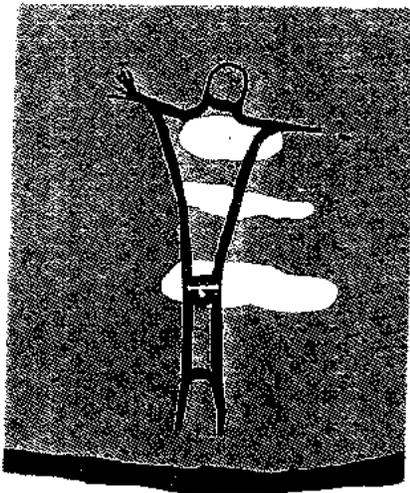
Figure 7. Two of the Barrier Canyon pictographs that embody weather related symbols.



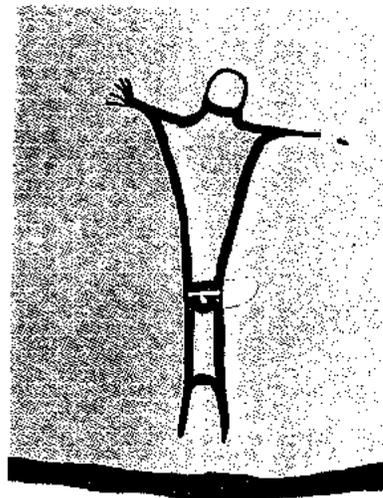
1310 MDST



1312 MDST



1313:30 MDST



1317 MDST

Figure 8. Progression of Buckhorn Wash cliff shadow down and over a pictograph during the summer solstice. The final ray of sunlight illuminates only the belt.