

AN EARLY USE OF WEATHER MODIFICATION

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The Royal Commentaries of the Inca, Garcilaso de Vega, was written by the son of a Conquistador and an Inca princess. It is a curious account prepared with a great deal of care and written in exquisite Spanish with a narrative style and structure that rivals some of the best fictional writing in the English language. Garcilaso de Vega is regarded as the primary authority for most of what we know about the Inca mores and folkways. He wrote the work after he had moved to Spain and for this reason later scholars have had some reason to reevaluate portions of the work and retell the stories from a different point of view. Nonetheless, the work is basically sound and fascinating reading.

In discussing the Inca folkways he describes the various fiestas that they observed throughout the year. Among the ones he describes is a feast called the *Cusquieraími*. It is probably best to retell it in the words of one of the better translations of his work.

"The third solemn feast of the Incas was called *Cusquieraími*, and it was celebrated after seedtime, when the corn had started sprouting. Many lambs, sheep, and sterile ewes were offered up to the Sun, so that it would keep the frost from destroying the corn, as happens too often in the cold land in and about Cuzco. At such high altitudes as these, it can freeze all year round, and the weather is worse on Mid-summer's Day than it is at Christmas, because then the Sun is farthest away. Therefore, when the Indians saw a bright, cloudless sky at nightfall, they feared frost and immediately lighted manure fires to obtain smoke, their idea being that smoke, like clouds, forms a covering that keeps the frost from the earth. I have seen them do this in Cuzco, although I can't say whether or not they still do it, or how efficacious a manner of proceeding it is; I was too much of a child at the time to care about learning everything there was to know about the things I saw the Indians do."

It is interesting to note that fires of manure were used as being capable of furnishing a good deal of smoke. They could hardly have chosen better. The material is full of nitrates and fizz burns rather slowly and reliably when dry. It produces copious hygroscopic smoke in that the particles are loaded with potassium and sodium salts. Under the conditions of a temperature inversion where the humidity is near saturation and the air is as clean as it is in the Andes, the addition of condensation nuclei would make a very effective screen composed of water droplets, situated around the smoke particles.

Although the Inca do not appear to have had a written language they did understand natural phenomena extremely well and were exceptional

engineers. They were also indefatigable bookkeepers and had developed a system of keeping notes in which they used strings with knots tied in them to keep records. This civilization appeared suddenly about 500 years before the Conquistadors and in the short time allotted to them, conquered most of the west coast of South America. They maintained peace for most of this time and indeed held their empire intact until just before the Spanish arrived. They built a series of roads and trails over all that country, built better water supply facilities than exist today, some of which are still in use, and supported, by diligence that can best be ascribed to a well organized antheap, a population considerably larger than exists in the area today.

Garcilasco de la Vega noticed the work of the Indians when he was a boy. This puts his observations at about 1550 AD. The Inca had been around for about 500 years and no doubt had been doing the same things for a long, long time. Hence, it is reasonable to conclude that active weather modification for frost control had been exercised perhaps 1,000 years ago. It must have been a good idea because the principles are still in use today, where the local air pollution authorities are nonexistent, or tolerant.