YELLOWSTONE FOSSIL FORESTS: A GEOCHEMICAL PERSPECTIVE

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Over the past several years, Adventist scholars have devoted a great deal of time and money into the study of the fossil forests of Yellowstone National Park, Wyoming/Montana U.S.A. This area attracts interest because of its multiple levels of fossilized trees in a presumable upright position of growth. Each individual fossil level is separated from the other levels by one or more volcanic breccia flows and one or more volcanic ash flows. Some of the fossilized trees are over four feet in diameter, representing hundreds of years of growth!

The standard geological interpretation of these features requires each level to be an individual growth zone. Such an interpretation would require a minimum of 1,000 to 1,500 years per level. In the Specimen Creek Ridge area of the fossil forest there are at least 75 individual levels that contain fossils! A simple arithmetic calculation suggests a minimum (ideal) time of 86,250 to 112,500 years for these levels to develop. This poses a time dilemma for our Adventist interpretation of Earth history.

Dr. Harold Coffin has devoted much of his research to understanding the physical environment and orientation of these fossil forests. From his studies he presents strong arguments for a transport model of the fossil forests rather than the standard growth model. My research is in support of the transport model.

The chemical composition of rocks, ash, breccia, etc., are unique and can be distinguished from each other. This ability to differentiate one volcanic ash from another holds true even if the ashes come from the same volcanic source, provided they are separated in time by a minimum of 6-8 months between eruptions. In less amount of time the ashes are too similar to be distinguished (statistically) as separate entities.

The chemical techniques used at GRI to characterize these various rock groups are the application of standard industrial analytical technique and statistical analyses to geological samples. Seventeen individual elements are determined, per sample, via energy-dispersion X-ray fluorescence. The elemental concentrations for each of the individual samples are then statistically combined and submitted to an Andrew's Fourier graphical analysis. The fourier analysis statistically sorts chemically similar samples into discrete arrays.

A baseline study of known historical lava flows was conducted in order to determine the applicability of these analytical techniques to geological samples. Hawaiian lava samples from the big island of Hawaii were collected from several overlapping flows. Some of these flows were from the same source area separated in time by a few days to several years. Other overlapping flows were from different sources. The fourier analyses were successful in sorting the individual flows into separate arrays unless the flows were from the same source and separated by less than six months.

These techniques are currently being applied to the individual volcanic ash and breccia levels of the Specimen Creek Ridge fossil forest in Yellowstone National Park. Preliminary results indicate that there are four dominant interlacing volcanic breccias and/or ashes that combine to produce the 75 levels of fossil material rather than 75 distinctly separate levels as proposed by the standard interpretation.

The significance of these findings strongly support a transport model in which material is being brought in from four primary source areas. The interlacing of level types would be the result of fluctuation of source areas through changes in aqueous and/or volcanic activity. In addition the time required for the amassing of these levels would have to be less than 6-8 months!

The eruption of Mt. Saint Helens may supply researchers with a modern-day analog for the buildup, layering and transport of material, similar to that needed for the buildup of the levels in Yellowstone National Park.

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EVENT	APPROXIMATE TIME REQUIRED
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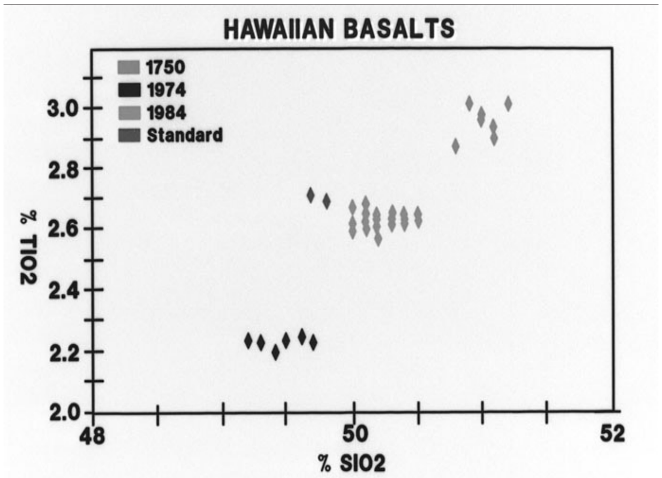

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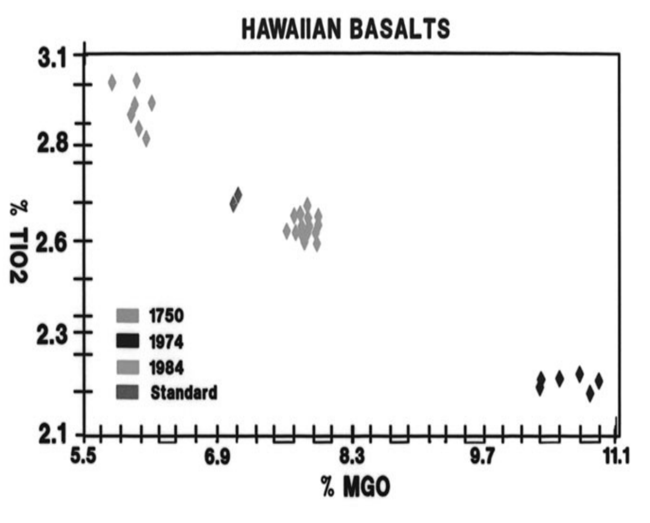

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ANDREWS FOURIER ANALYSIS

$$F(t) = x_1 / 2 + x_2 \sin(t) + x_3 \cos(t) + x_4 \sin(2t) + x_5 \cos(2t) + x_6 \sin(3t)$$

where

$x_1 = AVG_{(Si)} - SMPL_{(Si)}$ $x_2 = AVG_{(Al)} - SMPL_{(Al)}$

$x_3 = AVG_{(Ca)} - SMPL_{(Ca)}$ $x_4 = AVG_{(Mg)} - SMPL_{(Mg)}$

$x_5 = AVG_{(Fe)} - SMPL_{(Fe)}$ $x_6 = AVG_{(Ti)} - SMPL_{(Ti)}$

and the function is plotted on the range

$$-\pi < t < \pi$$

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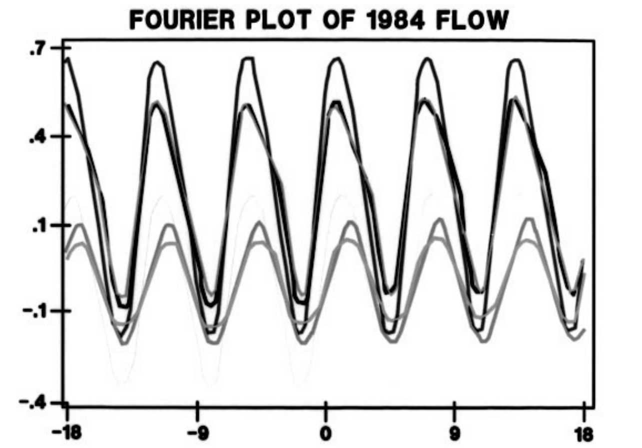

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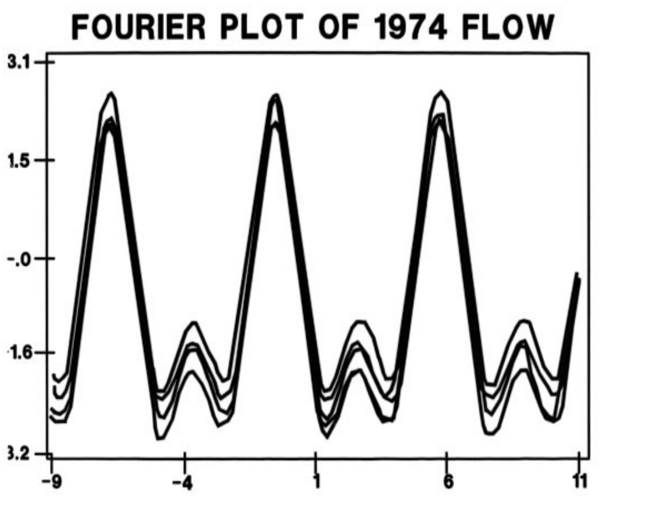

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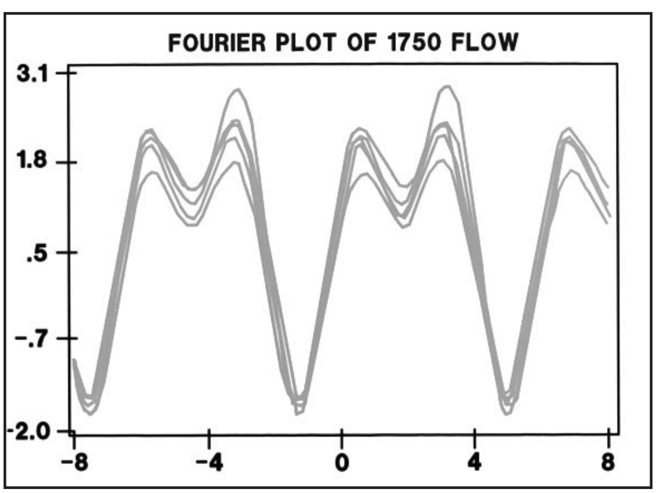

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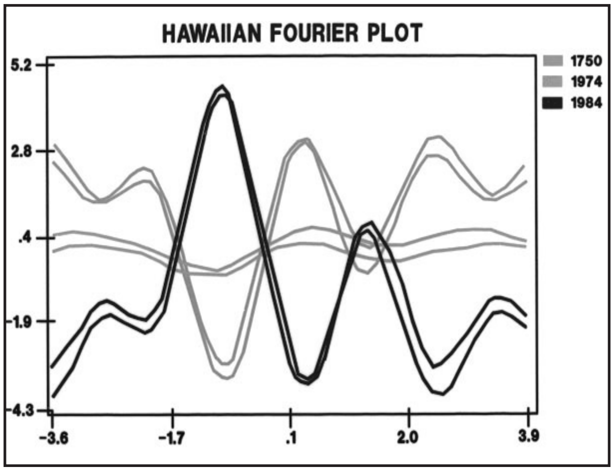

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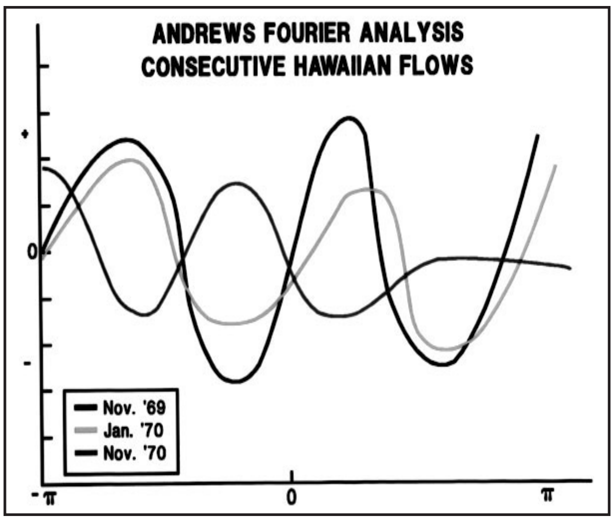

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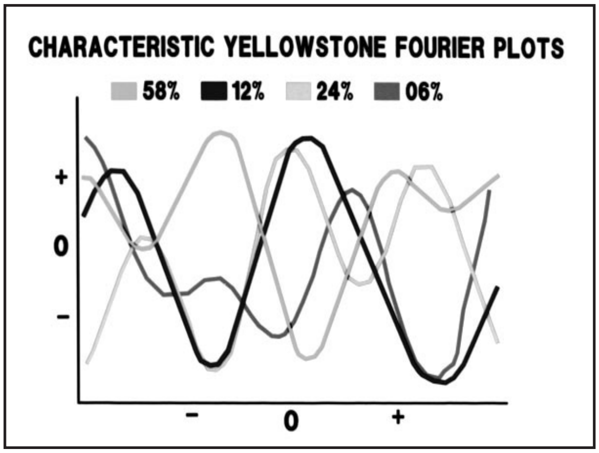

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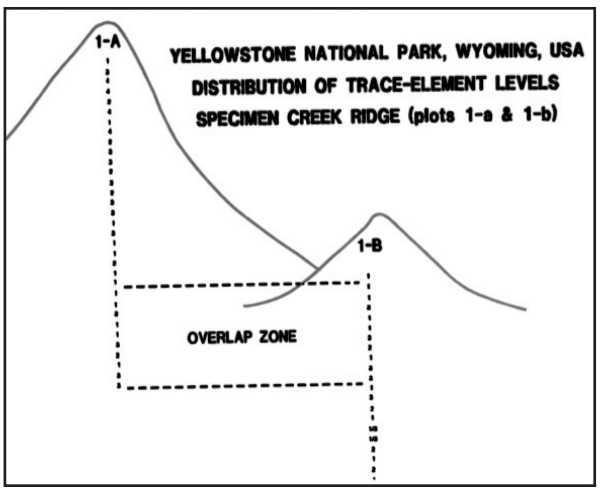

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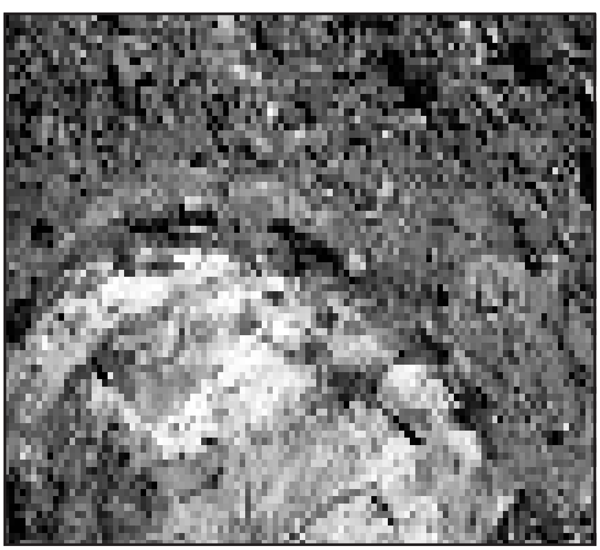

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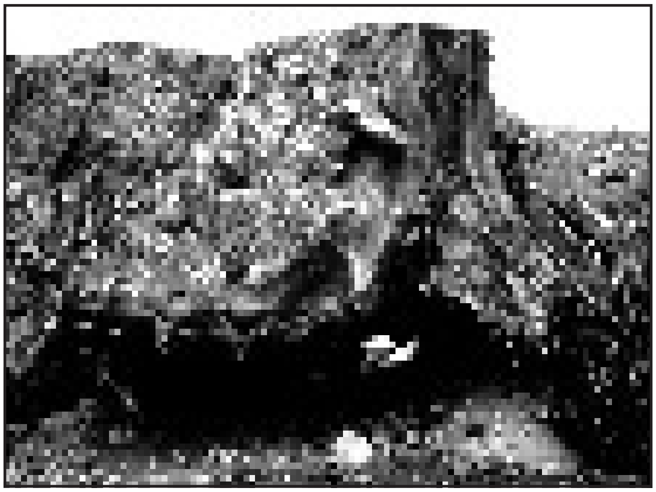

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CONCLUSIONS: