Magma, thermal source of energy

University geophysicist taps underground potential

By Sandy Johnstone
Of the Emerald

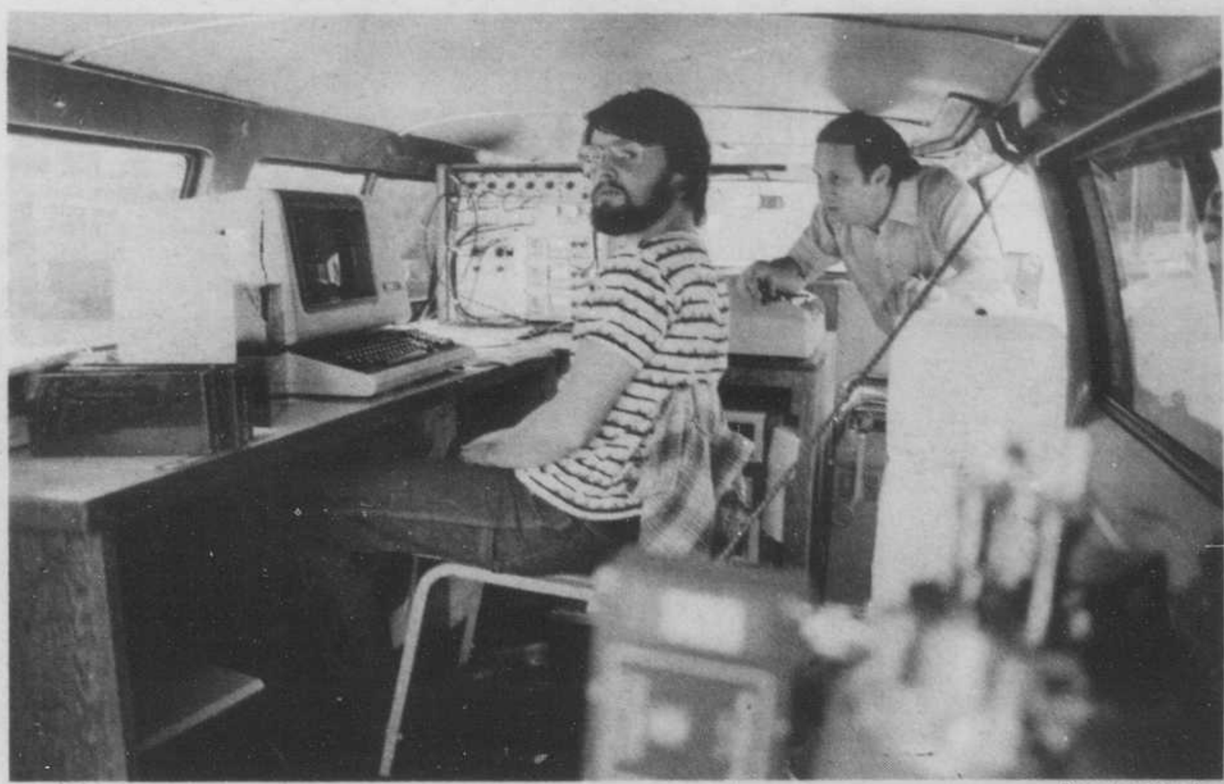

Photo by Dave Kao

Geophysicist Harve Waff displays the SQUID magnetometer which measures thermal structures.

First in a continuing series highlighting the research and goals of University professors.

Geophysicist Harve Waff may not be burying his head in the sand, but he is looking underground for the answers to Oregon's energy future.

Waff, a University professor, is trying to find existing magma chambers and geothermal deposits beneath the Cascade Mountains.

"Oregon is one area with the potential for geothermal resources because of the Cascades and other volcanoes," he says. "Oregon has the potential for clean, inexpensive energy over a very long time period."

The amount of thermal energy available in the upper six kilometers of the earth is estimated by the U.S. Geological Survey to be at least 800 years worth at current consumption rates. Waff estimates at least 15 percent of the total could be housed in Oregon, which is more than the known oil reserves in the entire United States.

"Oregon happens to be one of the exciting parts of the country now," he says. "Our research started out to be purely scientific, but now we see its potential for development because it can be so big for Oregon.

Currently, Waff's research aims at understanding the thermal structure beneath the Oregon Cascades. Over the past three years, he has been accumulating the equipment needed to make measurements of the thermal structure. He built part of the SQUID magnetometer himself to save money (the SQUID would cost private industry about $400,000), and he spent 350 hours (about six weeks) troubleshooting to find the problems, which all turned out to be factory related.

"The SQUID is possibly the most sensitive instrument man ever built," he says.

Why is such a sensitive tool needed?

"You can't tell from the surface where the heat is because the rains flush out the heat from the top 1,200 feet in the Cascades," he says. "The system senses minute magnetic fields which we are able to induce into electrically conducting bodies beneath the ground."

Magma chambers conduct electricity much better than other parts of the earth. "As far as we can tell, electrical signals are the best way yet devised to detect them," he says.

They will use the system to find magma fields and convert the data into a map of the electrical structure under the ground.

It will take them two to five years to cover most of the potential areas in Oregon and Washington alone, he estimates. Then, he thinks it will take another two to five years to do fine-scale measurements if a company would want to drill.

Using current technology, after a magma chamber has been located, a closed pipe with a smaller pipe inside of it is inserted into the ground down to the magma chamber. The pipe is cooled down with water on the perimeter of the inside pipe. Then the heat of the magma chamber changes the water into steam and provides heat with very little pollution. It is also possible to use an open pipe which will form a bubble in the magma chamber and work the same way as the closed pipe system, except it allows a few pollutants in the air.

Funding for the project comes from three National Science Foundation grants totaling between $140,000 and $150,000 per year. However, Waff says funding for energy-related projects has been cut by the federal government so he is hoping for money from private companies.

"I have not tried to take an active posture because I don't want to put the cart before the ox," says Waff. "I want to have a firm foundation and demonstrate it works well first. If the first hole or two (drilled in the Cascades) are successful then there will be a much better possibility of getting support (from the government or private industry)."