



Geophysical exploration in the San Juan Basin

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GEOPHYSICAL EXPLORATION IN THE SAN JUAN BASIN

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Introduction

Sporadic geophysical work has been done in the San Juan Basin for the past eighteen years. Although it might appear from records of the number of crew years worked, that the basin had been rather thoroughly combed for favorable structural conditions, such is far from the case. Small parts of the basin have been well covered, but because of the very difficult terrain and inaccessibility of some of the areas, little or no work has been done in these places. Detailed seismic and gravity surveys have been made in only a very few areas.

The greater part of the basin has very few if any roads, and towns in which crews and their families can live are few and far between. The remote areas, therefore, necessitate the use of field camps for the workmen on the crews. Trailer camps have proved to be the answer to this problem. Four-wheel drive equipment and the use of bulldozers to clear roadway and cut crossings of the very sharply cut canyons are a necessity.

As of the date of the writing of this article, there are four trailer camps for the use of seismograph crews doing work in Rio Arriba and Sandoval Counties, New Mexico. Six seismograph crews are operating in the basin in New Mexico and two in Colorado. No gravimeter or magnetometer crews are operating at the present time.

Gravimeter Surveys

The extreme topographic relief and irregular terrain encountered in various parts of the basin complicate the calculation of gravity values from the gravity meter observations. Obviously in such areas the local variations in the surface and near surface densities cause local irregularities in the gravity values, and some of these can not feasibly be eliminated from the gravity maps. Very large terrain corrections must be made in some areas. Prominent Tertiary intrusive masses and many mesas require special attention.

Approximately ten crew years of gravity work have been done in the basin.

Surface Magnetometer Surveys

Surface magnetometer work is complicated by Tertiary intrusives and lava flows. Where alluvial

deposits are present the irregular distribution of igneous material causes complications.

About eight crew years of surface magnetometer work have been done in the basin and a number of crew months of aerial magnetometer work has also been done.

Seismograph Surveys

The major problem facing the seismograph crew is the absence or shortage of water in most of the basin. The field camp must have an adequate supply of good drinking water and for other use around the camp. Much water is needed for the drilling and tamping of the shot holes. In many areas loss of circulation during drilling results in excessive use of water. Very hard ground and slow drilling of shot holes is found in some places, but in the majority of cases the drilling is not too difficult. In many parts of the area it is necessary to drill expensive water wells in advance of the operations. The use of bulldozers to clear roadways and make crossings of canyons, more than pays for their use in many parts of the basin.

The very irregular terrain and great relief added to the crossbedding of shallow Tertiary beds may cause some rather large variations in near surface velocities. Therefore the elevation correction for the seismic work is a considerable problem in some parts of the area. There are no doubt many local variations in seismic datums due to these variables, but all in all seismic work appears to be satisfactory.

Approximately twenty-one crew years of seismograph work have been completed in the San Juan Basin.

Conclusions

Very little deep drilling has been done on the basis of geophysical exploration, but the outcome of some tests that are now drilling or some that are contemplated in the near future may show the value of geophysics in the basin. Considerably more drilling must be done before any conclusions can be drawn as to the value of the various geophysical methods. Around the rim of the basin where the Tertiary beds are absent geological surface work may suffice, but in large parts of the basin that are covered with Tertiary deposits, some type of geophysical exploration to supplement the geological work will be required in most cases.