Geophysical Inversion is the recovery of the distribution of physical properties in the earth from a data set. One of the major concerns facing inversion is that the problem is non-unique, that is, for any data set provided, there are several possible models that predict the data given. Constraining the answer to be a geologically likely distribution is a major avenue of research in geophysical inversion. The most common way of resolving this non-uniqueness is regularization, adding the constant that the recovered earth model is small and smooth.

Unfortunately most real deposits are not always small and smooth. To achieve more realistic models that more accurately represent the earth we require more complicated model objective functions. Much work has been done on models objective functions and mathematical sophistications that allow for the earth model to be less-smooth in some places or only small relative to some reference model have been thoroughly developed.

While the mathematical foundation has been created, the difficult portion is now how to decide on the model objective function. The simple answer is to use a priori information about the geological situation in the region that is being inverted. This information usually comes in the form of drill holes, geological maps, and surface samples. The problem now becomes how to incorporate these a priori data into the inversion problem through the model objective function.

The intern has not only made the incorporation of geological maps into geophysical inversions possible, they have made it feasible for all geologists and geophysicist to do the same by incorporating the program written into an existing software package: GIFtools. This will allow geologists and geophysicists in all fields to constrain their inversions with geological maps, reducing exploration time and increasing the reliability of inversion results.

On-going and future work focuses on the sophistication of constraints derived from geological models. Specifically, rather than simply reducing the requirement of smoothness across boundaries in the geological model by the same amount for all boundaries, we are using parametric inversion to determine the degree of smoothness individually for each boundary.