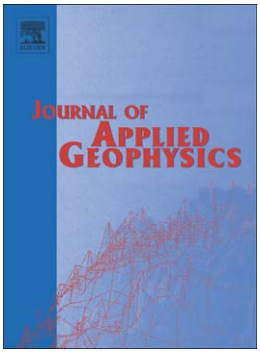

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Imaging of Subsurface Faults using Refraction Migration with Fault Flooding

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ABSTRACT

We propose a novel method for imaging shallow faults by migration of transmitted refraction arrivals. The assumption is that there is a significant velocity contrast across the fault boundary that is underlain by a refracting interface. This procedure, denoted as refraction migration with fault flooding, largely overcomes the difficulty in imaging shallow faults with seismic surveys. Numerical results successfully validate this method on three synthetic examples and two field-data sets. The first field-data set is next to the Gulf of Aqaba and the second example is from a seismic profile recorded in Arizona. The faults detected by refraction migration in the Gulf of Aqaba data were in agreement with those indicated in a P-velocity tomogram. However, a new fault is detected at the end of the migration image that is not clearly seen in the traveltime tomogram. This result is similar to that for the Arizona data where the refraction image showed faults consistent with those seen in the P-velocity tomogram, except it also detected an antithetic fault at the end of the line. This fault cannot be clearly seen in the traveltime tomogram due to the limited ray coverage.

INTRODUCTION

In this paper we focus on seismic refractions to delineate and image the shallow subsurface faults. Figure 1 shows several types of waves recorded in a seismic survey. The seismic reflections are typically used to estimate the subsurface reflectivity distribution from the