

The Four Big Challenges of Subsalt Imaging

John T. Etgen, BP Corporation United Kingdom, john.etgen@bp.com

Our industry has put a great deal of effort into “seeing” below salt with the seismic reflection method. In many ways, these efforts have succeeded, leading to hydrocarbon discoveries below salt in the Gulf of Mexico. However, there are still many areas where our best seismic efforts do not result in images of sufficient quality to make informed business decisions. Sometimes, this is as simple as not being able to see the prospect at all. Sometimes the structure is interpretable, but the details of the reservoir architecture are not interpretable.

I count four main reasons why our ability to image below salt is impaired. First, and maybe most important is the “illumination problem”. Salt is a highly distorting acoustic lens, strong enough to create “shadow zones” where we cannot send and/or receive reflected seismic energy with a given acquisition geometry. Usually, the second most important problem is that of constructing an accurate velocity model. The challenge is to predict/estimate velocities in the sediments below salt where traditional methods of velocity estimation, even those based on prestack migration fail. Third, even in these days of fast computers and sophisticated seismic migration algorithms, we still have trouble imaging steep dips. This leads to difficulty seeing targets that truncate against steep salt flanks, and to difficulty defining the salt itself. Finally, we often have significant difficulty removing multiple reflections, especially those generated between the sea surface and other strong reflectors, such as top of salt or the sea floor. I will illustrate some of the strategies used by industry for subsalt imaging that address these issues.
