Problems with seismic multiple reflections have haunted geophysicists ever since the development of modern exploration seismology. Multiples can range from short period interbed multiples to long period water bottom reverberations. All have the potential deleterious effect of masking desired primary reflections. From a prospecting perspective, multiples generally have two properties that allow us to differentiate them from primary reflections: (1) Multiples are (somewhat) predictable. (2) Multiples usually have greater normal moveout (NMO) than coincident primaries. Predictive deconvolution is used to exploit the first property, while stacking is used to exploit the second. Unfortunately, these multiple suppression techniques are less than perfect – due to the fact our data do not obey our processing assumptions. Other approaches must be tried and we apply these in the acquisition, processing, and interpretation stages. In some cases, acquisition methods such as dual sensor summation are used to suppress receiver-side multiples. Processing methods generally attempt to exploit predictability or velocity differences – often in various domains. Processing methods generally rely on the interpreter to identify primaries and multiples. A combination of methods may be used. In the case of short period interbed multiples, it is useful to combine information from synthetic seismograms, range limited stacks, and vertical seismic profile corridor stacks (ref., Burton and Lines, 1997). In the areas of hard water bottoms where multiples completely overwhelm primary reflections, it may be better to consider multiples as signals rather than noise and model the multiples by adjusting reflection coefficients (ref., O’Brien, 1997). The difficulty of extracting useful information from seismic sections contaminated by multiples require innovative solutions using processing and inversion techniques.

References