Comments to hybrid-gather patents

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Three US patents on the subject of hybrid gathers (Thomas, 2000; Thomas and Hufford, 2001; Thomas and Hoover, 2002) have been awarded to Phillips Petroleum Company (now ConocoPhillips).

The first patent (Thomas, 2000) deals with sorting of seismic data into what is called hybrid gathers, but which are commonly known as minimal data sets (cross-spreads, 3D shot gathers, etc.). The same "invention" was also submitted for an International Patent (Thomas, 1998). The International Patent Office judged five of the eight claims in the patent to be covered by prior art. This judgement was based on a reference in the patent application to Vermeer (1995). A quote from this paper is: "A common seismic experiment … is the cross-spread experiment … . It is the basic subset (Vermeer, 1994) of what is probably the most common land geometry, the orthogonal geometry (widely-spaced parallel shotlines orthogonal to widely-spaced parallel receiver lines), and consists of all traces that have a shotline and a receiver line in common." The reference to Vermeer (1994) in Vermeer (1995) was not exploited. The 1994 paper describes classes of acquisition geometries and their basic subsets. If this paper would have been looked at by the patent officers none of the claims would have been accepted, as it would have been clear that the whole invention is covered by prior art.

Reading Thomas (1998), I was very surprised that someone would take all the effort of filing for a patent for an invention that was entirely covered by prior art. When I communicated this feeling to Thomas in August 1999, he replied that the patent was only meant "to protect our developments in the processing technology based on the hybrid gathers". One of the developments in processing technology was apparently the idea to migrate cross-spreads with ground-roll velocity, remove the focussed ground-roll energy and then demigrate. This invention is described in Thomas and Hufford (2001). It looks like an interesting idea, although the invention is not substantiated with examples.

The recognition that cross-spreads and 3D shot gathers can be used for all kinds of prestack processing steps forms the basis of Thomas and Hoover (2002), the third patent (strangely enough, they call the processing of single-fold gathers multi-trace *post*-stack processing). All papers by Vermeer and co-authors in the reference list below also discuss processing of those basic subsets (next to covering a great deal more). All those papers were published prior to the filing dates of the 2001 and 2002 patents. Neither Thomas and Hufford (2001) nor Thomas and Hoover (2002) refer to any of these papers all being relevant to their patents. Neither do they refer to most relevant papers by Lee et al. (1994), Meunier (1999), and Padhi and Holley (1997). Lee et al. (1994) show the benefit of low-fold 3D migration of cross-spreads, Meunier (1999) discusses the benefit of 3D velocity filtering of cross-spreads and 3D shot gathers, and Padhi and Holley (1997) describe benefits of imaging and other processing steps of cross-spreads and introduce the term "minimal data set" for single-fold gathers such as cross-spread and 3D shot.

Thomas and Hoover (2002) use processing of cross-spread data to establish whether the acquisition parameters should be changed. Of course that is an excellent idea, but whether it justifies a patent is questionable. "Those skilled in the art" know that the results of processing are always used to provide feedback to acquisition and the earlier in the process the better. It may well be that the only intention of the patent is to protect ConocoPhillips against claims by others, but I do not think that anybody using processing of cross-spread data to refine his acquisition parameters should be afraid of a claim by ConocoPhillips.

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