On "Analyzing the effectiveness of receiver arrays for multicomponent seismic exploration" (B.H. Hoffe et al., Geophysics, 67, 1853-1868).

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Hoffe et al. (2002) provide a thorough and instructive analysis of the benefit of using receiver arrays for P-P and P-S data acquisition. Their conclusion that "geophone groups are unnecessary for P-P data acquisition and detrimental to P-S data quality" applies to data acquisition in "the Blackfoot area, given the source configuration and the 24-bit recording instrument". The question may be asked: In how far is this conclusion applicable to acquisition in other areas than Blackfoot? Intuitively, one might say that the conclusion would apply to areas with low levels of groundroll and with rapid variations in shear-wave statics. In areas with a low level of groundroll, suppression of this noise by stacking and migration may be adequate. In other areas, described for instance in Newman (2000) the severe groundroll requires arrays for its suppression. Yet, at the same time there may still be rapid variations in shear-wave statics. The detrimental effect of intra-array shear-wave statics is clearly shown in the paper and likely applies in many other areas. The only way of satisfying the requirement to suppress severe groundroll while not harming the P-S waves is by reducing the group interval, not using arrays, but suppressing noise in prestack processing, stacking and migration, i.e., in the computer rather than in the field.

The authors make a distinction between the noise-aggressive approach of array design (overlapping arrays) and the signal-preferred approach (adjacent arrays). However, as pointed out in Vermeer (1990, p.56,57) overlapping arrays, if needed, can always be simulated by a two-trace running mix in the computer, hence there is no need to use overlapping arrays in the field. Apart from the advantage of smaller field effort, the simulation can be applied after correction for statics and NMO, even after stack, thus reducing the detrimental effect of long arrays on the desired signal.

References

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