LETTER

Hydraulic fracturing not responsible for methane migration

Although Osborn et al. (1) provided important geochemical measurements of dissolved methane in a portion of the Appalachian basin, their report does not fully appreciate the geologic history of this region and misrepresents potential risks of modern drilling and completion techniques used to develop shale-gas resources. The fear that hydraulic fracturing is responsible for methane migration from the Marcellus shale into shallow groundwater is contrasted by direct observations in microseismic studies that even the longest fractures induced by the hydraulic fracturing process remain thousands of feet below groundwater resources (2).

The Marcellus is a Devonian-age (~390 Ma) black shale and the source rock for many previously developed natural gas fields in the basin. This means that natural migration of thermogenic gas from the Marcellus to shallower horizons has been occurring over geologic time. Knowledge of significant methane as a natural constituent of groundwater in this region long predates the recent development of shale-gas resources (3), which is consistent with the observation by Osborn et al. (1) of thermogenic methane in all but one of the methane-containing groundwater samples (regardless of the presence or absence of nearby gas wells).

Osborn et al. (1) presented their interpretations without baseline (predrill) data for comparison and without explaining any selection criteria for the small nonrandom sample ($n = 68$) used in the study. In close proximity to natural gas wells, many water samples showed low concentrations of methane [figure 3 of Osborn et al. (1)]. This shows that elevated methane concentrations are not an inevitable effect of drilling. Finally, Osborn et al. (1) found no evidence of hydraulic fracturing fluids in any of their samples, which would have been expected if hydraulic fracturing initiated communication between the deep shale and shallow groundwater. The data presented simply do not support the interpretation put forth that shale-gas development is leading to methane migration from the Marcellus into shallow groundwater. These data especially do not justify coauthors' reports in the popular press ["Strong Evidence that Shale Drilling is Risky," *Philadelphia Inquirer*, May 10, 2011 (4)] about the process of hydraulic fracturing. Although instances of inadequate well construction [as suggested by Osborn et al. (1)] could conceivably enable methane migration from shallower horizons, industry best practices recently codified in Pennsylvania drilling regulations (5) ensure that the region's substantial shale gas resources can be developed safely and environmentally responsibly.

Samuel C. Schon[1]

Department of Geological Sciences, Brown University, Providence, RI 02912

1. Osborn SG, Vengosh A, Warner NR, Jackson RB (2011) Methane contamination of drinking water accompanying gas-well drilling and hydraulic fracturing. *Proc Natl Acad Sci USA* 108:8172–8176.
2. Veil J (2011) *White Paper on SPE Summit on Hydraulic Fracturing* (Society of Petroleum Engineers, Houston). Available at http://www.spe.org/industry/docs/HFsummitwhitepaper.pdf. Accessed May 14, 2011.
3. Lohman SW (1937) *Ground Water in Northeastern Pennsylvania. US/Pennsylvania Geological Survey.* Available at http://thesis.library.caltech.edu/5645/1/Lohman_sw_1938.pdf. Accessed May 14, 2011.
4. Jackson R, Vengosh A (May 10, 2011) Strong evidence that shale drilling is risky. *Philadelphia Inquirer.* Available at http://articles.philly.com/2011-05-10/news/29528421_1_water-wells-safe-drinking-natural-gas. Accessed May 14, 2011.
5. Pennsylvania Environmental Quality Board (2011) *Oil and Gas Well Casing and Cementing (25 Pa Code, Ch. 78)* (Environmental Quality Board, Harrisburg, PA) Available at http://www.pabulletin.com/secure/data/vol41/41-6/239.html. Accessed May 14, 2011.

Author contributions: S.C.S. wrote the paper.

The author declares no conflict of interest.

[1]E-mail: samuel_schon@brown.edu.