Shale Gas: A Panacea for the Energy Woes of America?

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The Hype

Shale gas has been heralded as a “game changer” in the struggle to meet America’s demand for energy. The “Pickens Plan” of Texas oil and gas pioneer T.Boone Pickens suggests that gas can replace coal for much of U.S. electricity generation, and oil for, at least, truck transportation[1]. Industry lobby groups such as ANGA declare “that the dream of clean, abundant, home grown energy is now reality”[2]. In Canada, politicians in British Columbia are racing to export the virtual bounty of shale gas via LNG to Asia (despite the fact that Canadian gas production is down 16 percent from its 2001 peak). And the EIA has forecast that the U.S. will become a net exporter of gas by 2021[3].

The Reality

Shale gas is expensive gas. In the early days it was declared that “continuous plays” like shale gas were “manufacturing operations”, and that geology didn’t matter. One could drill a well anywhere, it was suggested, and expect consistent production. Unfortuately, Mother Nature always has the last word, and inevitably the vast expanses of purported potential shale gas resources contracted to “core” areas, where geological conditions were optimal. The cost to produce shale gas ranges from $4.00 per thousand cubic feet (mcf) to $10.00, depending on the play. Natural gas production is a story about declines which now amount to 32% per year in the U.S. So 22 billion cubic feet per day of production now has to be replaced each year to keep overall production flat. At current prices of $2.50/mcf, industry is short about $50 billion per year in cash flow to make this happen[4]. As a result I expect falling production and rising prices in the near to medium term.

The Environmental Costs

The mantra that natural gas is a “transition fuel” to a low carbon future is false. The environmental costs of shale gas extraction have been documented in legions of anecdotal and scientific reports. Methane and fracture fluid contamination of groundwater, induced seismicity from fracture water injection, industrialized landscapes and air emissions, and the fact that near term emissions from shale gas generation of electricity are worse than coal. A sane energy security strategy for America must focus on radically reducing energy consumption through investments in infrastructure that provides alternatives to our current high energy throughput. Shale gas will be an important contributor to future energy requirements, given that other gas sources are declining, but there is no free lunch.

[1] http://www.pickensplan.com/.
[2] http://anga.us/why-natural-gas/abundant/shale-plays .
[3] http://www.eia.gov/forecasts/aeo/er/ .
[4]http://arcfinancial.com/research/energy-charts/who-is-eating-at-the-petroleum-club/.

Spatial and seasonal variations of the δ^{30}Si signatures in the Amazon Basin

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The Amazon Basin is the world’s largest basin and covers an area of 6.1 million km^2 occupied for more than 96% of its surface by silicate rocks [1]. We present here the first large-scale study of riverine silicon isotopes signatures in the Amazon Basin. The Amazon and its main tributaries, which can be considered as representative of the main types of rivers in the basin, were studied at different seasons of the annual hydrological cycle. Concentrations of dissolved silicon (DSi) and of biogenic silica particles were measured as well as isotopic signatures of DSi. An occasional impact of diatoms growth on the silicon cycle and isotopic signatures is observed, but outside these periods of high biologic influence, δ^{30}Si signatures of the different rivers are shown to correlate with DSi concentrations. This is probably a consequence of the more important impact of clay formation during low flow period. The mean δ^{30}Si signature measured in the Amazon River itself is +1.0‰ (n=6), a value similare to that measured in the Congo River (+0.96‰ [2]). Very low isotopic signatures were measured in the upper Río Negro, confirming recent observations in Congolese black rivers. We also tested the homogeneity of the Amazon River regarding DSi concentration and isotopic ratio: A river cross-section shows the homogeneity of the Amazon River when diatoms activity is low. Our data provide evidences that silicon isotopic signatures of rivers result from a complex combination of biological and geological processes which contribution to the silicon biogeochemical cycle varies spatially and seasonally.

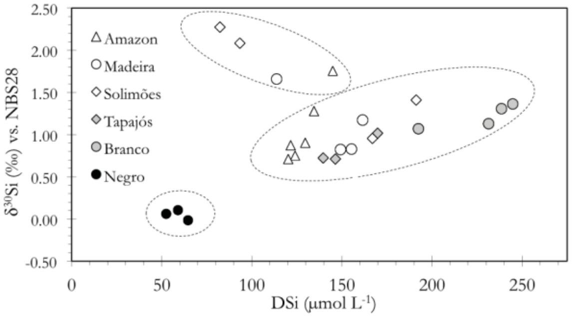

Figure 1:. Three groups of samples can be defined in the Amazon Basin: Samples showing a decreasing DSi concentration for increasing δ^{30}Si ratio, most probably due to diatoms uptake; samples showing a simultaneous increase of DSi concentration and δ^{30}Si ratio; and the Rio Negro samples

Reference

[1] Amiotte-Suchet et al., (2003) *Global Biogeochem. Cycles* **1**, 1038-1051.
[2] Hughes et al. (2011) *Limnol. Oceanogr.* **56**, 551-561.