Petroleum formation from serpentinizing continental mantle by Fischer-Tropsch synthesis

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Commercial petroleum formation by Fischer-Tropsch synthesis (FTS), as the water breaks up during serpentinization, was proposed by Szatmari [1]. The process was observed on the ocean floor [2] and is likely to be especially active in super-extended distal rifts [3]. Large hydrogen- and HC-producing FTS cells overlain by thick salt seals may have contributed to the huge oil reserves of the Middle East, of western Canada, and of the recently discovered subsalt oil in the offshore Santos basin of Brazil [4]. The role of trace metals in FTS was discussed at the AAPG research conference in 2005 [5]. Trace elements in oils, analyzed by IPC-MS for each producing basin of Brazil and normalized to spinel peridotite/1000, were uniform (~10) for Co, Ni, Cu, Zn, Ga, Rb, Ba, Y, La, Ce, Nd, suggesting a continental mantle source; low (0,02-0,07) for Cr, Mn, Fe, probably because they oxidized during serpentinization; and high (100-1000) for As, Mo, Pb, Ag, suggesting hydrothermal enrichment. Normalized V varied widely (0.2-40) between the basins. V and Ni isotopes are being studied by Alex Halliday at Oxford.

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Fossil and non-fossil sources of carbonaceous aerosols from ^{14}C

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Measurements of the long-lived radioisotope ^{14}C allow the apportionment of fossil and non-fossil sources of carbonaceous aerosols, as modern material is on the contemporary ^{14}C level, whereas this nuclide has totally disintegrated in fossil materials. As this distinction of both source types is unambiguous and enables direct quantification of emissions, ^{14}C analysis is a powerful tool of source apportionment of carbonaceous aerosols [1]. Separate ^{14}C determination in organic carbon (OC) and elemental carbon (EC) fractions is necessary for the quantification of the three major sources fossil-fuel, biomass-burning, and biogenic emissions making specific regulatory air quality measures possible [2].

Determinations of wood-burning contributions from several winter campaigns are presented. During winter smog episodes in Switzerland with PM10 concentrations of up to 150 $\mu g\ m^3$, EC and OC originated from residential wood burning by ~25% and ~70%, respectively. Differences between urban and rural sites in the Swiss Plateau were small. For Alpine valleys, however, these contributions may increase substantially as organic matter was observed to stem by >90% from non-fossil sources [3]. At an urban site in Gothenburg (Sweden), wood burning contributed only ~10% to EC, whereas this portion was about threefold at a rural station nearby the city. This contrast between Switzerland and coastal Sweden reflects the different histories of air masses: At Gothenburg, the local fossil impact is better detectable due to the comparatively clean air entering the city. For Switzerland, air-masses have been accumulated over the moderately-populated continent with a rural character so that the local emissions play a minor role for the air quality.

[1] Szidat (2009), *Science*, **323**, 470-471. [2] Szidat *et al.* (2006), *JGR*, **111**, D07206. [3] Alfarra *et al.* (2007), *ES&T*, **41**, 5770-5777.