Interactive comment on “Sulfur-containing particles emitted by concealed sulfide ore deposits: an unknown source of sulfur-containing particles in the atmosphere” by J. Cao et al.

J. Cao et al.
eescjj@mail.sysu.edu.cn

Received and published: 2 March 2015

There is earth degassing phenomena in metallic and nonmetallic deposits. The giant gold deposits, such as the Porcupine gold deposit in Canada, the Witwatersrand gold deposit in South Africa, and the Muruntau gold deposit in Uzbekistan, exhibit upward vertical movement of hydrocarbon gas. The Witwatersrand gold deposit has significant upward gas flow. In one day, 36700 m$^3$ of hydrocarbon gases degas from underground gold mining vents and $5 \times 108$ m$^3$ of hydrocarbon gases degas from 3000m or deeper mines every year. The Azerbaijan oil and gas region is strongly degassed, with $4 \times 108$ m$^3$ of gases degassed every year (Du, 2009). The ascending gas flow rates were
measured to be between $60 \times 10^{-4}$ and $4 \text{ cm}^3 \text{ min}^{-1} \text{ m}^{-2}$ horizontally projected borehole area at three different sites by Malmqvist & Kristiansson (1984). Carbon dioxide concentrations above sulfide mineralizations are often enhanced. Hidden sulfide mineralizations at a depth of 200 m have been located in quartzite in areas such as Brittany, and sulphide ores have been located in granite in Cornwall. Above mineralizations, carbon dioxide in the soil gas has been found to increase to 10% from the normal concentration of 1%. The carbon dioxide flow may be as large as $0.2 \text{ l m}^{-2} \text{ h}^{-1}$ (Hermansson et al. 1991). The Dongshengmiao deposit lies in a seismically active zone. The Langshan Mountain-front fault, in which minor earthquake activity frequently takes place and where $M=6$ earthquakes have taken place three times in the twentieth century, passes through the deposit. The release of geogas in active tectonic areas is widespread and occurs at a significant level (Judd et al., 1997; Etiöpe, 1999; Mörner and Etiöpe, 2002). The CO2 emission flux of the Siena Graben Faults (Italy), Siena G. Arbia Fault (Italy), Ustica Arso Fault (Italy), and San Andreas Fault (California) were $0.83–1123$, $12.4–74.4$, $77.3$, and $0.4–23 \text{ kg m}^{-2} \text{ year}^{-1}$ respectively (Etiöpe, 1995; 1999; Mörner and Etiöpe, 2002; Lewicki and Brantley, 2000). These equate, respectively, to $0.02–26.94$, $0.3–1.78$, $1.85$, and $0.01–0.55 \text{ cm}^3 \text{ m}^{-2} \text{ s}^{-1}$ if CO2 density is assumed to be $1.3401 \text{ kg m}^{-3}$. The area of the Dongshengmiao deposit is $4.65 \text{ km}^2$. The emission flux estimation of the Dongshengmiao deposit was $0.5 \text{ cm}^3 \text{ m}^{-2} \text{ s}^{-1}$ according to the emission fluxes of the above-mentioned faults and deposits. Therefore, the estimated degassing rate for the Dongshengmiao deposit was $2.325 \text{ m}^3 \text{ s}^{-1}$. According to the minor comments, the manuscript has been revised.

References


Interactive comment on Atmos. Chem. Phys. Discuss., 14, 28299, 2014.