Nat. Hazards Earth Syst. Sci. Discuss., 1, C873–C875, 2013
www.nat-hazards-earth-syst-sci-discuss.net/1/C873/2013/

Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "Sulfur dioxide emissions from Papandayan and Bromo, two Indonesian volcanoes" *by* P. Bani et al.

P. Bani et al.

philipson.bani@ird.fr

Received and published: 13 August 2013

First we thank the anonymous referee #3 for reviewing this manuscript and we are happy to provide additional details following the referee comments.

1) Referee: ...would like to see in the introduction a full description of previous estimates of SO2 flux from the Indonesian arc and exactly how they were calculated and a full discussion of what the issue is that is to be resolved.

Response: A new table (new Table 1) is introduced, highlighting global SO2 emission estimates and the contribution from Indonesian volcanoes. A brief description on SO2 estimation approaches is also provide in the table.

Text L15-17 is modified to better highlight the objective of this work. "This is the case in Indonesia where, despite the high number of active volcanoes, the past SO2 emission estimates were based on extrapolation and inference (Nho et al, 1996; Halmer et al., 2002; Hilton et al., 2002), whilst SO2 flux measurements were carried out only on very few volcanoes (Table 1). This present work aims to point out this misrepresentation and further highlight the possibility to better constrain the SO2 emission from Indonesian volcanoes using DOAS."

2)referee: The errors must be discussed further and should be broken down into the main components. Is the dominant source of uncertainty the effect of unconventional view angle, 30 degrees from zenith? How might one calculate a detection limit, what does it depend on, and does the emission at Papandayan fall significantly above it?

response: A new paragraph on Errors in SO2 flux measurements is introduced. 2.2. Errors in the SO2 flux measurements Error in the SO2 flux measurements derives from four different factors, including the retrieved column amount, the distance perpendicular to the plume transport direction, the angle between the assumed wind direction and the traverse path and the plume transport speed (Mather et al., 2006). Error in the retrieved SO2 column amount depends on many factors (Stutz and Platt, 1996; Hausmann et al, 1999; Kern et al., 2010) but we assume that the dominant error is induced by variable cloudiness that we compensate using artificial constant dark calculated from each recorded spectrum, in the range of blind pixel (pixel below 290 nm) (Tsanev, 2008). Such correction account for dark spectrum, offset and stray light. We estimate that the error in the column amount contributes 0.006-0.014 to the squared variation coefficient of the total flux, whilst error contributions from the distance traversed perpendicular to the plume and from the assumed wind direction following the approached detailed in Mather et al. (2006) are 0.001-0.006 and $\sim$0.003 respectively. Note however that all these errors are negligible in comparison to uncertainties in the plume speed (e.g., Stoiber et al., 1983). We assumed that the plume transport speed is conservative throughout our measurements period with a relative error of $\sim$30-35%,

in coherence with Stoiber et al. (1983).

3)referee: The unfinished traverses at Bromo are certainly not ideal and limits our confidence in the data.

response: We clearly stated in Discussion (L17-L21) that results on Bromo may not be representative of the volcano's activity. Also in the conclusion (L14) we also stated that Bromo SO2 flux is higher than our estimate (22-32 t/d), in accordance with uncompleted traverses. However our result point out the high and fluctuating SO2 flux from Bromo.

Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., 1, 1895, 2013.