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Discussions

Interactive comment on "Low titanium magmatism in northwest region of Paraná continental flood basalts (Brazil): volcanological aspects" *by* F. B. Machado et al.

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Thank you for your comments.

There is no study on volcanic aspects on the North part of PCFB. For the first time, strong evidences of the presence of a humid environment at the beginning of the volcanism (and not only desertic) are reported, as well as the interaction features between lavas and sediments. In addition, for the first time in literature, the occurrence of sand filled cracks is described for the whole PCFB. This is very important to know the onset conditions of this huge volcanism in Northern Paraná Basin, which, until now are poorly understood. It is also remarkable that, only in this area, the volcanic activity started with

basaltic flows of Ribeira type, according to the chemical classification criteria proposed by Peate et al. (1992), which is scarce in the province.

Previous studies about the lava-sediment interaction were focused on very well preserved expositions from the South area of the province, where there are found several outcrops (e.g. Luchetti et al., 2014). In contrast, the investigated region has a completely different geomorphology, encompassing several geological faults, rare outcrops and significant erosive (tropical climate) processes. It is important to emphasize that, those features make much more difficult to recognize important volcanological characteristics, in comparison to regions where the eruptions occurred recently and/or the rocks are fresh. Therefore, the geochemical signatures of the rocks are essential in order to stablish the accurate stratigraphy of the flows. Although it is not possible to remove completely the geochemistry of the discussion, it will be minimized.

In fact, the distinction among HTi and LTi basaltic rocks using titanium contents as the unique criterion is very understandable for those who are not working in this specific issue. This classification originated in the eighties, mainly based on the contents of major and minor elements (e.g. Bellieni et al., 1983; 1984a, b, 1986a, b; Mantovani et al.,1985; Piccirillo & Melfi, 1988; Piccirillo et al., 1987, 1989; Marques et al., 1989). During this period, a large number of analyzes of incompatible trace elements and isotopic ratios were obtained, allowing refining the characterization of the basalts, which were referred by different names. The data also indicated a geochemical provinciality of the magmatism and Peate et al. (1992) proposed classification criteria to distinguish the different magma types, and gave names to the identified geochemical groups, as it can be seen in the table presented below (Fig. 1). It is possible to verify that there is some overlapping on the titanium contents, on other minor and trace elements, as well as on their ratios. Thus, for a complete characterization, it is necessary to take account the groups the geographical localization of the basalts (Northern: Ribeira, Paranapanema and Pitanga; Southern: Esmeralda, Gramado and Urubici). For the SE amended version of the manuscript, only the proposition of Peate et al. (1992) will be used.

Following your comments and those of referee#2, the discussion about mineral chemistry and temperature of the magmas will be removed from the paper.

For Specific comments: Your corrections, comments and suggestions for the improvement of the paper were very well appreciated. All of them will be rigorously followed.

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Table 2. Classification criteria for basalt magma types

	'High-Ti'			'Low-Ti'		
	Urubici	Pitanga	Paranapanema	Ribeira	Esmeralda	Gramado
SiO_2	> 49	> 47	48 - 53	49 - 52	48 - 55	49 - 60
TiO_2	> 3.3	> 2.8	1.7- 3.2	1.5 - 2.3	1.1- 2.3	0.7 - 2.0
P_2O_5	> 0.45	> 0.35	0.2- 0.8	0.15- 0.50	0.1- 0.35	0.05- 0.40
$Fe_2O_3(t)$	< 14.5	12.5-18	12.5- 17	12 - 16	12 - 17	9 - 16
Sr	>550	>350	200 -450	200 -375	<250	140 -400
Ba	>500	>200	200 -650	200 -600	90 -400	100 -700
Zr	>250	>200	120 -250	100 -200	65 -210	65 -275
Ti/Zr	> 57	> 60	> 65	> 65	> 60	< 70
Ti/Y	>500	>350	>350	>300	<330	<330
Zr/Y	> 6.5	> 5.5	4.0- 7.0	3.5 - 7.0	2.0- 5.0	3.5 - 6.5
Sr/Y	> 14	> 8	4.5- 15	5 - 17	< 9	< 13
Ba/Y	> 14	> 9	5 - 19	6 - 19	< 12	< 19

Fig 1 - Extracted from Peate et al. (1992).