Solid Earth Discuss., 6, C1537–C1541, 2015
www.solid-earth-discuss.net/6/C1537/2015/

Solid Earth
Discussions
Open Access

Interactive comment on "Syn-eruptive, soft-sediment deformation of dilute pyroclastic density current deposits: triggers from granular shear, dynamic pore pressure, ballistic impacts and shock waves" *by* G. A. Douillet et al.

M. Moretti (Referee)

massimo.moretti@uniba.it

Received and published: 4 February 2015

The manuscript is focused on the description and interpretation of a large variety of soft-sediment deformation structures (SSDS) in pyroclastic deposits. Different and/or similar morphologies in SSDS are reported from various locations in deposits of different ages allowing general discussions and reliable conclusions. The most important goal of this manuscript is the interpretation of the trigger mechanism for each kind of SSDS. My opinion on this version of the manuscript is highly positive. In fact, progress in the SSDS research has been made recently in developing methodologies to recog-

nise the mechanisms of deformation and the reliable trigger mechanisms (see Owen and Moretti, 2011; Owen et al., 2011). Nevertheless, specific literature on SSDS in pyroclastic deposits is relatively scarce (Nocita et al., 1988; Fisher and Schmincke, 1984) and outdated. For these main reasons, the manuscript by Douillet et al. is intriguing and of general interest. The manuscript is well-written, data and interpretations are well separated and photos are attractive. Some key references should be added in all papers focused on SSDS (Allen, 1982; Nichols et al., 1994). This version of the manuscript only needs of a re-organisation of some specific parts that are very complicated. In my opinion, it needs only of minor revisions. General and specific comments are reported below.

GENERAL COMMENTS

A) The abstract is quite confusing. It begins as an introduction and, later, treats data and interpretations in a mixed way. Please, try to give a rigorous order to this important part (often it is the only part I read in a paper), mentioning the various kinds of SSDS You describe, the main mechanisms of deformation relating them to the sediment state, grain-size, sub-environments, and finally talking about the possible trigger mechanisms and the general interest of Your paper.

B) The Nomenclature. Load-casts, ball-and-pillows, pseudonodules and flame structures, cusps, water escape features between two descending lobes of a load-casts, ecc. are only different expressions of load-structures (Allen, 1982; Owen, 1987). Load-structures represent deformations (often only an undulation) of the interface between two units with different grain-size, density, viscosity, ecc. Furthermore, pseudonodules and dikes cannot be described as similar SSDS. Pseudonodules are “detached” load-structures. Dikes are induced by fluidization along more or less elongated vertical paths that cut overlying sedimentary units. Dikes cannot be detached (end of page 3264 and beginnings of page 3265). I suggest the following classification: a) Load-structures (including load-casts, pillows, pseudonodules, flames, small diapirs, ecc.). b) Dikes (for large-scale vertical water-escape structures), cusps if they are smaller. c)

SED
6, C1537–C1541, 2015

Overturned laminae/beds is correct. d) I do not like the term vortex bedding, but You correctly cite a reference for that. e) Folds-and-faults structures. Are they “slumped beds”?

C) I suggest to slightly re-organise the text. After the paragraph 2 Geological settings and data (I suggest to rename it - 2. Geological settings and occurrence of SSDS or SSDS features - data is a too much general term) the order of different parts of the manuscript is too much complicated and confusing in some places. That is normal since You are describing SSDS coming from different places and with various origins. You distinguish SSDS on the basis of trigger mechanisms. It is more simple and logic to separate SSDS using morphologies, mechanisms of deformation and/or sub-environments. In this way, later in the text, You can discuss, and after conclude on the interpretation of trigger mechanisms.

SPECIFIC COMMENTS

1) Page 3262, lines 1-5. I suggest to begin the abstract directly with the focus of the paper, deleting general sentences. Please start with “We document examples of syn-eruptive...”

2) Page 3264, line 10. SSDS are not rare in subaerial environments. Effects of liquefaction during present-day earthquakes are sand blows and dykes formed in continental settings.

3) Page 3264, line 11. Seismogenic fluidization and/or liquefaction. I suggest to use the term “seismically-induced liquefaction” here, since fluidization is often only a result of re-sedimentation after complete liquefaction (Allen, 1982).

4) Page 3264, from line 18 to the other page. See general comment A.

5) Page 3265, line 13. I suggest to delete “with some angularity”.

6) Page 3267, line 14. Please pay attention citing the paper of Nocita (1988) for triggers related with primary volcanic origin (at page 3279 too). This paper was criticised

SED
6, C1537–C1541, 2015

by McPherson et al. (1989) who show how the deposits containing the SSDS are fluvial/alluvial in origin.

7) Page 3274, lines 1-4. Load-structures (load-casts, ball-and-pillows and flames) with asymmetrical features induced by high-rates of sedimentation and recording the slope orientation (maybe flow-direction too?) are described in Moretti et al. (1999) with calculations and analogue models.

8) Fig. 1.e. Pseudonodules seem to be load-casts. They are not detached from the overlying source bed. The term pseudonodule is used for completely "isolated" masses (without preserved lamination) of material coming from the upper unit. I do not understand the term dike used here.

9) Fig. 6 is unclear. I cannot distinguish any clear recumbent folds. I can see distorted/contorted laminations as in a slumped bed.

REFERENCES

Allen. J.R.L., 1982. Sedimentary structures: their character and physical basis. Elsevier, New York, Vol. II, 663 pp.

Fisher, R.V., Schmincke, H.-U., 1984. Pyroclastic Rocks. Springer-Verlag, Berlin, Heidelberg, 472 pp.

McPherson, J.G., Flannery, J.R., Self, S., 1989. Discussion - Soft-sediment deformation (fluid escape) features in a coarse-grained pyroclastic surge deposit, north-central New Mexico. Sedimentology, Sedimentology, 36,943-949.

Moretti M., Soria J. M., Alfaro P. Walsh N. (2001) - Asymmetrical soft-sediment deformation structures triggered by rapid sedimentation in turbiditic deposits (Late Miocene, Guadix basin, Southern Spain). Facies, 44, 283-294.

Owen, G., 1987. Deformation processes in unconsolidated sands, Geol. Soc. Sp., 29, 11–24.

SED

6, C1537–C1541, 2015

Owen, G., Moretti, M., 2011. Identifying triggers for liquefaction-induced soft-sediment deformation in sands. Sediment. Geol., 235, 141-147.

Owen, G., Moretti, M., and Alfaro, P., 2011. Recognising triggers for soft-sediment deformation: current understanding and future directions, Sediment. Geol., 235, 133–140.

Nichols R. J., Sparks R. S. J. e Wilson C. J. N. (1994) - Experimental studies of the fluidization of layered sediments and theformation of fluide escape structures. Sedimentology, 41,233-253.

Nocita, B.W., 1988. Soft-sediment deformation (fluid escape) features in a coarse-grained pyroclasticsurge deposit, north-central New Mexico, Sedimentology, 35, 275–285.

Interactive comment on Solid Earth Discuss., 6, 3261, 2014.