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***Interactive comment on “Evaluating the importance of surface soil contributions to reservoir sediment in alpine environments: a combined modelling and fingerprinting approach in the Posets-Maladeta Natural Park” by L. Palazón et al.***

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Major concerns:

1 \*Fingerprint measurements are provided for the source material, but not for the target sediment. This crucial information should be provided, as it would be very useful for the readers to compare property values in both source and target material

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Target sediment measurements have been added to the table 3.

2 \*The authors measured the potential fingerprint properties in only 2 to 3 samples per source, and I think that analysing such a small number of samples is not sufficient and is very unlikely to lead to relevant results

We understand the comment raised by the reviewer but this is a preliminary research study that aims to demonstrate the potential of combining two different approaches to identify main sources of sediments within an alpine catchment. Apart from the Cambisols, within sample sets variability is small. Between sample sets variability is large enough to ensure good distinction between soil types. The stepwise discriminant function analysis resulted in 100 % of soils correctly classified and Wilks' lambda values close to 0 that indicated very good discrimination between soils. Furthermore, as in the Posets-Maladeta Natural Park all land covers are natural and there is low anthropogenic impact further variations in fingerprints due to land use changes are negligible.

4 \*Channel sediment material is used as a surrogate of soil sources, which is not relevant in my opinion, except in very specific contexts (at river locations draining an area covered by a single soil type). Furthermore, based on the results of the fingerprinting approach, the authors state that channel bed sediment is one of the main sediment sources, which does not provide a very robust finding

We agree with the referee that channel sediment material as surrogate of soil sources is not relevant and it has been changed from source to intermediate targets. Over a longer timeframe these intermediate targets could also be considered as a secondary source. Consequently new fingerprinting analysis has been assessed and the text has been rewritten accordingly.

5 \*The Leptosol source was not sampled for logistical reasons, but the SWAT model shows that Leptosols rank among the main sediment sources in the catchment, which is quite inconsistent

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The absence of Leptosols for the fingerprinting approach represented a limitation. However the Fluvisols are directly supplied from the Leptosols. Further, field observations suggested that direct connectivity is poor between the Leptosols and the channel i.e. intermediate sediment storages in the form of small depressions, perched flat areas and dense vegetation cover that favours sediment retention. Leptosol connectivity is restricted in many cases along the river. As the temporal and spatial scales differed between SWAT and fingerprinting approaches it was considered appropriate to do this preliminary fingerprinting analysis without Leptosols as a source. This information has been added in the text L528.

6 \*The authors argue that contribution of riverbank material to river sediment is negligible. However, when comparing the Cs-137 activities (Table 3) in soil sources (> 47 Bq/kg) and corresponding measurements in channel bed sediment (0-12 Bq/kg), I suspect that soil material supplied to the river should be mixed with subsurface or riverbank material depleted in Cs-137 to explain those low values. Overall, I encourage the authors to address the points listed above to correct their manuscript, which could then provide a very useful contribution to the literature.

Riverbank materials were not sampled because most streams are blocky (see photos below) and riverbanks are very local and not fully developed with maximum river incisions of 10 -15 cm in the soils of the valley bottoms. In this preliminary study we intended to focus on sampling the surface soils that were most abundant in the catchment and also that had clear connectivity with the streams. However, we know that further studies should consider all potential sediment source types existing in the study catchment. We agree with the reviewer that the depleted  $^{137}\text{Cs}$  values in the target samples may suggest subsoil and riverbank sources, but also sources from non-competent lithologies as shales could contribute to the depleted levels of  $^{137}\text{Cs}$  (except at Linsoles reservoir) in bed channels and Paso Nuevo reservoir. Resolving these ambiguities is a key recommendation for future work.

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Interactive comment on Solid Earth Discuss., 6, 1155, 2014.

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6, C676–C680, 2014

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**Fig. 1.**

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