British Society for Geomorphology Postgraduate Research Grant Report

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PROJECT TITLE: Quantifying the lithologic and tectonic controls on sediment supply from normal-fault bounded catchments in the Southern Apennines (Italy).

AMOUNT GRANTED: £950

1. PROPOSAL SUMMARY

I requested funds for a 25 days long 1st field campaign to collect data for my PhD in the Southern Apennines (Campania & Basilicata), to address the lithologic and tectonic controls on sediment supply from fault bounded catchments in the Southern Italy. The field campaign was successful and we were able to exceed our expectations on data collection.

Figure 1. (A) Example of one of the studied landslides, in which we sampled the grain size, dimensions, and landslide type. (B) Example of one of the active channels in which we measured the grain size distribution of the active sediment export from catchments.

2. RESULTS

Objective 1: *quantifying the relative influence of lithology and tectonics on the volume and grain size of sediment exported from modern catchments.*

We sampled the main lithologies in the area, and the results (Figure 1A) suggest that different lithologies supply significantly different grain size distributions, with stronger rocks supplying coarser material. Therefore, the grain size input that reaches the channels is going to be notably different for catchments dominated by different lithologies. To explore the tectonic control on grain sizes export, we sampled 31 catchments along two active faults (the East Agri and the Vallo di Diano faults) and preliminary results (Figure 1B) show that catchments that are uplifting at higher rates, are also delivering coarser grain size distributions. We will address the question of how different lithologies and uplift rates affect volumes of sediment released by using a combination of ^{10}Be catchment average erosion rate data and sediment flux models (e.g. the BQART model) in the coming year, and see how our results scale for different lithologies and uplift rates.

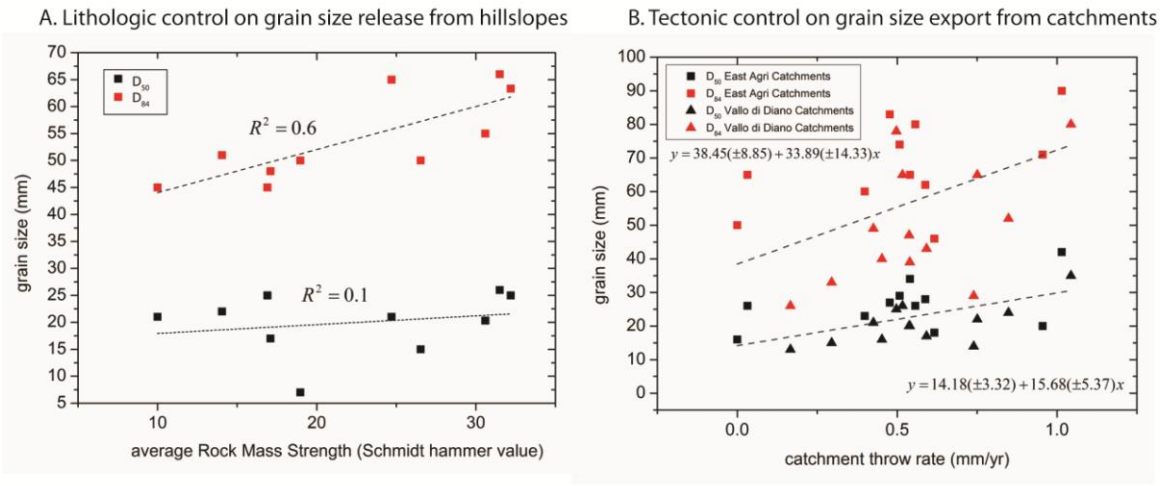
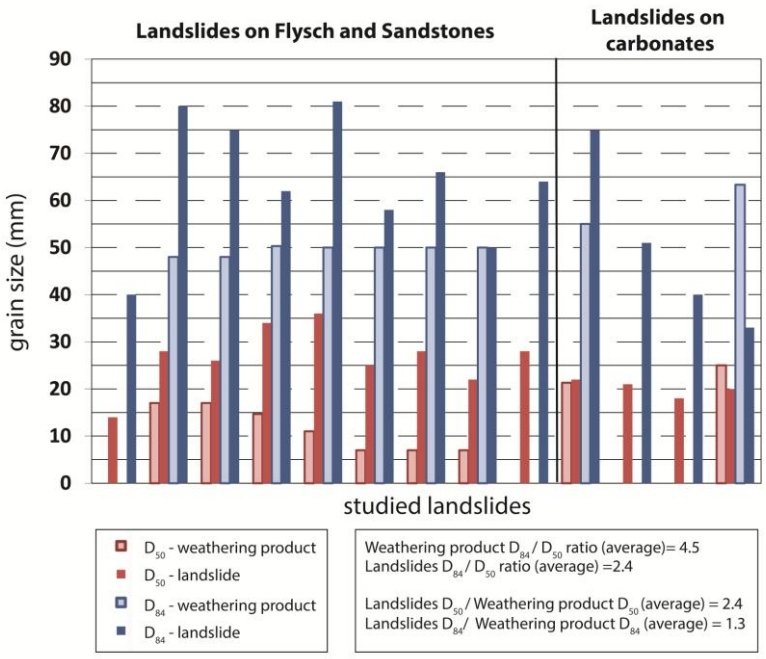


Figure 2. (A) Lithologic controls on grain size on weathering products released from hillslopes. (B) Tectonic controls on grain size export from catchments, using throw rate (vertical component of fault slip rate) as the tectonic variable.

Objective 2: *determining the grain size distribution of the sediment supplied by the landslides, and ground-truthing landslide types to improve volume estimates.*



I sampled the grain size distribution on 13 landslides, and the data shows that landslides tend to deliver twice as coarse median grain sizes than the same lithology when it is unaffected by landslides (Figure 2). We have now extended our data set to 56 landslides, that cover a range of lithologies, uplift rates, slopes, areas, and landslide types. Using these newly collected data, along with our estimates of landslide ages in the sampling localities, we will improve our volume and sediment flux from landslide estimates.

Figure 3. Grain size supply from landslides compared to grain size supply from weathering products of the same lithologies in which each landslide occurs.

Objective 3: *Contrasting these results with the characteristics of sediment preserved in Pleistocene-Recent deposits in the Agri and Diano valleys.*

We studied Pleistocene to Recent terrace and alluvial fan deposits on 65 localities on the Val d'Agri basin and 15 localities in the Vallo di Diano deposits. Figure 3 shows the average D_{50} – median grain size - and D_{84} – coarse grain size- for the Val d'Agri deposits mapped and dated by Zembo et al.

(2010), compared to our sediment supply from active channels, weathering product, and landslides. These results demonstrate that landslide input is needed to explain the coarse deposits found on the basins.

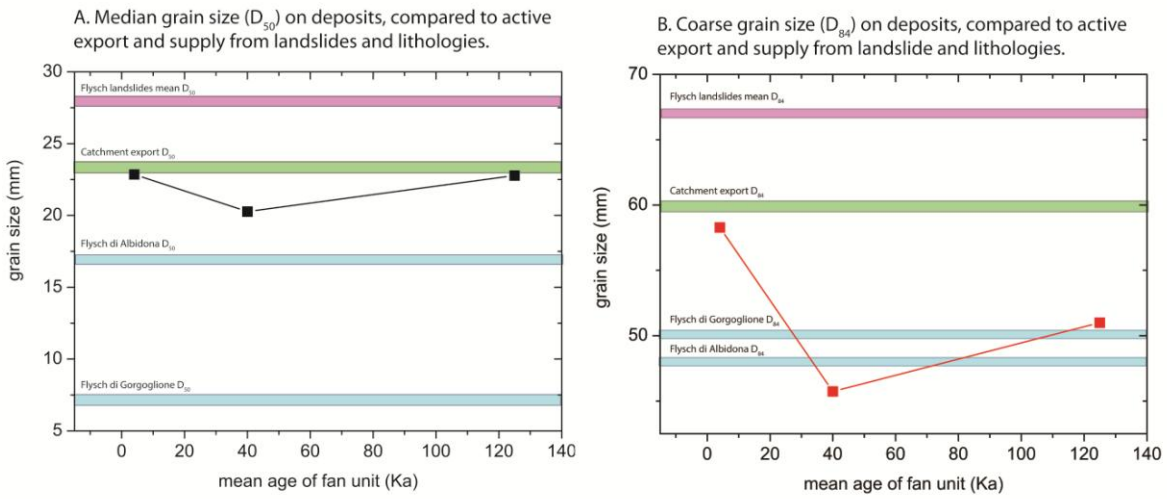


Figure 4. Grain size distributions found on the Val d'Agri basin deposits, compared to the active export from catchments, and the sediment supply from landslides and the lithologies that dominate the source catchments.

3. OUTCOME AND FUTURE RESEARCH

The preliminary results presented here show that both lithology and tectonics control sediment supply, and that empirical data can provide important constraints on how these factors affect the grain sizes and volumes of sediment delivered from catchments. Based on the results from this field campaign, we have obtained funding by NERC to analyse catchment-averaged erosion rates using ^{10}Be in detrital quartz, which will allow us to quantify sediment fluxes on the scale of 10^3-10^4 yrs and calibrate our sediment supply estimates. Funding from BSG has been instrumental to help me obtain my first field results, which additionally have allowed me to outline the project plan and research needs more effectively.

Some of the results from the 1st field campaign, funded by BSG, were presented in the BSG AGM 2014 in Manchester. These results will also be presented in the BSRG AGM 2014, and we expect to publish some of these results in ESPL in the coming months.

4. ACCOUNT OF EXPENDITURE

I requested from BSG £950 to spend on the car hire and part of the food costs of the 25 days long field campaign. The car hire costs added up to £600.3 (768.16€). With the remaining grant money I covered 60% of food expenses for me and my field partner, a total of 448.15€ (£350). Receipts are attached. The remaining costs of the first field campaign were covered by my supervisor.