

THE DANGKHAR BRECCIA: INSIGHTS ON THE FORMATION FROM REMOTE, FIELD AND LABORATORY BASED INVESTIGATIONS

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Remote, field and laboratory investigations revealed the spatial extent, internal structure and mineralogic-petrologic properties of the Dangkhar breccia, Spiti Valley India. The breccia formation is related to the availability of large quantities of carbonate rich debris provided by the Dangkhar Landslide and glacial meltwater lakes on the slope. The breccia clusters about 100 m above the floor and deposition initiated during a valley glaciation (Fig.1a). The breccia was deposited in several cycles with a compact bottom layer of lodgment till of subrounded blocks within a fine grained matrix, followed by proglacial outwash material. A crudely stratified mid layer exhibiting wet sediment deformation and flow structures characteristic of a flow till (BENN & EVANS, 2010), and the top layer with inverse grading and large angular blocks representing a debris flow deposit follow (Fig.1b). Cathodoluminescence imaging showed dark, zoned calcite cement growth characteristic for near surface meteoric cementation (FLÜGEL 2010; Fig.1c). Stable carbon and oxygen isotope values of cements range from $\delta^{18}\text{O}$ -22.78 to -20.23 ‰ VPDB and $\delta^{13}\text{C}$ 2.37 to 2.82 ‰ VPDB, respectively, support a freshwater influence. The clasts exhibit values of $\delta^{18}\text{O}$ -10.25 to -17.45 ‰ VPDB and $\delta^{13}\text{C}$ 2.37 to 3.51 ‰ VPDB. The three layers represent changes from glacial to paraglacial conditions. Contemporary debris flows are being deposited in an analogous way to the paleo-debris flows through the ephemeral stream channels.

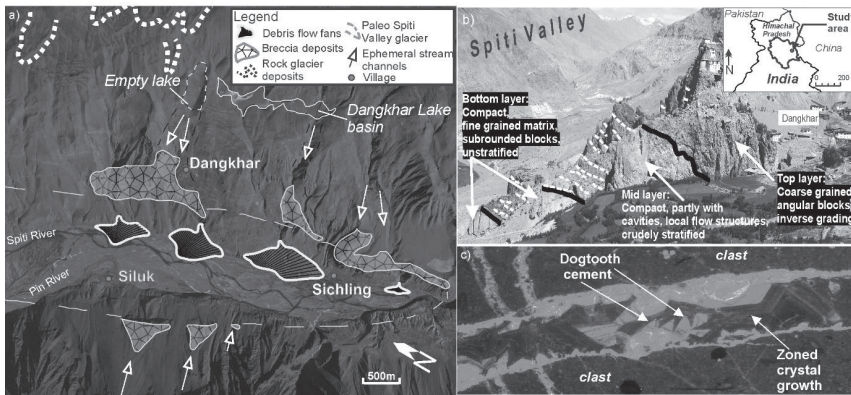


Figure 1. Setting of the Dangkhar breccia. a) satellite image; b) field outcrop; c) cathodoluminescence image.

BENN D.I., EVANS D.J.A. (2010): *Glaciers and Glaciation*, 2nd edn. Taylor & Francis, London, 816p.

FLÜGEL E. (2010): *Microfacies of carbonate rocks—analysis, interpretation and application*, 2ndedn. Springer.