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Fluvial response to sub-orbital scale environmental changes in southern French Alps

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Linkage between landscape processes and deep sea deposits is assumed by rivers transfer. Despite all the efforts of the Source-to-Sink community during the last decade, very few studies permit to link marine sedimentary records with phenomena occurring onland. The Var sedimentary system is a spatial restricted sediment routing system with a very narrow continental shelf and steep slope. This particularity makes the Var an ideal target for studying sediment transfers under glacial climate. Late Quaternary sea level changes didn't modified the size of drainage area and during both highstand and lowstand, the deep submarine fan (Var Sedimentary Ridge) was continuously feed by a single channel directly connected to Var river mouth. Located at the border between Mediterranean and alpine domains, the Var River watershed is characterized by steep slope and rare sediment dams. Several studies during the last 20 years had shown that for centennial to daily scale, turbidity flows are related to Var river floods.

Based on the analysis of stable oxygen isotopes and radiocarbon dates we established the first high resolution stratigraphy of 20 meters long turbidite deposits on the Var Sedimentary Ridge. This record covers the last 75 ka of the Var turbiditic activity which directly reflects the hydrological and sediment discharge of the onshore fluvial system. The turbidite frequencies show a multiscale variability : (1) the higher frequency corresponds to Dansgaard-Oeschger oscillations and Heinrich events, and (2) the lower frequency characterizes the amplitude of suborbital-scale variability which seems to be modulated by long term orbital parameters variations. The same pattern is reported for vegetation history of European Mediterranean border. This is consistent with our results which suggest that soil stabilization by vegetation cover plays an important role in the modulation of sediment transfers. Under stadials and Heinrich cold and dry climate, the scarce vegetation cover was favorable to intense sediment discharge of the Var River. The opposite trend is observed during interstadials when milder condition permit the spreading of tree cover, the turbidite activity at that time was as low as during Holocene. The highest frequency of turbidite deposition is observed during LGM and rapidly decreases during Heinrich stadial 1, this period could correspond to glacier retreat towards upper valleys. In order to test this hypothesis, future studies will focus on the nature and origin of sediment sources.