# Cosmogenic $^{21}$Ne and $^{10}$Be dating on offset fans along the Dead Sea Transform, Jordan

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The rate at which diplacement has occurred through time, especially during the Late Pleistocene, is important for understanding the general behavior of the Dead Sea Transform (DST). Since several years, faults slip rates have been calculated by dating offset fans.

In this study we propose to measure and compare cosmogenic $^{10}$Be ($^{10}Be_c$) and $^{21}$Ne ($^{21}Ne_c$) concentrations in quartz from cobbles embedded in the surface of alluvial deposits and in quartz from river sediments sampled in the corresponding drainage areas. Because $^{21}$Ne is stable, coupled $^{10}Be_c$ and $^{21}Ne_c$ analysis may provide insight to the potentially complex story of the cobbles/sediments prior to and/or post deposition in the fan, since a cobble exposure age does not necessarily reflect the fan deposit age.

We targeted six sample sites on well-preserved alluvial surfaces at Jabal al-Risha and Mazla, in the southern section of the DST, in Jordan. Alluvial fans were mapped from satellite imagery and field observation and geomorphologic analysis were used to determine their offset relative to their corresponding drainage area.

Prelimanary $^{10}Be_c$ results and the following assumptions allow us to calculate a Late Pleistocen slip rate. 1) there was negligeable exposure during transport or potential storage in the drainage area (because of its steep morphology) and 2) we neglected loss of material related to erosion (due to the arid climate). Preliminary rates are ranging from 3.3 to 5.7 mm/yr for the southern section of the DST.

However, $^{10}Be_c$ analysis on the same fan, show scattered exposure ages. Comparison with $^{21}Ne_c$ measurements, will allow to i) constrain the preliminary assumptions ii) explain the observed scattering, due to either complex alluvial processes prior to deposit, or to the erosion of the fan surface, or even burial history and iii) specify the slip rate of the southern section of the DST with a better offset fan dating.

# A stable isotope study of soil water and soil $CO_2$ along a climate gradient

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Climate is complexly linked to the soil water budget in that it controls water and heat fluxes to the soil as well as influencing soil formation and soil properties. In this study, we combined stable isotope geochemistry with climatic and soil physics monitoring to investigate how the soil water budget and styles of soil water movement vary across a climate gradient. In addition, the isotopic composition of soil water is an important control on the isotopic composition of soil $CO_2$. On a global scale, a quantitative model of the isotopic systematics of soil $CO_2$ can constrain the flux and isotopic composition of $CO_2$ that enters the atmosphere from soils ('soil-respired' $CO_2$). At high latitudes, the $^{18}O/^{16}O$ ratio of atmospheric $CO_2$ is lower than that predicted for equilibrium with ocean water, a difference which has been attributed to substantial flux of lower-$^{18}O$ $CO_2$ to the atmosphere from plants and soils.

Precipitation, snowmelt, soil water and soil $CO_2$ were monitored at sites along a climate gradient in central Washington State, USA. In this transect, annual precipitation ranges from 266 cm to 23 cm and occurs mostly as snow in the winter months. The isotopic data indicate that a significant component of immobile soil water, which is isotopically heavy due to evaporation, resides in the shallow soil throughout the summer dry season, particularly at the driest sites. Soil-respired $CO_2$ from these sites has exchanged isotopes with these heavy waters and thus is significantly heavier than $CO_2$ in equilibrium with precipitation. During the spring snowmelt, immobile soil water is largely flushed from the soil at all depths at all sites and soil-respired $CO_2$ reflects isotopic equilibrium with spring snowmelt. These results suggest that soil-respired $CO_2$ is heavier than simple equilibration with precipitation might predict and thus might contribute more to the atmospheric $CO_2$ budget.