Bacillus simplex from “Evolution Canyon” – Tracing the evolution of ecotypes

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We have recently described a model population of *Bacillus simplex* that shows distinct patterns of adaptation to the microclimatically contrasting slopes of "Evolution Canyon" I and II in the Carmel and Galilee Mountains, respectively, in Israel (Sikorski and Nevo, PNAS 2005). These canyons represent similar ecological replicates, separated by 40 km, in which the orientation of the sun yields a strong sun-exposed "African" south-facing slope (SFS) versus a rather mesic-lush "European" north-facing slope (NFS) within a distance of only 100 m (bottom) and 400 m (top).
The environmental heterogeneity of "Evolution Canyon" has yielded several either SFS or NFS adapted ecotypes, as suggested by Ecotype Simulation (Koeppel et al, PNAS 2008). However, the type of ecological stress and the type of phenotypic response that drive the separation of these ecotypes still remains less resolved. Here, we summarize the present data on the phenotypes of UV-C survival, mutation rate, carbon source utilization pattern, growth at different temperatures (hot, intermediate, cold), fatty acid membrane composition at different temperatures (hot, intermediate, cold), growth under hyperosmotic (kosmotropic) (NaCl) and chaotropic (ethanol) stress of 131 representative strains of the slope-specific lineages. These experimental conditions are thought to mimic environmental stresses (temperature, drought, nutrient supply) of which we think that they are of significance in “Evolution Canyon”. We discuss to what extend these phenotypes might have evolved as response to the habitat specificities, and thereby might have participated in driving the separation of the ecotypes within *B. simplex*.