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Neogene basin infilling from cosmogenic nuclides (^{10}Be and ^{21}Ne) in Atacama, Chile

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In the hyperarid Atacama Desert, northern Chile, Neogene sediments host copper rich layers (exotic supergene mineralization). Current mines are excavated into relatively thin (<200-300 m) Neogene basins whose infilling chronology is poorly constrained. We took advantage of one of these mining pits, and sampled for ^{10}Be and ^{21}Ne cosmogenic nuclide dosing. These cosmogenic nuclides help constraining the infilling chronology. Indeed, basin sediments were deposited with a cosmogenic nuclide content acquired on hillslopes. Then within the basin, cosmogenic nuclide concentrations evolved through the competing production (quickly decreasing with depth) and disintegration (not for ^{21}Ne). Sampling depths are at $\sim$100 m and at $\sim$50 m below the desert surface.
First, ^{21}Ne gives lower boundaries for upstream erosion rates or local sedimentation rate. These bounds are between 2 and 10 m/Ma, which is quite important for the area. The ratio between the two cosmogenic nuclides indicate a maximum burial age of 12 Ma (minimal erosion rate of 15 m/Ma) and is surprisingly similar from bottom to top, indicating a probable rapid infilling. We finally processed a Monte-Carlo inversion. This inversion helps taking into account the post-deposition muonic production of cosmogenic nuclides. Inversion results is dependent on the muonic production scheme. Interestingly, the similarity in concentrations from bottom to top pleads for quite low production at depth. Our data finally indicates a quick infilling between 12.5 and 10 Ma BP accounting for $\sim$100 m of deposition (minimum sedimentation rate of 40 m/Ma).