## Experimental study of deformation effect on 4°Ar/39Ar dating in muscovite

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The effect of temperature for argon retentivity is a well-known process, while the role of deformation for argon diffusion remains very elusive. To address this issue, we performed deformation experiments followed by 40Ar/39Ar dating on white mica within a Hercynian granite (Carnac, France). A set of cores were deformed using a solid-medium, Griggs-type apparatus at a pressure of 1.2 GPa and a temperature of 650 °C. These conditions have been chosen so that muscovite can deform viscously in nominally open-system conditions for argon, but without any melting. Coaxial deformation has been applied for different amounts of shortening between 15% and 30%. Each experiment was backed by a control experiment performed in the same pressure-temperature-time conditions, but without deformation (hot pressing) to constrain the influence of temperature alone. While a first set of experiments was performed as-is (no water added), a second set of experiments has been performed in the same conditions, with 0.2 wt.% water added. In-situ UV laser ablation 40Ar/39Ar dating was then applied on muscovite. While <sup>40</sup>Ar/<sup>39</sup>Ar ages on the starting material are homogeneously close to  $305.5 \pm 0.4$  Ma, the control experiments show a slight rejuvenation with a very homogeneous spatial distribution (295.2  $\pm$  0.2 Ma for the hot pressing without water added). In contrast, deformed samples – with or without water added – display more scattered ages with pronounced rejuvenation and heterogeneous spatial distribution controlled by grain size and location of ablation spot (core-rim gradients). Local rejuvenation can amount to up of 45% <sup>40</sup>Ar loss. Such argon loss is spatially correlated with deformation features.

Key words: experimental deformation, muscovite, <sup>40</sup>Ar/<sup>39</sup>Ar dating, argon retention