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## Electrical conductivity in a Griggs apparatus: a new experimental geophysical tool to investigate geological processes

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Electrical conductivity measurements on well-characterized materials in the laboratory allow accurate interpretations of electrical anomalies within the lithosphere and asthenosphere. But so far, most measurements have been performed statically, and hence, the effect of deformation and/or differential stress on electrical conductivity remains largely unknown. Here we report the first successful deformation experiments performed in a new-generation Griggs-type apparatus adapted for electrical conductivity measurements. The experiments were conducted on samples of Åheim dunites at a confining pressure of 1 GPa and temperatures of 500, 650 and 800°C. In silicate polycrystals, electrical charges are known to preferentially travel through grain boundaries, which act as high-diffusivity pathways. Our results show that stress and strain can significantly impact the electrical conductivity of peridotites by changing the thickness and the number of grain boundaries, respectively. At fixed P-T conditions, the electrical conductivity varies within an order of magnitude during deformation. This motivates to reappraise interpretations of electrical anomalies in mantle rocks, at least in tectonically active regions. The design presented in this study is fully stable at 1 GPa ( $\approx$  30 km depth) and should be stable up to 2 GPa at least, and to average temperatures as high as 1000°C. Further developments should soon enable similar measurements at pressures up to 4 GPa (120 km depth). These experimental achievements open a new research field, which will help to understand electrical anomalies and strain localization processes in rocks under stress at depth, notably within the lower crust, the upper mantle, and subducting slabs.