Petrographical and Geochemical Features coupled with Geophysical Observations on the Nazca Lines

Silvia Rosas (Pontificia Universidad Católica del Perú), **Kerstin Hartsch** (IPRO DRESDEN), **Andreas Weller** (Clausthal University of Technology), **Michael Eidner** (Bo-Ra-tec GmbH)

This poster reports a geological overview of the stone desert of Nazca and Palpa (Peru), the results of petrographical analyses at the selected test site P6, the interpretation of sediments provenance, geochemical relevant features and relations with geophysical observations, as part of the "Geoscientific investigations of the geoglyphs of Nazca" project. Another contribution to this meeting (A04, Weller et al.) reports the results of the resisitivity and georadar survey at the test site P6 in the Palpa district (Fig. 1). The project aims at a better understanding of the geological structures and processes in the vicinity of the geoglyph sites to deliver suggestions for conservation options of this world cultural heritage.

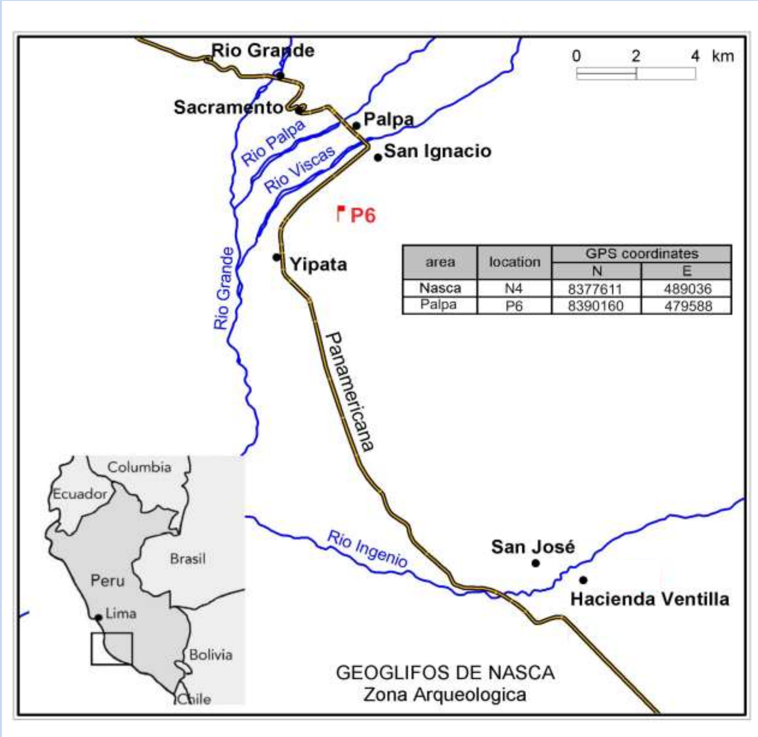

Figure 1 Location of the test site P6.

Figure 2 Hamada soil or desert pavement.

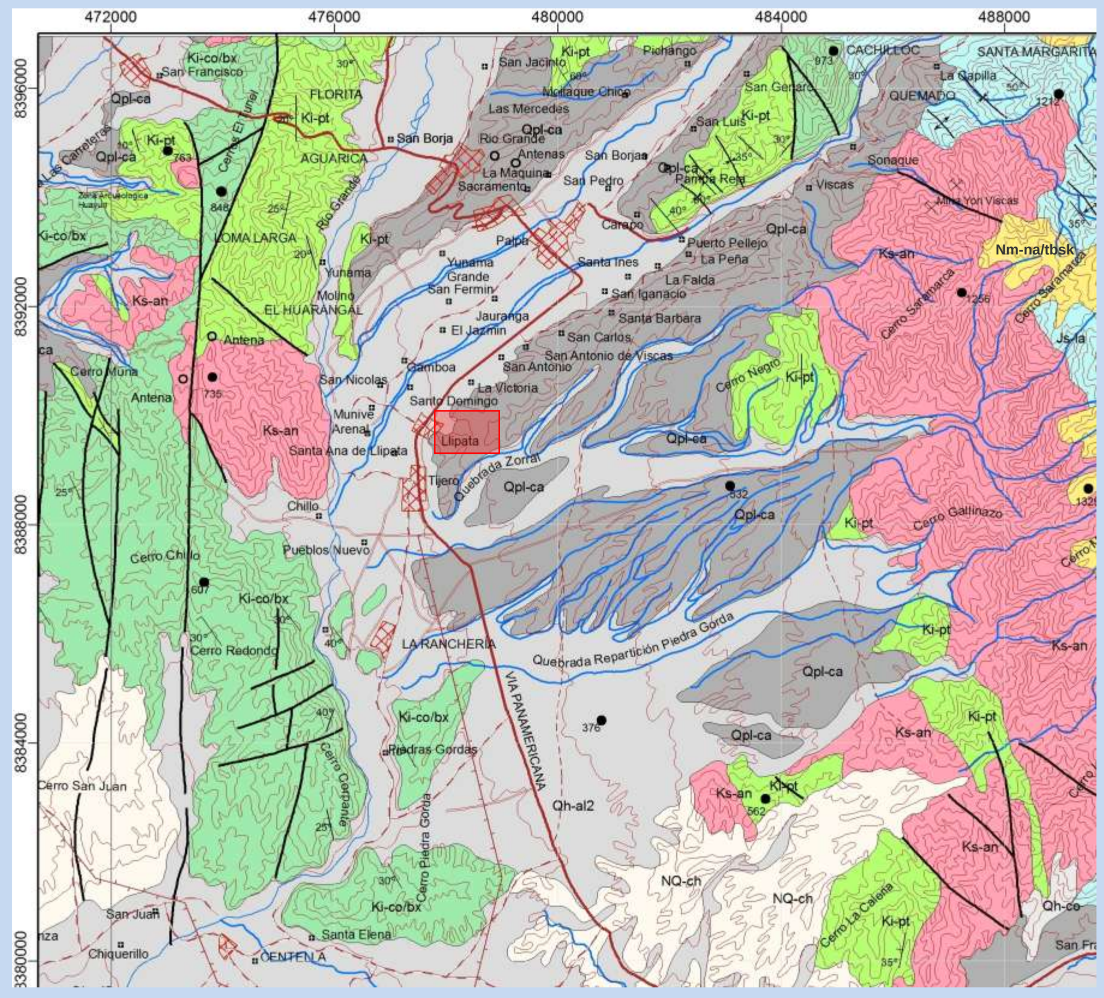

Figure 3 Section of the Palpa Geological Map (León Lecaros & Torres Bazán 2001). The red rectangle indicates the teste site P6. Qpl-ca: Cañete Formation, Nm-na/tbsk: Nazca Formation, Ks-an: Hypabisal andesites, Ki-pt: Pariatambo Formation, Ki-co/bx: Copara Formation, Js-la: Labra Formation.

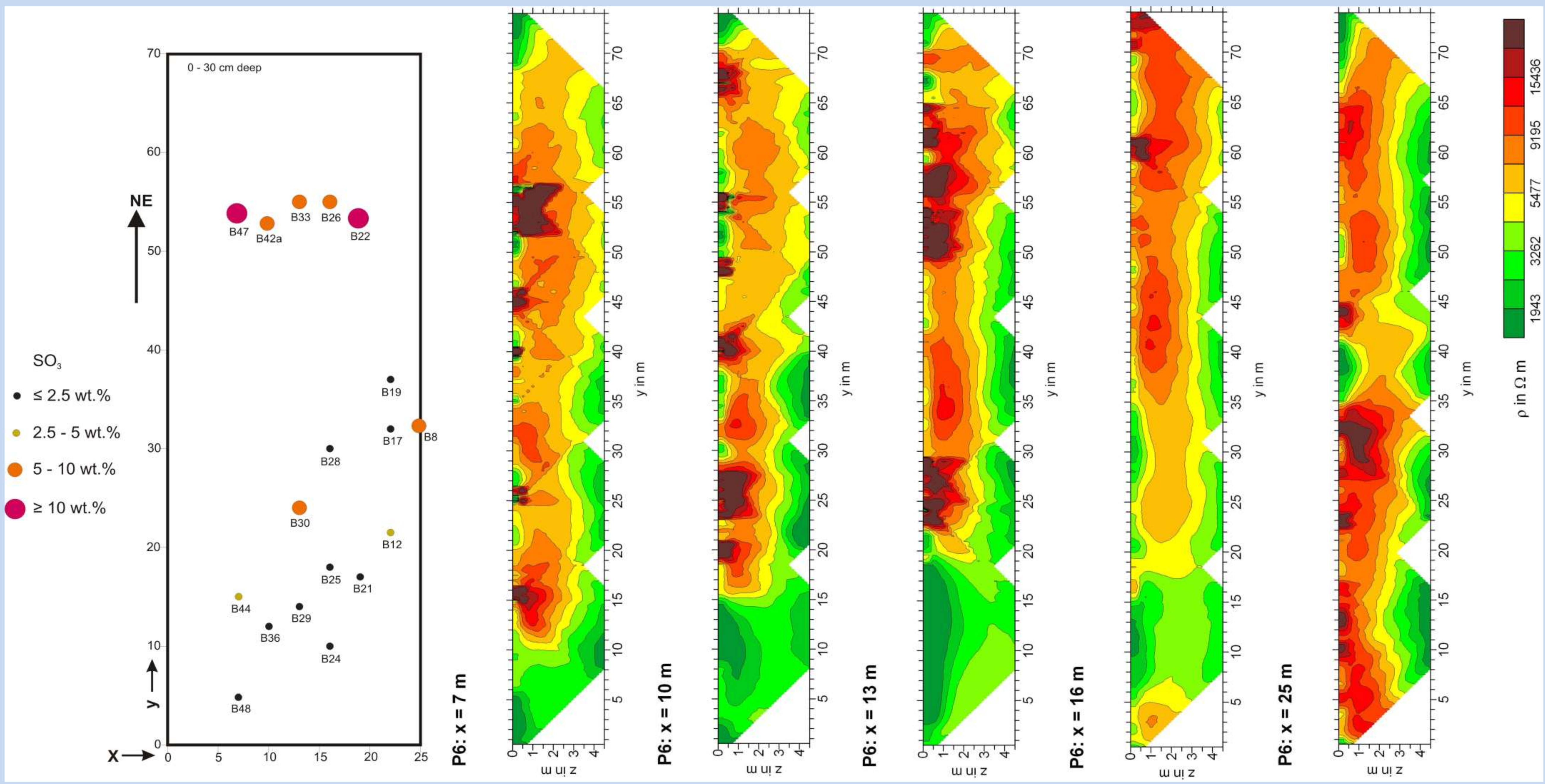

Figure 4 Relation between the SiO_3 content and electrical resistivity.

The studied sediments belong to the Pleistocene alluvial clastic gravel rich Cañete Formation, described as polimictic conglomerates with gravels of magmatic, both intrusive and extrusive, metamorphic and sedimentary rocks (Figs. 2 and 3), including intercalations of white volcanic ashes which are strongly contaminated with sulphate minerals of diagenetic origin. The samples which were taken by a hand drill bit machine up to 90 cm depth, consist of a limolitic-arenaceous matrix with a predominance of fine grained material as indicated by the geophysical measurements too (Fig. 4). The petrographical analysis (Fig. 5) is consistent with the gravel composition observed at the field. The grain-identification allows to confirm the provenance of the sediments directly from the surroundings Prequaternary rocks croping out west to the test site.

High sulphur (up to 26 wt.%) and salt contents characterize the test site, even much higher than reported by Eitel et al. (2005) and as product of early diagenetic cementation. Probably this process occurs as result of wind transported aerosols precipitation product of sea water spray. Figure 4 shows indications of high sulphur contents at the surface of geoelectrical resistivity anomalies probably due to cemented porosity in these coarser grained sites. Coarse grained sediments in P6 correlate with high geoelectrical resistivity. Elevated As contents already noticed by Hartsch et al. (2009) are especially included in hydrothermally altered rocks and volcanic glass fragments as detected using Laser Ablation Inductively Coupled Plasma Mass Spectrometry (LA-ICP-MS, Fig. 6). Other minor geochemical elements display normal contents for volcanic rocks, graywackes and in general the Upper Continental Crust.

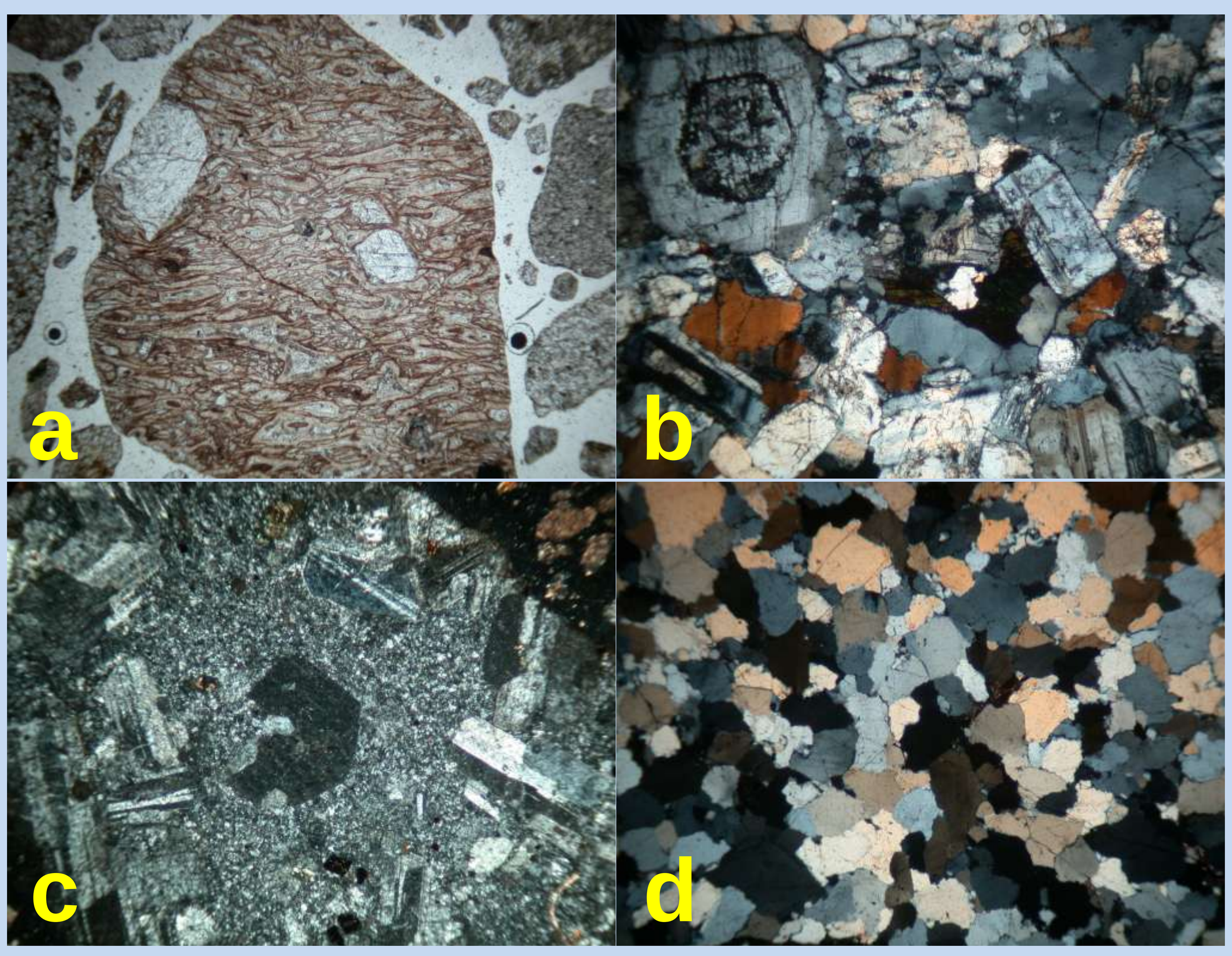

Figure 5 **a** Pyroclastic glass grain including quartz crystals, **b** granodiorite fragment with plagioclases, quartz, amphiboles and opaque minerals, **c** porphyritic latiandesite with plagioclases as fenocrystals as well as matrix, **d** medium grained quartz arenites showing advanced diagenesis. Each photo width: 5.6 mm. Photos b, c and d with X polarized light.

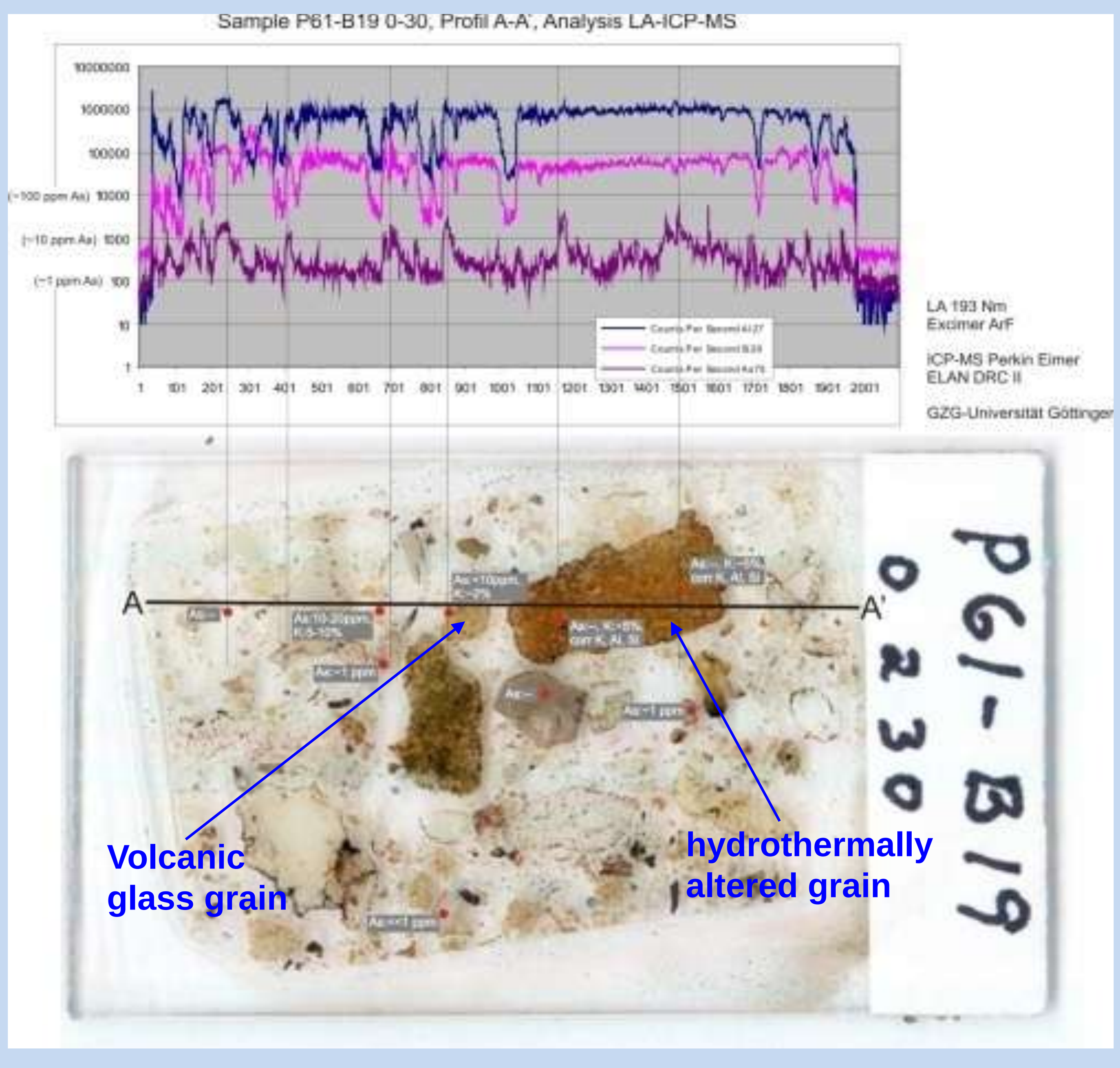

Figure 6 Analysis LA-ICP-MS in a profile along a thin section showing anomalous high As-contents in hydrothermally altered and volcanic glass grains (LA 193 Nm – Excimer ArF coupled with an ICP-MS "Perkin Eimer ERLAN DRC II", GZG – University Göttingen).

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