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Induced polarization imaging of volcanoes

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The first part of the presentation is related to the petrophysics of induced polarization of volcanic rocks. We described induced polarization of these rocks using a dynamic Stern layer model describing the polarization of the electrical double layer around the mineral grains. This model shows that the normalized chargeability and quadrature conductivity of volcanic rocks is sensitive to the cation exchange capacity (CEC) of these materials and therefore to their alteration. In the second part pf the presentation, we use a geostatistical inversion framework to image chargeability in 2.5D or in 3D. This new framework is benchmarked using synthetic data and data from various volcanoes (Kilaua, Furnas, Yellowstone). We show that chargeability tomography is very complementary to the now classical electrical resistivity tomography in order to image volcanic structures and to separate the conduction in the bulk pore network from interfacial effects such as surface conductivity. This approach appears to be promising as a first step toward joint inversion with seismic and gravity data.