Geophysical Research Abstracts
Vol. 19, EGU2017-15073, 2017
EGU General Assembly 2017

A simple and robust method for artifacts correction on X-ray microtomography images

Sizonenko Timofey (1), Karsanina Marina (2), Gilyazetdinova Dina (3), Bayuk Irina (1), and Gerke Kirill (1)

(1) Institute of Physics of the Earth of Russian Academy of Sciences, Moscow, Russian Federation (luckydevil2007@gmail.com), (2) Institute of Geosphere's Dynamics of RAS, Moscow, Russia, (3) Geology Faculty, Lomonosov Moscow State University, Moscow, Russia

X-ray microtomography images of rock material often have some kinds of distortion due to different reasons such as X-ray attenuation, beam hardening, irregularity of distribution of liquid/solid phases. Several kinds of distortion can arise from further image processing and stitching of images from different measurements. Beam-hardening is a well-known and studied distortion which is relative easy to be described, fitted and corrected using a number of equations. However, this is not the case for other grey scale intensity distortions. Shading by irregularity of distribution of liquid phases, incorrect scanner operating/parameters choosing, as well as numerous artefacts from mathematical reconstructions from projections, including stitching from separate scans cannot be described using single mathematical model.

To correct grey scale intensities on large 3D images we developed a package Traditional method for removing the beam hardening [1] has been modified in order to find the center of distortion. The main contribution of this work is in development of a method for arbitrary image correction. This method is based on fitting the distortion by Bezier curve using image histogram. The distortion along the image is represented by a number of Bezier curves and one base line that characterizes the natural distribution of gray value along the image. All of these curves are set manually by the operator.

We have tested our approaches on different X-ray microtomography images of porous media. Arbitrary correction removes all principal distortion. After correction the images has been binarized with subsequent pore-network extracted. Equal distribution of pore-network elements along the image was the criteria to verify the proposed technique to correct grey scale intensities.

[1] Iassonov, P. and Tuller, M., 2010. Application of segmentation for correction of intensity bias in X-ray computed tomography images. Vadose Zone Journal, 9(1), pp.187-191.