

EGU2020-20954

<https://doi.org/10.5194/egusphere-egu2020-20954>

EGU General Assembly 2020

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Using computer vision and deep learning for acquisition and processing of low-distortion sediment core images

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Imaging the split surface of sediment cores is standard procedure across a range of geoscience fields. However, obtaining high-resolution, continuous images with very little distortion has traditionally required expensive and fragile line-scanning systems that may be difficult or impossible to transport into the field. Thus many researchers take photographs of entire core sections, which may result in distortion, particularly at the upper and lower edges. Using computer vision techniques, we developed a set of open source tools for seamlessly stitching together a series of photographs, taken with any camera, of the split surface of a sediment core. The resulting composite image contains less distortion than a single photograph of the entire core section, particularly when combined with a simple camera sliding mechanism. The method allows for detection of and correction for variable camera tilt and rotation between adjacent pairs of images. We trained a deep neural network to post-process the image to automate the tedious task of segmenting the sediment core from the background, while also detecting the location of the accompanying scale bar and cracks or other areas of coring-induced disturbance. A color reflectance record is then generated from the isolated core image, ignoring variations from e.g., cracks and voids.