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Tectonic Evolution of the Ohrid Basin (Macedonia/Albania): preliminary results for a future ICDP deep drilling site

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In the frame of the planned ICDP deep drilling site within the Lake Ohrid (Macedonia/Albania, SCOPSCO initiative), we are focusing on the tectonic framework of the site. The Ohrid basin is an important N-S trending graben structure in Macedonia/Albania and located within the Afro-European Convergence Zone a region with dispersed active seismicity. In contrast to the compressive coastal part of Albania the central and eastern part are presently subject to extension. Earthquake focal mechanisms showed active N-S normal faulting with horst and graben structures, in a basin and range like environment. Several pronounced scarps testify to an active, seismogenic landscape as revealed also from DEM data. Paleozoic metamorphic and magmatic rocks form the country rock of the Western Macedonian Zone around Lake Ohrid. Triassic carbonates and clastics are widely exposed to the southeast and northwest of the lake. These rocks bear the imprints of several deformation phases that affected the basin system since the Late Cretaceous to present.
However, until today the different steps in the tectonic evolution of the graben is not clear. Therefore, we started to investigate the (neo)tectonic evolution of Lake Ohrid with a field campaign focusing on the collection of structural data, like paleostress data (fault-slip data) and mapping of folds, joints and fractures. We studied a total of 24 sites along the steep flanks and the mountains surrounding Lake Ohrid, with suitable fault-slip data for stress inversion. At each location we measured a representative number of fault planes concerning the spatial orientation of fault plane (dip direction, dip) and striae (azimuth, plunge) and additional the sense of slip (reverse, normal, dextral or sinistral).

After separation and classification of the data the preliminary results already show a tendency of three major deformation phases affecting the surroundings of Ohrid Basin: NW-SE, NE-SW horizontal contraction and later an almost vertical uplift with E-W extension. The multiple inverse method of Yamaji (2000) was applied on datasets with a polyphase stress history and to investigate the spatial and temporal variations of paleostresses in the Ohrid Basin. The applied methods led us to the following preliminary results:
- Three main phases of deformation can be assumed NW-SE shortening, NE-SW shortening and a present-day extension

- Morphological lineations, which are directed NNE-SSW, NW-SE, and E-W fit in the assumed pattern of faults

- Earthquake focal solutions and data of the world stress map data point to SW-NE directed extension and normal faulting acting presently

- The origin of the lake formation is unclear, possibly an older tectonic transtensional phase or reactivation of inherited faults led to a pull-apart like opening of the basin, followed by E-W directed extension.

Reference:
Yamaji, A., 2000. The multiple inverse method: a new technique to separate stresses from heterogeneous fault-slip data. J. Struct. Geol. 22, 441-452