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A multidisciplinary study on the Xiangshan uranium-bearing caldera structure: evidences from anisotropy of magnetic susceptibility and gravity modeling

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As the world's third largest volcanic type uranium ore field, Xiangshan volcanic basin attracted scientific research as well as large amount of industry investment. Gradually, it came to reach a consensus that a "three-storeyed type" model: under the uranium mineralized volcanic rocks, there were still Pb-Zn and Ag. However, these research results and drill cores also brought hot debates which focus on the locations of volcanic calderas because researchers believed it related to the pathways of U-Pb-Zn-Ag-bearing fluid. Here we report the first systematic study of paleoflow of the two main uranium-bearing wall rocks, aiming to find the volcanic vents. This study integrates results of anisotropy of magnetic susceptibility (AMS) and magnetotelluric sounding (MT) in addition field geological observation. It shows that (1) rhyodacite and porphyritic lava are the main wall rock of uranium ore, which outcrop about 350km2 covering 80% of the Xiangshan basin; (2) magnetite and hematite are the main magnetic minerals; (3) the rhyodacite developed in the North-West-most of Xiangshan basin illustrated North-East magnetic lineation with low-angle-foliation, and those rhyodacite located a few kilometers to the East of the previews one displayed progressively North-West magnetic foliation with barely horizontal foliation. It indicated probably all these rhyodacite flowed from the South; (4) whereas to the porphyritic lava, it shows variable magnetic lineation around the basin, which may suggest five volcanic calderas. It is noteworthy that the AMS results are consistent with fielded lineation observation and MT; (4) finally, a gravity modeling has been conducted and the result shows that the bodies of rhyodacite and porphyritic lava are laccolithic with relative thick center that may interpret as feeder of magma.