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## Complex lava flow evolution reveals prolonged fissure-fed eruption scenario for the youngest (~2000 BP) eruptive event of the Arxhan-Chaihe Volcanic Field, Inner Mongolia in NE China

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The Arxhan-Chaihe Volcanic Field (ACVF) is a young intracontinental monogenetic volcanic field erupted since the Pliocene and located in the northeast of China. ACVF preserves at least 47 vents in a 2000 km<sup>2</sup> area. The small-volume volcanic edifices and their eruptive products resemble typical landforms such as tuff rings, scoria cones, fissure-controlled vents, and complex, but small volcanic cones. The youngest known eruption site at Yanshan, located in the centre of the volcanic field along an elevated normal-fault bounded, SW-NE-aligned zone, dated by C<sup>14</sup> method and yielded closely spaced but various ages of - 2040 +/-75; 1960 +/-70; 1990 +/-100; 1900 +/-70, BP. The age variation is in good concert with the presence of nested vent complex as the reconstructed source of this eruption, forming amalgamated scoria and spatter cones with three distinct vents. The volcanic landforms are well-preserved due to the abundance of accumulated agglutinated and clastogenic lavas in their crater rims. It is apparent, that the Yanshan-event produced an extensive and multi-tephra pyroclastic succession, that formed an ash plain just east of the cone complex. The extend of the ash blanket revealed to be far more than previously thought as recent SENTINEL imagery marks ash coverages - even in patchy mode - well over 20-km from the vent. Large rafted, welded cone blocks, mostly in the SW opening of the main cone where a major lava flow broke out, create strong surface ruggedness and young volcanic surface features in the vicinity of the vents. The lava flows (mostly rubble, slabby pahoehoe) apparently filled a north-westward steeply inclined rift shoulder and reached the Halaha River valley within 8 km, in about 230 m elevation drop. When the lava flows reached the Halaha River valley floor, in the combination of sudden slope angle changes of the terrain and the wet valley floor produced a spectacular lava tumuli field. Present day lacustrine systems are inferred to be formed after the major lava flows from the Yanshan vent diverted the fluvial channels about 2000 years ago. Analysing of SENTINEL satellite imagery, it is evident, that the Halaha River lava field is far more complex, and not exclusively derived from the Yanshan vents. A large crater (~1.1-km across), Dahei Gou just about 5-km to the SW from Yanshan shows young lava lake within its crater and slightly older lava outflow toward the Halaha Valley on SENTINEL imagery. Lava flows are seemingly diverted and partially "invaded" the Dahei Gou lava flow system in the axis of the Halaha Valley, marking a relative chronology of volcanic events inferred to be driven by a SW to NE directed fissure opening that likely took place over weeks or even years based on the lava flow surface patterns. In addition, a 6.5-km long fissure connects the Dahei Gou and Yanshan vents. This volcan-morphological study reveals an important volcanic hazard this region and making the youngest volcanic event a key eruption scenario future volcanic hazard planning of the region needs to observe.

