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# Discovery of Tracing Diamond in South Linyi

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## Introduction

We have searched for diamondiferous kimberlite and lamproite (DKL) in China for the last 50 years but have not discovered it since Fuxian diamondiferous kimberlite in 1974. Some scholars believe that the North China Craton has been thinned and damaged, losing the conditions for diamond growth. However, the growth period of diamonds is relatively long (Smit and Shirey, 2019). Studies have shown that the east Siberian Craton has been divided into multiple continental blocks with uneven thickness. The existence of various DKL fields in east Siberia is testimony that this region is the most enriched in diamonds in the world (Ashchepkov et al., 2021), which tells us that the large diamonds unearthed in south Linyi, China (Fig.1b.c) are highly likely to have formed before the thinning of the North China Craton. South Linyi is the area most likely to make a breakthrough in discovering DKL in China.

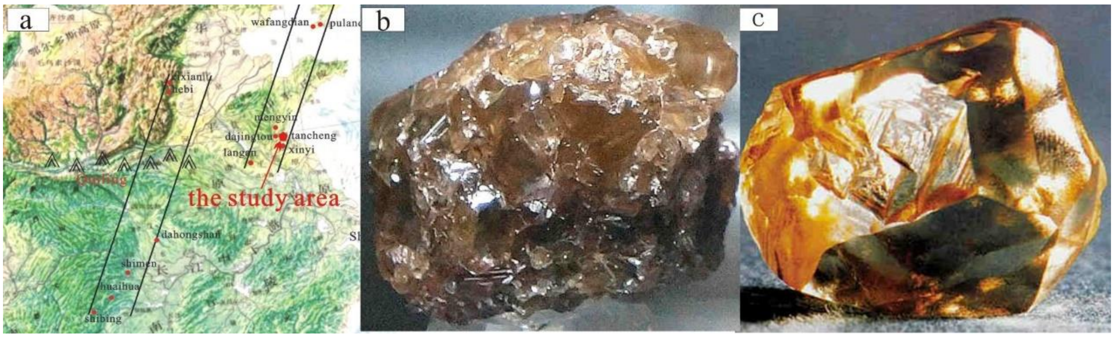


Fig. 1 (a). The topographic map of abnormal locations of DKL in east China (red dots). They are distributed within two parallel zones (black lines). The location indicated by the red arrow is South Linyi, where we currently work; (b) The 338.60 carat "Linyi Star" unearthed in South Linyi in 2003; (c) 158.79 carat "Changlin Diamond" found in Changlin in 1977.

## Clues

There are clear indications for DKL existence in South Linyi (Ding et al., 2020): a) Multiple large diamonds were unearthed (338.60 carats of "Linyi Star" in 2002, 124.27-carat "Chenbu 2" in 1999, 158.79-carat "Changlin" in 1977, and 281.25 carats of "Golden Chicken" diamond in 1937). Careful checking of "Linyi Star" (Fig. b) and "Changlin Diamond" (Fig. c) reveals that the edges of these two large diamonds did not suffer from any wearing (although diamonds have high hardness and strong wear resistance, rolling over long distances can also cause edges being round). Therefore, we can deduct that their "short-distance source indication" is strong, demonstrating that they are highly likely to be from local instead of traveling 100 km away from the Mengyin diamond mine (discovered in 1965); b) This area is located within the Archaean North China Craton (2.5-4.0 billion years); c) The Tan-Lu deep fault cut through South Linyi (Fig.1); d) Multiple alluvial diamond mines (Chenbu, Wadi, Motong, Linghongbu) were mined in South Linyi, and pyrope was discovered; e) In many areas of South Linyi, "explosive breccia" and "explosive agglomerate rocks" have been unearthed. We believe the strong impact force of underground gas-liquid magma upwells rich in $CO_2$ and $H_2O$ formed them.

## Discussion

South Linyi lacks streams and is flat with wheat and corn growing, making it impossible to trace DKL using the traditional method of tracking KIM. To approach a target, we comprehensively investigate the rock type and distribution, structural orientation, magnetic strength and distribution of different rocks in the area, the location of large diamond unearthed and alluvial diamond, and only discovered pyrope. We designed a mutual verification method by interpreting remote sensing data, geology, and geophysical inspection. Specifically, we analyzed remote sensing data of the past decade on multiple remote sensing platforms and verified suspected targets through field investigations, selecting 21 initial targets less than 0.25 $km^2$ and then checking them using the cross-section method of physical magnetism. Based on whether the magnetic field intensity formed a shape of a "small plateau" or "peak cluster," we screened out seven preferred targets. Then, collect sand samples 2 meters below surface soils within the select target locations. We have discovered a mineral combination of tens of diamond, diopside, magnesium spinel, hundreds of garnets and ilmenite, and thousands of amphibole-group minerals in one of the targets. The large quantity and variety of KIMs and the euhedral shape of some easily-weathered minerals are essential clues for discovering the DKL pipe. Based on the author's experience searching for DKLs and global literature on tracking KIMs, this "positioning DKL" should be determined.

## Conclusions

The large quantity and variety of KIMs pinpoint the location of hidden diamondiferous kimberlite or lamproite.

The designed mutual verification method by interpreting remote sensing data, geology, and geophysical inspection, the success of which method may lead to more discovery of DKL pipes hidden under thick Quaternary coverage in an area where one can not adopt the traditional KIM tracing DKL.

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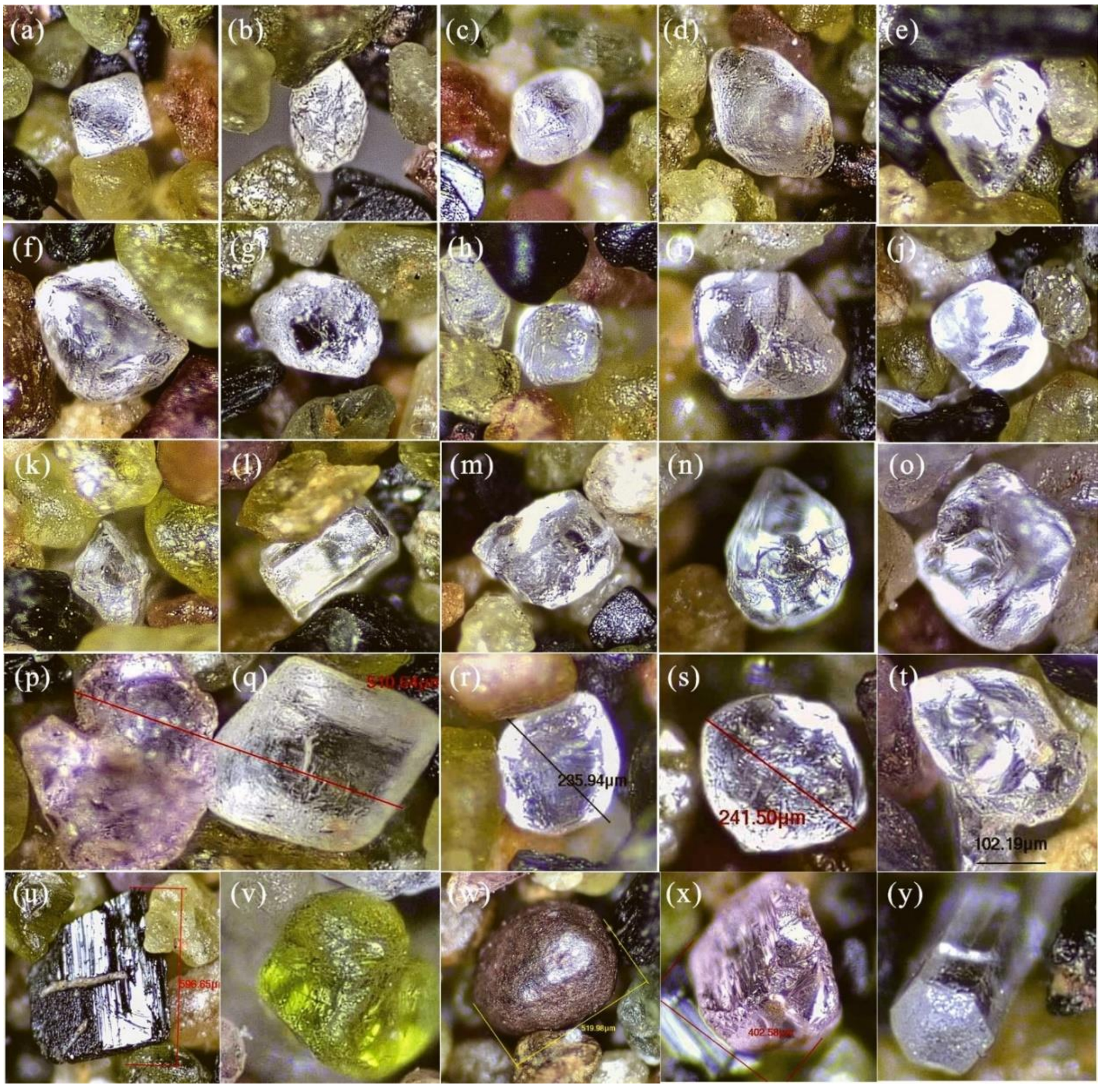


**Fig. 2** (a-o), (q-t) colorless and transparent diamond (0.30-0.5mm) with diamond luster, most of them with euhedral shape having fine grain growth lines (d, h, q), among which (l) is a rare octagonal long columnar crystal (the most common natural shapes of diamond are octahedra (a, f, i), cubes, and dodecahedra, while long columnar crystals (l) are distorted (Tuppert et al., 2011); Amphibole minerals (a, d, h, k); (p, x) is manganese aluminum~iron aluminum garnet (0.4-0.7mm), which exhibits apparent melting corrosion phenomenon; (u) ilmenite (0.5-0.7mm); (v) diopside (0.4-0.6mm); (w) ferric small-ball, similar to those found in the Hebi kimberlite (Hou et al., 2023) ; (y) apatite.