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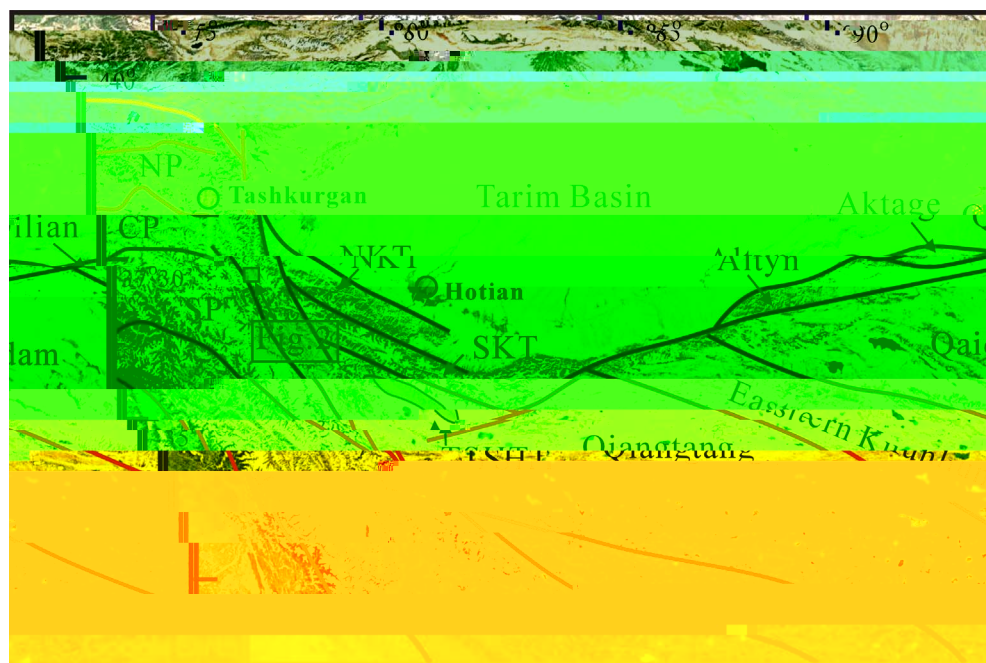


Fig. 1. Geological map of the Tarim Basin region showing various tectonic units and features. The map includes labels for NP, CP, NKT, SKT, Aktage, Hotian, Qiangtang, and Eastern Kunlun. It also shows the locations of Tashkurgan and Hotian. The map is color-coded with green and yellow/orange tones and includes a coordinate grid with longitudes 80°E, 85°E, and 90°E.

The Tarim Basin is a large tectonic basin in the northwestern part of the Tibetan Plateau. It is bounded by the Qiangtang Plateau to the south, the Eastern Kunlun Mountains to the east, and the Pamir Knot to the west. The basin is filled with thick sedimentary rocks, including sandstones, shales, and limestones. The basin is divided into several tectonic units, including the North Pamir (NP), Central Pamir (CP), North Kunlun Tectonic Zone (NKT), and South Kunlun Tectonic Zone (SKT). The basin is also characterized by several major faults, including the Aktage Fault, the Hotian Fault, and the Qiangtang Fault. The basin is a major oil and gas province in China, with several large oil and gas fields, including the Tashkurgan field, the Hotian field, and the Qiangtang field.

2. Regional Geological background

The Tarim Basin is a large tectonic basin in the northwestern part of the Tibetan Plateau. It is bounded by the Qiangtang Plateau to the south, the Eastern Kunlun Mountains to the east, and the Pamir Knot to the west. The basin is filled with thick sedimentary rocks, including sandstones, shales, and limestones. The basin is divided into several tectonic units, including the North Pamir (NP), Central Pamir (CP), North Kunlun Tectonic Zone (NKT), and South Kunlun Tectonic Zone (SKT). The basin is also characterized by several major faults, including the Aktage Fault, the Hotian Fault, and the Qiangtang Fault. The basin is a major oil and gas province in China, with several large oil and gas fields, including the Tashkurgan field, the Hotian field, and the Qiangtang field.

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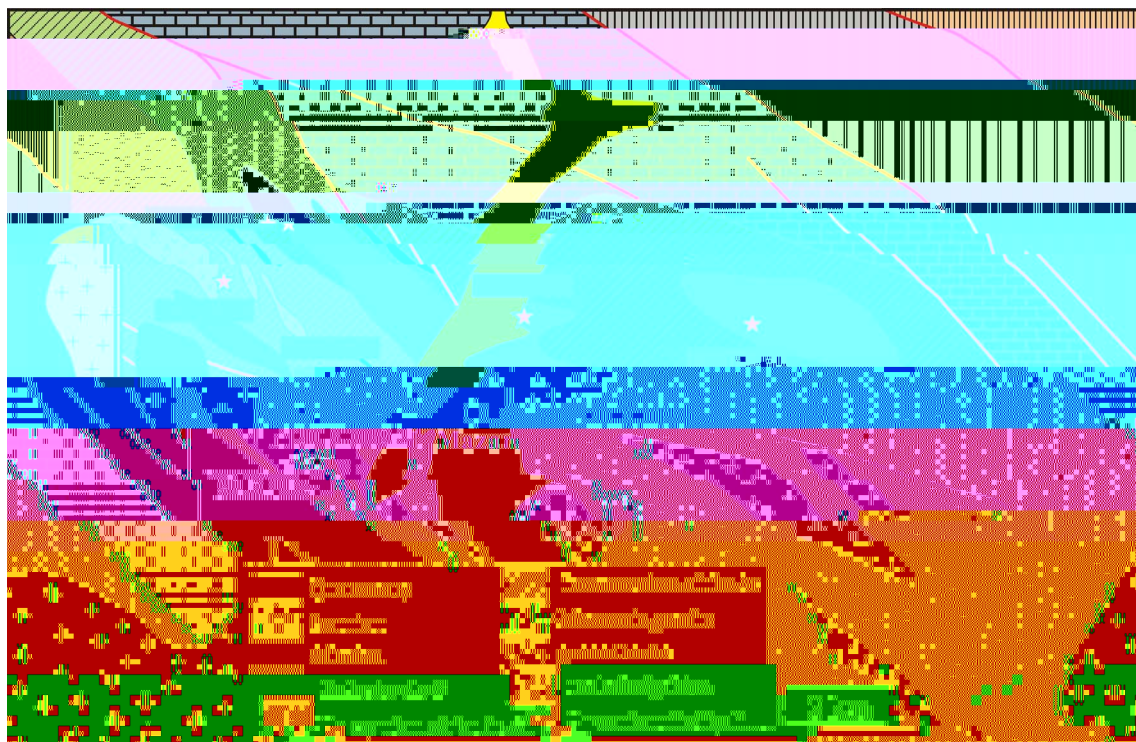


Fig. 2. Geological cross-section of the study area showing the distribution of various rock units and structural features.

The study area is characterized by a complex geological structure. The basement consists of Archean gneisses and schists, which are overlain by Proterozoic volcanic and sedimentary rocks. The volcanic rocks include bimodal volcanic rocks and trondhjemite-tonalites. The sedimentary rocks are primarily quartzites and shales. The structural features include a major fault zone that trends north-south and a series of smaller faults that are generally east-west trending.

3. Petrography

3.1. The metamorphic bimodal volcanic rocks

The bimodal volcanic rocks are composed of two main types: felsic and mafic. The felsic rocks are primarily quartz monzonitic gneisses, which are characterized by a coarse-grained texture and the presence of quartz, feldspar, and biotite. The mafic rocks are primarily amphibole gneisses, which are characterized by a fine-grained texture and the presence of amphibole, plagioclase, and biotite. The rocks show evidence of high-pressure metamorphism, with the presence of kyanite and staurolite. The metamorphic grade is estimated to be in the range of 10–12 kbar and 600–700 °C.

3.2. The trondhjemite-tonalites

The trondhjemite-tonalites are a type of granitoid rock that is characterized by a high SiO₂ content and a low K₂O content. They are primarily composed of quartz, plagioclase, and biotite. The rocks show evidence of high-pressure metamorphism, with the presence of kyanite and staurolite. The metamorphic grade is estimated to be in the range of 10–12 kbar and 600–700 °C.

The mafic rocks are primarily amphibole gneisses, which are characterized by a fine-grained texture and the presence of amphibole, plagioclase, and biotite. The rocks show evidence of high-pressure metamorphism, with the presence of kyanite and staurolite. The metamorphic grade is estimated to be in the range of 10–12 kbar and 600–700 °C.

3.3. The granodiorite

The granodiorite is a type of granitoid rock that is characterized by a high SiO₂ content and a low K₂O content. It is primarily composed of quartz, plagioclase, and biotite. The rock shows evidence of high-pressure metamorphism, with the presence of kyanite and staurolite. The metamorphic grade is estimated to be in the range of 10–12 kbar and 600–700 °C.

4. Analytical procedure

The analytical procedure involves the use of a variety of techniques to determine the mineral composition and chemical composition of the rocks. These techniques include X-ray diffraction (XRD), electron microprobe analysis (EMPA), and laser Raman spectroscopy (LRS). The XRD technique is used to identify the mineral species present in the rocks. The EMPA technique is used to determine the chemical composition of the minerals. The LRS technique is used to determine the temperature of metamorphism.

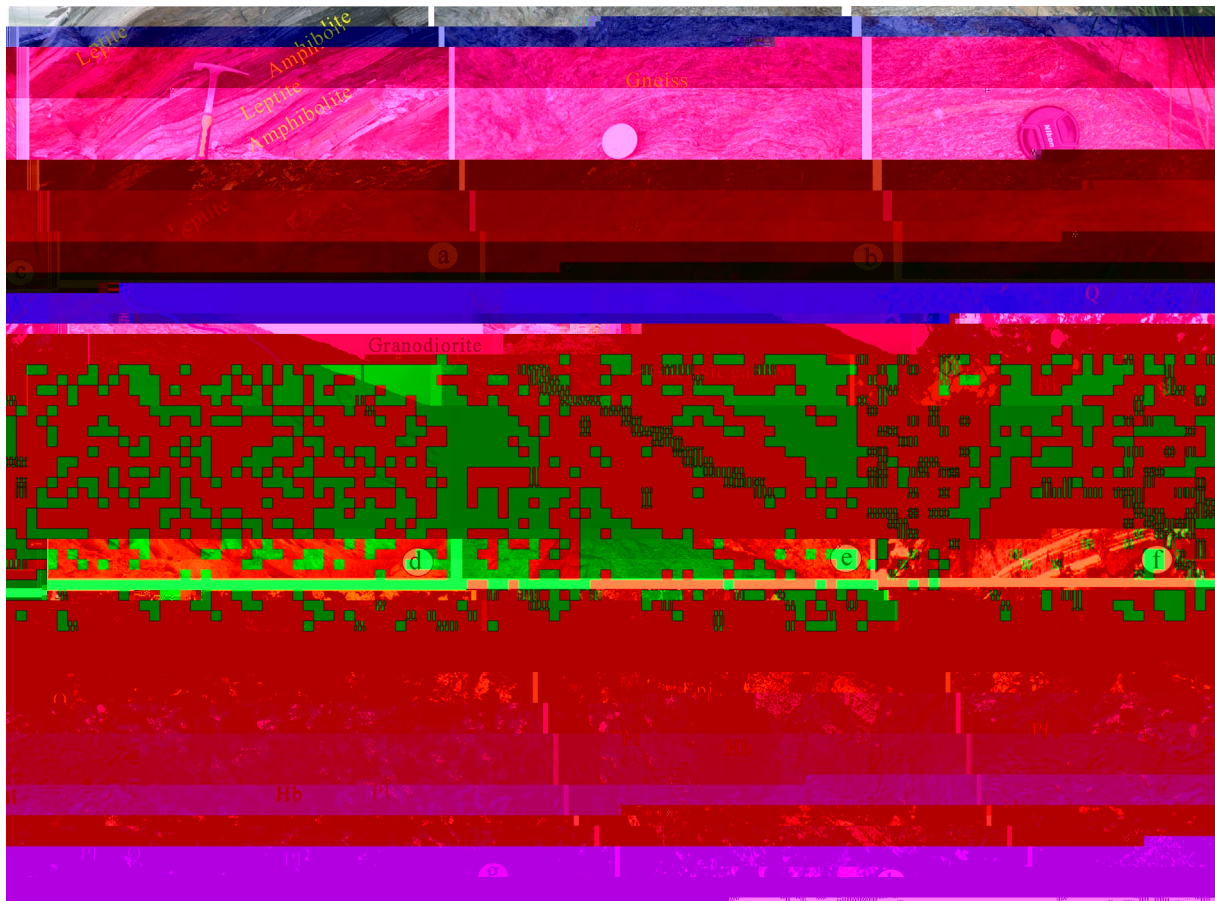


Fig. 3. (a)–(f) Photomicrographs showing the textures of the rocks. (a) Leptite, (b) Amphibolite, (c) Leptite, (d) Amphibolite, (e) Gneiss, (f) Granodiorite. The scale bars represent 1 mm.

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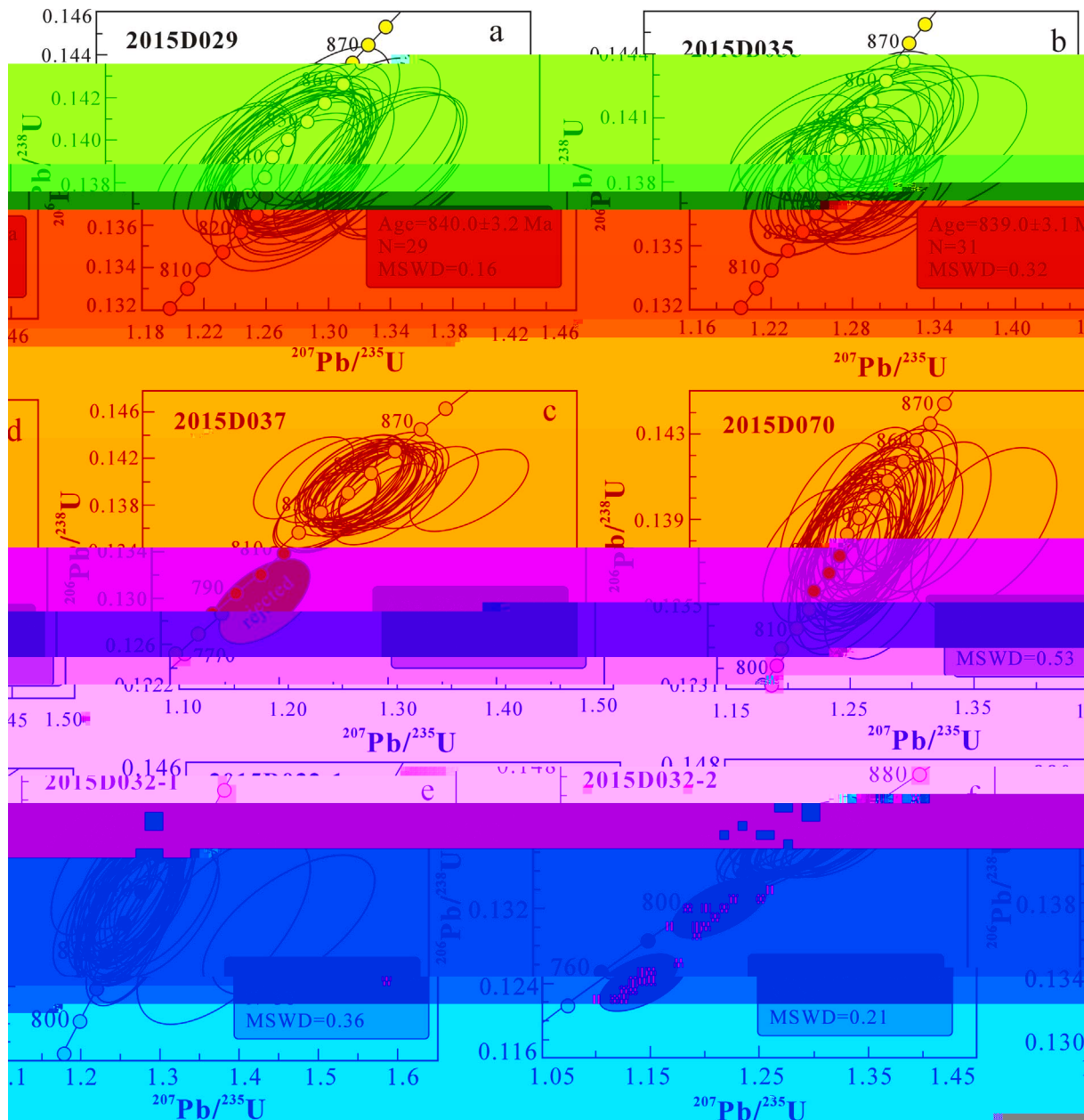


Fig. 6. $^{206}\text{Pb}/^{238}\text{U}$ vs $^{207}\text{Pb}/^{235}\text{U}$ isochron diagrams for different samples.

5.2.2. The granodiorite

The granodiorite samples (2015D029, 2015D035, 2015D037, 2015D070, 2015D032-1, 2015D032-2) show a range of ages from 760 Ma to 840 Ma. The ages are generally consistent with the regional tectonic evolution. The MSWD values are mostly below 1, indicating good fit of the data to a single age. The 2015D032-1 and 2015D032-2 samples show a younger age of 760 Ma, which may represent a later stage of the granitoid intrusion.

5.3. Zircon Hf isotope compositions

The zircon Hf isotope compositions of the granodiorite samples are plotted in Fig. 7. The $\epsilon_{\text{Hf}}(t)$ values range from -10 to +10, indicating a range of Hf isotopic compositions. The positive $\epsilon_{\text{Hf}}(t)$ values suggest a juvenile crustal source, while the negative values suggest a recycled crustal source. The Hf isotope compositions are consistent with the tectonic evolution of the region.

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6.2. Petrogenesis of the granodiorite

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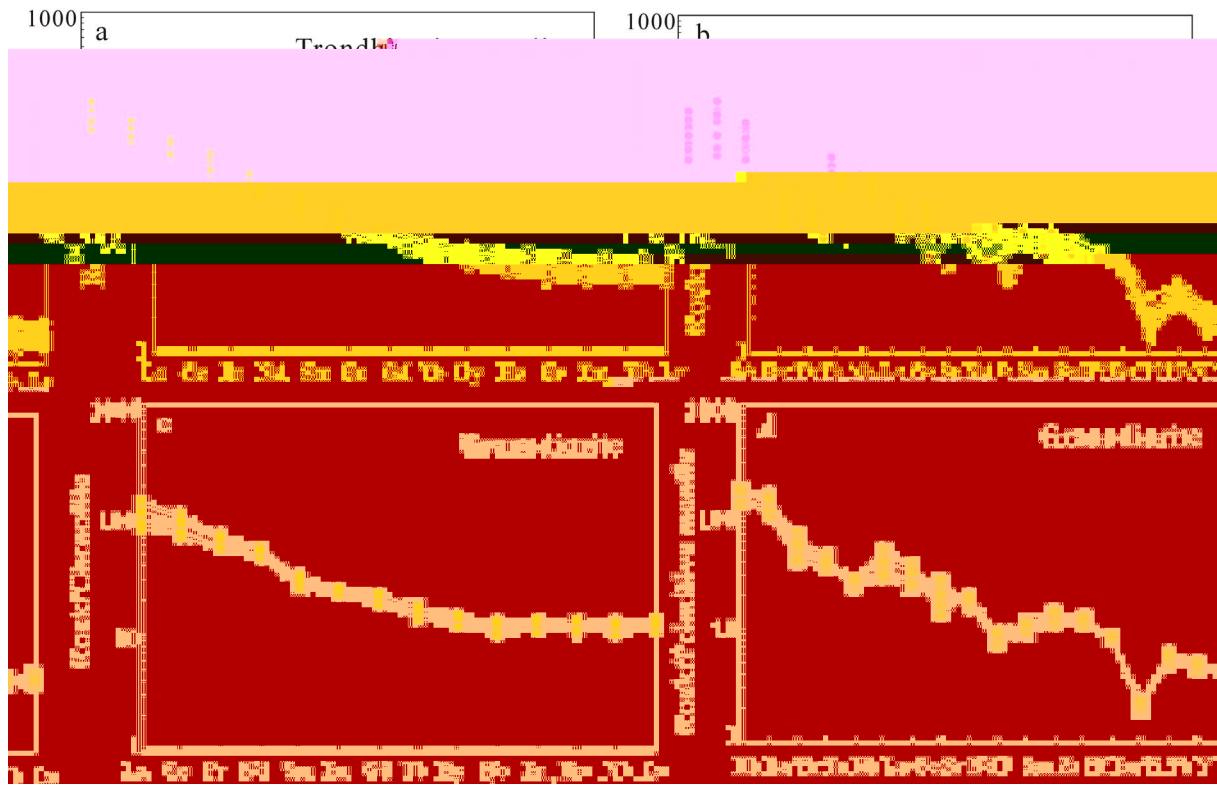


Fig. 10. Trace element patterns of the granitoids from the Neoproterozoic in the study area. The patterns are normalized to the primitive mantle composition of Sun and McDonough (1989). The patterns are similar to those of continental crust (see also Fig. 11).

The granitoids from the study area show a wide range of compositions, from quartz-diorite to granite. The quartz-diorite (Fig. 10c) is characterized by high SiO₂ and low K₂O and Na₂O contents, and is enriched in light rare earth elements (La, Ce, Nd, Sm, Eu, Tb, Tm, Er, Yb, Lu). The granite (Fig. 10b) is characterized by high K₂O and Na₂O contents, and is enriched in heavy rare earth elements (Tm, Er, Yb, Lu). The gneiss (Fig. 10d) is characterized by high SiO₂ and low K₂O and Na₂O contents, and is enriched in light rare earth elements (La, Ce, Nd, Sm, Eu, Tb, Tm, Er, Yb, Lu). The tonalite (Fig. 10a) is characterized by high SiO₂ and low K₂O and Na₂O contents, and is enriched in light rare earth elements (La, Ce, Nd, Sm, Eu, Tb, Tm, Er, Yb, Lu).

6.3. Tectonic implications

6.3.1. Tectonic environment of the Neoproterozoic granitic intrusions

The Neoproterozoic granitic intrusions in the study area are characterized by high SiO₂ and low K₂O and Na₂O contents, and are enriched in light rare earth elements (La, Ce, Nd, Sm, Eu, Tb, Tm, Er, Yb, Lu). This is characteristic of continental crust. The granitoids are similar to those of continental crust (see also Fig. 11). The granitoids are similar to those of continental crust (see also Fig. 11).

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6.3.2. The initial breakup of the Rodinia supercontinent

The initial breakup of the Rodinia supercontinent is characterized by high SiO₂ and low K₂O and Na₂O contents, and is enriched in light rare earth elements (La, Ce, Nd, Sm, Eu, Tb, Tm, Er, Yb, Lu). This is characteristic of continental crust. The granitoids are similar to those of continental crust (see also Fig. 11).

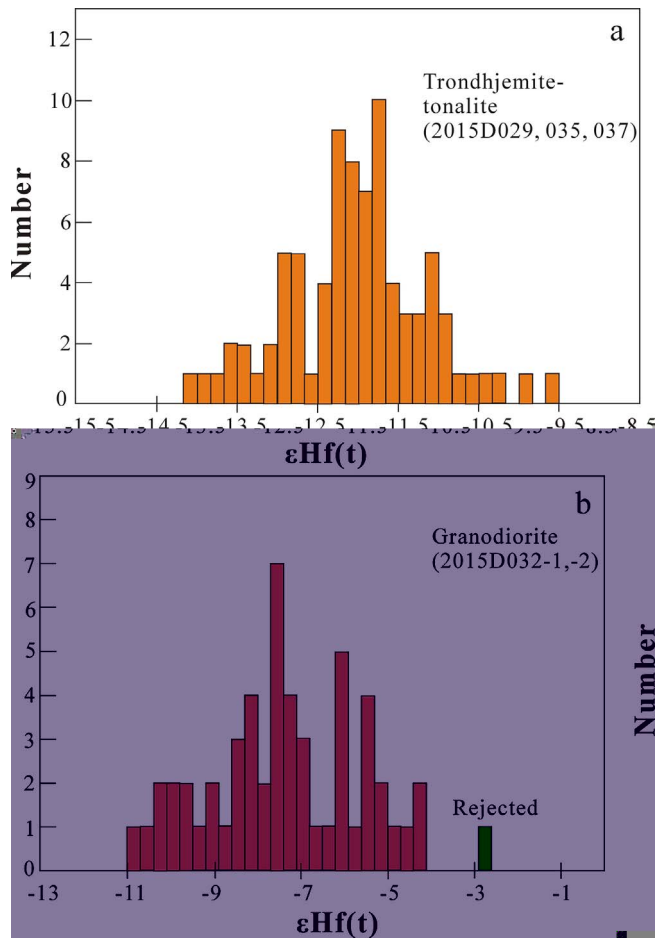


Fig. 11. Histograms of $\epsilon_{\text{Hf}}(t)$ for Trondhjemite-tonalite (a) and Granodiorite (b).

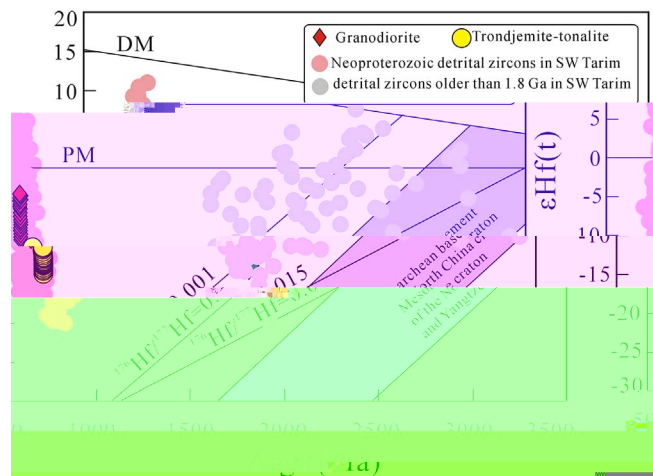


Fig. 12. Hf isotope evolution diagram showing $\epsilon_{\text{Hf}}(t)$ vs. time (Ga). The diagram includes DM (Depleted Mantle), PM (Primitive Mantle), and various crustal and mantle reservoirs. Key features include 'Neoproterozoic detrital zircons in SW Tarim', 'detrital zircons older than 1.8 Ga in SW Tarim', and 'Mesoproterozoic China craton and Yangtze'.

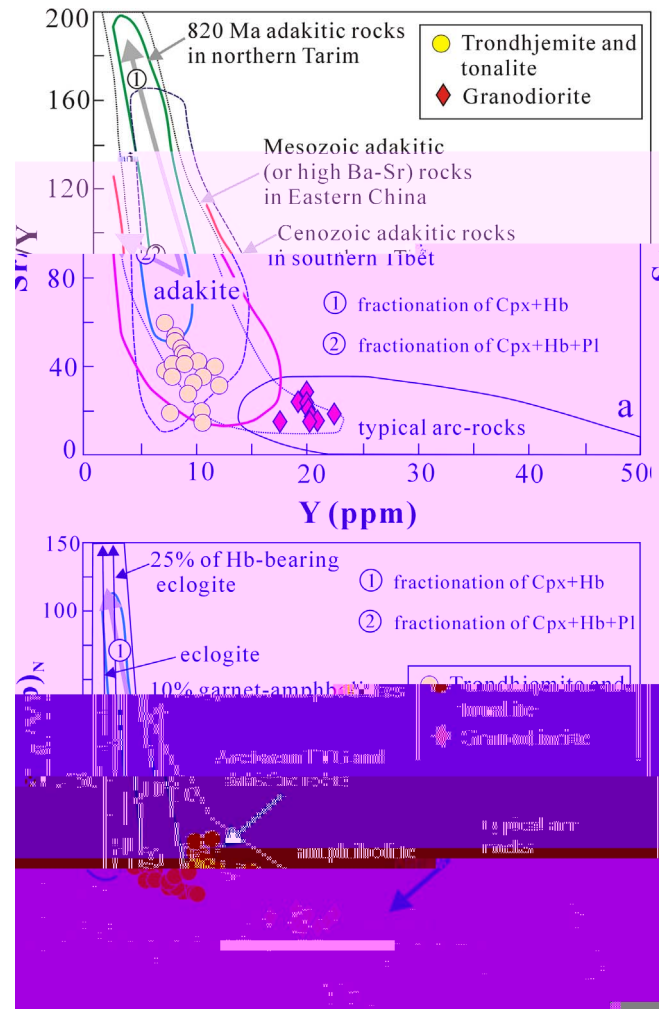


Fig. 13. Sr/Y vs. Y (ppm) diagram. Panel (a) shows 820 Ma adakitic rocks in northern Tarim, Mesozoic adakitic rocks in Eastern China, and Cenozoic adakitic rocks in southern Tibet. Panel (b) shows eclogite and 25% of Hb-bearing eclogite. Both panels include fractionation curves for Cpx+Hb and Cpx+Hb+Pl.

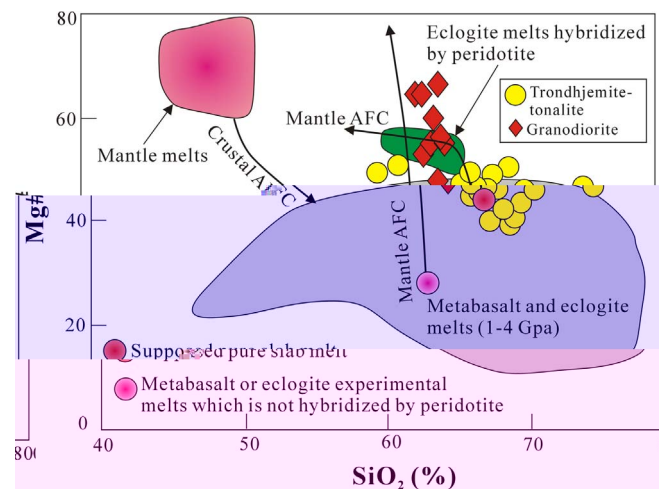


Fig. 14. Mg# vs. SiO₂ (%) diagram. The diagram shows Mantle melts, Crustal AFC, Mantle AFC, Eclogite melts hybridized by peridotite, Trondhjemite-tonalite, and Granodiorite. A shaded region represents 'Metabasalt and eclogite melts (1-4 Gpa)'.

The Precambrian terranes in the Tibetan Plateau are divided into two distinct types based on their geological characteristics and tectonic evolution. The first type is characterized by high-grade metamorphic rocks and mafic intrusions, indicating a continental arc setting. The second type is characterized by low-grade metamorphic rocks and sedimentary sequences, indicating a passive margin setting. The tectonic evolution of these terranes is related to the collision of the Indian and Eurasian plates, which resulted in the formation of the Tibetan Plateau.

6.3.3. Two distinct types of the Precambrian terranes in Tibetan Plateau

The Precambrian terranes in the Tibetan Plateau are divided into two distinct types based on their geological characteristics and tectonic evolution. The first type is characterized by high-grade metamorphic rocks and mafic intrusions, indicating a continental arc setting. The second type is characterized by low-grade metamorphic rocks and sedimentary sequences, indicating a passive margin setting. The tectonic evolution of these terranes is related to the collision of the Indian and Eurasian plates, which resulted in the formation of the Tibetan Plateau.

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1. The first part of the document discusses the importance of maintaining accurate records of all transactions. It emphasizes that proper record-keeping is essential for the integrity of the financial system and for the ability to detect and prevent fraud. The text notes that without reliable records, it would be difficult to track the flow of funds and identify any irregularities.

2. The second part of the document outlines the specific requirements for record-keeping. It states that all transactions must be recorded in a clear and concise manner, using a standardized format. This includes recording the date, amount, and purpose of each transaction. The text also mentions that records should be maintained for a minimum of five years, unless otherwise specified by law.

3. The third part of the document discusses the role of internal controls in ensuring the accuracy of records. It explains that internal controls are designed to prevent errors and fraud by establishing a system of checks and balances. The text notes that these controls should be regularly reviewed and updated to reflect changes in the organization's operations.

4. The fourth part of the document addresses the issue of data security. It states that all records must be stored in a secure and confidential manner, protected from unauthorized access and disclosure. The text also mentions that appropriate measures should be taken to ensure the integrity and availability of the data, such as regular backups and disaster recovery plans.

5. The fifth part of the document discusses the importance of transparency and accountability in the financial system. It notes that accurate records are essential for providing a clear and complete picture of the organization's financial performance. The text also mentions that this information is crucial for stakeholders, including investors, creditors, and the public, to make informed decisions.

6. The sixth part of the document discusses the role of technology in record-keeping. It notes that the use of digital systems can significantly improve the efficiency and accuracy of record-keeping. However, it also emphasizes that these systems must be properly implemented and maintained to ensure their effectiveness. The text also mentions that appropriate security measures must be in place to protect the data from cyber threats.

7. The seventh part of the document discusses the importance of training and education for staff involved in record-keeping. It notes that staff should receive regular training to stay up-to-date on the latest record-keeping practices and technologies. The text also mentions that this training should cover both technical skills and the importance of maintaining high standards of accuracy and integrity.

8. The eighth part of the document discusses the role of external audits in ensuring the accuracy of records. It notes that external audits provide an independent and objective assessment of the organization's financial records. The text also mentions that these audits are essential for identifying any weaknesses or areas for improvement in the record-keeping process.

9. The ninth part of the document discusses the importance of regular reviews and updates to the record-keeping system. It notes that the system should be regularly reviewed to ensure it remains effective and efficient. The text also mentions that updates should be made as needed to reflect changes in the organization's operations or regulatory requirements.

10. The tenth part of the document discusses the importance of maintaining a clear and concise record-keeping policy. It notes that a well-defined policy provides a clear framework for staff to follow and ensures consistency in the way records are maintained. The text also mentions that this policy should be regularly reviewed and updated to reflect changes in the organization's needs and regulatory requirements.

