Analysis of geographically distributed ore deposit production status data

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Abstracts Analyzing the geographic distribution of ore deposits is crucial in understanding global resource availability, economic implications, and environmental impacts of mining activities. This article examines the distribution patterns of various ore types worldwide, highlighting their economic significance and current mining status. Utilizing tools such as Pandas for data preprocessing, Matplotlib and Seaborn for visualization, Geopandas for geographic data handling, and Scikit-learn for clustering analysis, we present a comprehensive review of ore deposits. Major ore types such as gold, copper, and iron are explored, emphasizing their industrial importance and geographic prevalence. The analysis reveals that many deposits are classified as Past Producers, indicating extensive historical mining activity. This underscores the need for efficient resource management and sustainable mining practices in the future. By understanding these distributions and statuses, stakeholders can better strategize for future mining ventures and environmental stewardship.

1 Introduction

Analyzing the geographic distribution of ore deposits is an important task in geology and mining [1-10]. It provides a better understanding of the distribution of resources, their economic significance and the potential environmental impacts of mining. In this article, we will review the distribution of ore deposits around the world, highlight the most common ore types and analyze their current mining status [11-38].

2 Methods

The following methods and tools were used to analyze ore deposit data:
- Pandas - for data loading and preprocessing.
- Matplotlib and Seaborn - for data visualization.
- Geopandas - for working with geographic data and creating maps.
- Scikit-learn - for cluster data analysis.

The following code was used to load the data:

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```
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
import geopandas as gpd
from sklearn.cluster import KMeans
from sklearn.preprocessing import StandardScaler

# Загрузка данных
file_path = '/mnt/data/image.png'
df = pd.read_csv(file_path)

# Предварительная обработка данных
df = df.dropna(subset=['latitude', 'longitude'])  # удаление строк без координат
df['latitude'] = pd.to_numeric(df['latitude'], errors='coerce')
df['longitude'] = pd.to_numeric(df['longitude'], errors='coerce')
df = df.dropna(subset=['latitude', 'longitude'])
```

Fig. 1 - Data loading

```
plt.figure(figsize=(12, 8))
plt.scatter(df['longitude'], df['latitude'], color='red', s=1)
plt.title('Географическое распределение рудных месторождений')
plt.xlabel('Долгота')
plt.ylabel('Широта')
plt.show()
```

Fig. 2 - Data visualization

```
plt.figure(figsize=(10, 6))
ore_counts = df['ore_type'].value_counts().head(20)
ore_counts.plot(kind='bar')
plt.title('Самые популярные виды руд')
plt.xlabel('Вид руды')
plt.ylabel('Количество упоминаний')
plt.show()
```

Fig. 3 - Most mentioned ore types

```
plt.figure(figsize=(10, 6))
status_counts = df['development_status'].value_counts()
sns.barplot(x=status_counts.index, y=status_counts.values, palette='pastel')
plt.title('Частота различных статусов разработки')
plt.xlabel('Статус разработки')
plt.ylabel('Количество')
plt.show()
```

Fig. 4. - Frequency of different processing statuses

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Geographical distribution of ore deposits

Ore deposits are formed by various geological processes such as magmatic, metamorphic and sedimentary activities. The geographic distribution of these deposits depends on the geologic history of the region, tectonic activity, and climatic conditions. For example, large copper deposits are often associated with areas of active volcanism, such as the Andes in South America.

Different types of ores have different economic importance. Gold, copper, and iron are the most important in the world economy because of their widespread use in industry, construction, and electronics. Less common ores, such as uranium and rare earth elements, are also highly valuable because of their use in nuclear power and high-tech devices.

Mineral deposits may be at different stages of development, from initial exploration drilling to active production and completion of operations. Understanding the current development status of mineral deposits allows us to assess their economic significance and plan future development activities.

2.1 Geographical distribution of ore deposits

The first graph shows that ore deposits are widely distributed around the world, especially in the Americas, Europe, Asia and Africa.

This indicates the global nature of mining and the diversity of deposits in different geological settings.

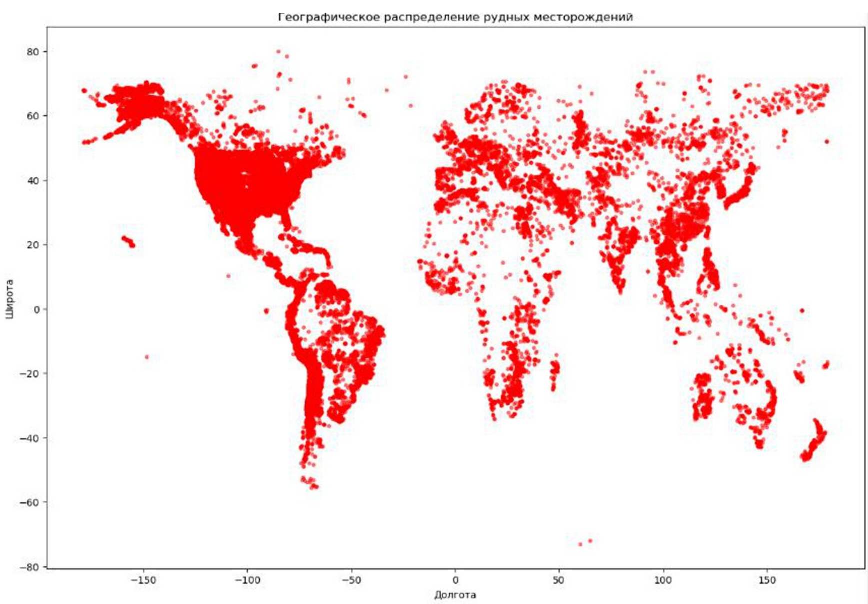

Fig. 5 - Geographical distribution

2.2 The most popular types of ores

The second graph shows that gold is the most frequently mentioned ore, followed by construction sand and gravel, copper and iron. This is in line with global mining trends where gold, copper and iron play key roles in industry and the economy.

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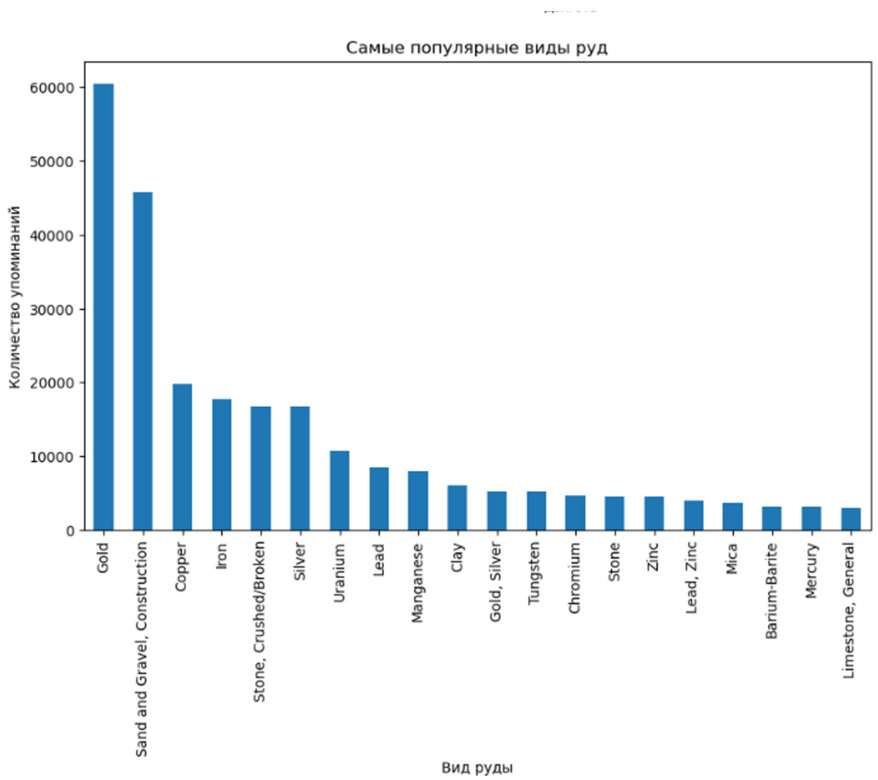

Fig. 6 - Most mentioned ore types

2.3 Frequency of different mining statuses

The third graph shows that most of the deposits have a Past Producer status, which means that the deposits have been mined in the past. This may indicate that many ore deposits have already been partially or fully exhausted or mining has been suspended for various reasons.

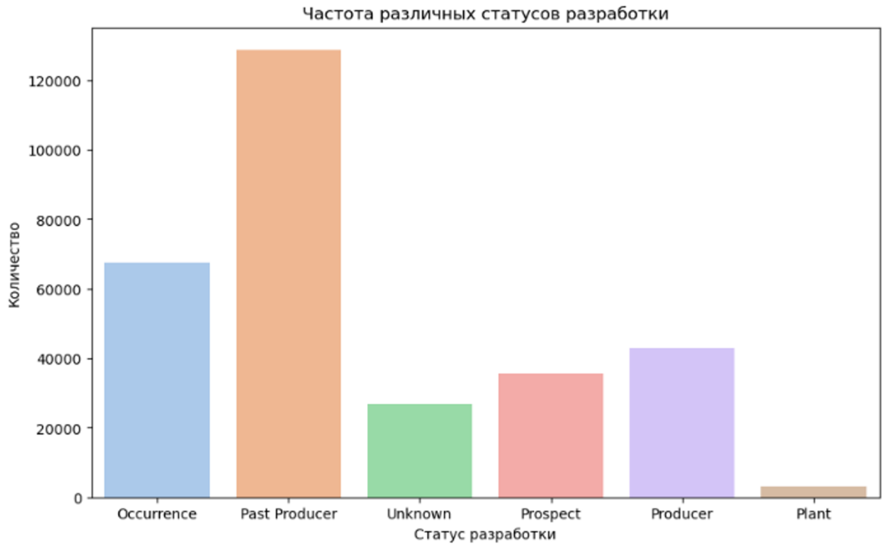

Fig. 7 - Frequency of different processing statuses

3 Conclusion

The analysis of ore deposits shows a wide geographical distribution and diversity of ore types, which emphasizes the importance of these resources for the world economy. The large number of deposits with Past Producer status indicates a significant mining history. Further research could focus on analyzing the economic and environmental efficiency of mining, as well as the search for new deposits.

Understanding the geographical distribution of ore deposits and their current mining status enables better planning of future mining projects and more informed resource management decisions.

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