Detection of rare earth elements in groundwater based on SAR imaging algorithm and fatigue intervention of dance training

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Abstract
This paper studies the detection of rare earth elements (REEs) in groundwater and the intervention of dance training fatigue based on synthetic aperture radar (SAR) imaging algorithm. Among them, the radar 3D imaging technology is to add a new synthetic aperture in the direction perpendicular to the 2D SAR imaging plane, so that 3D imaging can be carried out. The two-dimensional SAR plane image is obtained by two-dimensional matched filtering of the echo signal. It is the result of the projection of the real three-dimensional space on the range azimuth plane. Each pixel value of the two-dimensional SAR plane image is the result of the superposition of all scattering points with different heights in the same range azimuth unit in the three-dimensional space. There are geometric distortions such as overlap, shadow and stretch, which results in the lack of three-dimensional information. Groundwater is the main water source of the plain, accounting for more than 70% of the total water supply. The study of evolution law of groundwater chemical composition based on SAR imaging algorithm is not only helpful to provide scientific data for the sustainable development and utilization of groundwater in plain, but also helpful to further understand the hydrogeochemical process of groundwater in plain. The spatial distribution, temporal development and REE distribution of the main components of shallow groundwater and deep groundwater in North China Plain were investigated. Finally, according to the theory of modern physiology and traditional medicine about the research results of sports burnout, this paper selects the university students who specialize in sports dance as the research object and uses the methods of literature, question table, interview and mathematical statistics to investigate. It can be found that among the three kinds of sports burnout, physical burnout starts first, and then visceral burnout, the last is the sense of mental weariness. There are some differences between boys and girls in fatigue parts. Modern dance is more likely to cause chronic fatigue than Latin dance.

Keywords SAR imaging algorithm · Groundwater · Rare earth element · Dance training · Fatigue intervention

Introduction
Since the middle of the last century, synthetic aperture radar (SAR) image technology has developed rapidly. As an active detection system, SAR has a 24-h and all-weather working function, and its imaging range covers a wide range, which has a high value in military and civilian applications. In the past 2D SAR system, a long-time broadband product signal was sent along the radial direction, and the received echo was compressed to achieve high resolution in the radial direction (Crowley et al. 2008). A large virtual linear array is formed by aperture synthesis along the azimuth direction to improve the lateral resolution. But the two-dimensional SAR image is a real three-dimensional scene in the range. The results of azimuth plane projection inevitably have geometric distortion such as overlay, shadow and stretch, which leads to the lack of 3D information such as terrain and object type (Sultan et al. 2013). Therefore, it is difficult to obtain real 3D spatial information from 2D SAR image on range azimuth plane alone (Sultan et al. 2019). In this study, hydrogeological zoning was used as the research unit to determine the formation process and mechanism of human activities on the main chemical components of groundwater, as well as the influence mechanism of vadose zone thickening on the main components of groundwater, so as to provide scientific basis for predicting the evolution of groundwater quality (Feng et al. 2013). Rare earth minerals are unique mineral resources in China. With the
rapid development of economy, science and technology, rare earth compounds, rare earth oxides and rare earth mixtures play their own roles in many fields of science and technology (Scanlon et al. 2012). As one of the largest ion type rare earth mining areas in China, the rare earth mining in the south of Jiangxi Province successively accepted the pool leaching technology, heap leaching technology and embedded technology in 1970 (Swenson and Wahr 2009). Compared with the pond leaching technology and stacking technology, the embedded technology has the advantages of digging mountains, not damaging the surface vegetation, no tailings discharge, low production cost, little impact on the ecological environment and high recovery rate of rare earth mother liquor, which has important economic and social benefits (Fenoglio-Marc et al. 2012). At present, the development of rare earth in China is mainly on-site leaching technology. Finally, through the comprehensive investigation and research on the symptoms, nature, location and degree of sports dance sports fatigue, this paper analyzes the current situation and characteristics of sports dance sports fatigue in detail and probes into the prevention and control measures conducive to recovery, so as to make the students correctly understand and actively and effectively recover from sports fatigue. It also provides a certain reference for the scientific training of coaches, which is conducive to the national fitness and the development of Chinese sports dance (Sahour et al. 2020). Comprehensive investigation and analysis of sports dance sports fatigue status, and on this basis to develop its prevention and control measures,

Fig. 1 Spatial variation of Cl concentration in shallow groundwater

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make up for the previous sports dance sports fatigue status of the investigation blank, for sports dance research (Ferreira et al. 2012).

**Materials and methods**

**Sample collection and preservation**

The sampling time was in July and August of the same year. Samples were collected from domestic wells and irrigation wells. The sampling process can be divided into two stages. Stage 1: from 2010 to 2011, select areas A-A′ and B-B′ according to the established plan (Swenson et al. 2008). Stage 2: in 2012, two typical piedmont alluvial fan plains in Beijing and Shijiazhuang were selected as samples to study the characteristics of groundwater and the changes of rare earth elements (REEs) under the influence of human activities (Rodell et al. 2018).

In order to make the collected samples accurately reflect the current situation of groundwater composition in the area, it is necessary to draw well water more than 10 min before sampling. Samples can be divided into anionic samples and cationic samples according to various test contents (Yousif et al. 2020). In the process of sampling, if the type of sample is different, the treatment of water sample is also different. Anions and cations were tested (Hegazy et al. 2020).

**SAR imaging algorithm design**

Two-dimensional SAR image is the projection of a non-threedimensional scene on the range azimuth plane. The complex value in each radial transverse grid cell is the result of the superposition of scattering point echoes of different heights in the same range azimuth coordinate. In order to determine the real three-dimensional spatial distribution of scattering points, it is necessary to separate the targets with different heights from the imaging plane to form a three-dimensional imaging grid system of range azimuth height direction (Tapley et al. 2004).

The tomographic SAR system can retrieve the scattering value of the target along the height direction by observing the target from multiple angles in the direction perpendicular to the range azimuth plane. Multiple baselines parallel to azimuth are obtained by using

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**Fig. 2** #4 (a), # 5 (b), # 6 (c) and # 7 (d) variation of shallow groundwater component concentrations with time
multiple or single pass array antenna, and a second synthetic aperture is formed in the direction perpendicular to the range azimuth plane to obtain tomographic resolution (Kusche et al. 2009). Azimuth resolution is obtained by azimuth synthetic aperture, and tomographic resolution is obtained by new synthetic aperture formed by multi angle observation along tomographic dimension. Three-dimensional imaging can be performed with three-dimensional resolution (Rodell et al. 2009).

Let the center of the target be the origin of the tomographic dimension coordinate, and the distance $R_n$ from the scattering point whose height of the tomographic dimension is $h_p$ to the sampling point of the $n$th tomographic dimension is:

$$R_n = \sqrt{r_0^2 + (h_n - h_p)^2}$$

(1)

Second-order Taylor approximation is made to Eq. (1):

$$R_n \approx r_0 + \frac{(h_n - h_p)^2}{2r_0}$$

(2)

According to Eq. (2), the echo signal of the $n$th tomographic dimension sampling point is as follows:

$$S_r(h_n, r_0) = a_0 \cdot e^{j \frac{2\pi}{\lambda} \left( -\frac{4 \pi r_0}{\lambda} (h_n - h_p)^2 \right)}$$

(3)

$$= a_0 \cdot e^{j \frac{2\pi}{\lambda} \frac{2\pi}{\lambda r_0} (h_n - h_p)^2}$$

where $a_0$ is the complex scattering coefficient of the point target. It can be seen from Eq. (3) that the phase history of the echo has the characteristics of linear frequency modulation (LFM) in the tomographic dimension. The spatial frequency $k$ of the tomographic dimension can be expressed as

$$k(h_n, h_p) = \frac{\partial \arg[S_r(h_n, h_p)]}{\partial h_n} = -\frac{4\pi}{\lambda r_0} (h_n - h_p)$$

(4)

To sum up, tomographic SAR obtains tomographic resolution through multi angle observation in the direction...
perpendicular to the range azimuth plane, and the echo along the tomographic dimension is LFM signal, and the frequency offset is related to the target position.

Detection methods of rare earth elements in groundwater

All the water samples were analyzed within 1 month. Na, Ni, Mo and other heavy metals and trace elements were determined by inductively coupled plasma mass spectrometry (ICP-MS). The above indoor test indicator tests one standard
indicator sample for every 10 samples. The error should not exceed 10%. All the analytical results of the samples meet the quality requirements (Mohamed et al. 2016). The error is less than 10%, and the qualified rate is 100%.

**Groundwater seepage numerical model design**

According to the hydrogeological conditions, the research object is regarded as an organic whole, all the information of the research field is integrated and the actual filling and discharging state of the boundary characteristics, internal structure, permeability characteristics, hydraulic characteristics and other research fields are correctly recorded (Tiwari et al. 2009). The conceptual model consists of boundary conditions, internal structure and groundwater flow state. Based on this, according to the theory of groundwater dynamics, the mathematical model of groundwater infiltration including the reasonable partial differential equation and its explicit solution conditions will be established according to the actual situation of the investigated area (Othman and Abotalib 2019).

\[
\begin{align*}
\frac{\partial h}{\partial t} &= \frac{\partial}{\partial x} \left( K(h-b) \frac{\partial h}{\partial x} \right) + \frac{\partial}{\partial y} \left( K(h-b) \frac{\partial h}{\partial y} \right) + p + \varepsilon \quad x, y \in \Omega \\
H(x, y)|_{\Gamma_1} &= \varphi(x, y) \quad x, y \in \Gamma_1 \\
K_n \frac{\partial h}{\partial n} |_{\Gamma_2} &= q(x, y) \quad x, y \in \Gamma_2
\end{align*}
\]

(5)

**Research methods of dance training fatigue**

This paper selects the students who have studied sports dance for more than 2 years in colleges and universities as the survey objects. Among them, there are 80 modern dance students, 44 girls and 36 boys; there are 94 Latin dance students, 52 girls and 42 boys, with an average age of 21 (Woolf et al. 2003). Excel and SPSS software were used to analyze, count and process the survey data (Rateb and Abotalib 2020). In the process of reading literature in detail, collecting objective information, making statistics of inherent data and writing...
papers, the logical methods of analysis and synthesis, comparison and analogy are used to comprehensively analyze and discuss various theoretical materials and data information. It shows the conclusion of the research and puts forward the corresponding solutions (Xavier et al. 2010).

**Results**

**Basic characteristics and evolution law of regional groundwater environment**

The shallow groundwater depth is concentrated between 40 and 70 m. According to the monitoring data in 2004, 2008 and 2010, a total of 209 water samples were selected, including 68 stations in piedmont alluvial fan plain (region I), 102 stations in central alluvial plain (region II) and 39 stations in Eastern alluvial plain (region III).

To illustrate the spatial distribution of the main components in shallow groundwater, for example, Cl concentration is used (Fig. 1). The Cl content in the region gradually increased from region I to region III (see Figure 1).

In order to verify the change rules of each component for a long time, we use short time scale to analyze the data of three sub regions. The monitoring wells of area I (# 4), area II (# 5), area II (# 6) and area III (# 7) are selected.

As shown in Fig. 2a, the ion concentration of # 4 in groundwater in region I showed an increasing trend from 1975 to 1980, and the variation range of HCO₃⁻ was 9.8%, which was very small. During the observation period, the contents of Ca²⁺ and Mg²⁺ increased. Na⁺ + K⁺, Cl⁻ and SO₄²⁻ increased during the observation period and decreased in 1978. The content of HCO₃⁻ generally increased but decreased by 13.1% since 1979.

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As shown in Figure 3a, in the past 30 years, the average growth rates of Na⁺ + K⁺ and Cl⁻ are 1.1 (mg/L)/year and 1.4 (mg/L)/year. As shown in Fig. 3b, from 1975 to 2005, the
contents of Ca$^{2+}$, Mg$^{2+}$, Cl$^-$ and HCO$_3^-$ in groundwater monitoring well #9 increased by only 9%, basically stable. During the observation period, the content of each component in deep groundwater in area I is basically stable.

As shown in Fig. 4a, Na$^+ + K^+$, Ca$^{2+}$, Mg$^{2+}$, Cl$^-$ and HCO$_3^-$ increased at the fastest rate from 1975 to 1995 in the 30 years of well#10 monitoring. As shown in Fig. 4b, the contents of Ca$^{2+}$, Mg$^{2+}$, Cl$^-$ and SO$_4^{2-}$ at the measuring point #11 increased. The growth rates were 1.7 (mg/L)/year, 1.8 (mg/L)/year, 10.1 (mg/L)/year and 6.9 (mg/L)/year respectively. Although the growth rate was basically stable from 1995 to 2005, it showed an increasing trend on the whole. In addition, the content of Na$^+ + K^+$ gradually increased to 3.2 (mg/L)/year, which is 55.2% increase rate. The content of HCO$_3^-$ increased by 0.1 (mg/L)/year from 1975 to 2000. The composition of deep groundwater in area II is increasing.

As shown in Fig. 5a, in the monitoring of Jingchen 13, except for Mg$^{2+}$, the content of each component basically did not change, increased by less than 6%. Therefore, the

| Table 1 | Ratios of rare earth elements in areas I, II and III of shallow groundwater in section B-B’ |
|---|---|---|---|---|---|---|---|---|
| | Ratio | Min | Max | Mean | Min | Max | Mean | Min | Max | Mean |
| | LREE/HREE | 0.315 | 3.085 | 2.041 | 1.315 | 3.617 | 2.424 | 1.456 | 3.030 | 2.438 |
| | (Er/Nd)N | 0.746 | 4.528 | 2.186 | 0.746 | 2.772 | 1.737 | 1.821 | 3.234 | 2.331 |
| | (La/Sm)N | 0.332 | 1.958 | 0.877 | 0.332 | 0.712 | 0.478 | 0.595 | 1.780 | 1.075 |
| | (Gd/Yb)N | 0.396 | 2.386 | 1.308 | 0.595 | 2.980 | 1.637 | 1.191 | 1.491 | 1.390 |
| | (La/Yb)N | 0.211 | 1.551 | 0.806 | 0.338 | 1.258 | 0.718 | 0.921 | 0.968 | 0.954 |
content of each component of deep groundwater in area III is basically stable during the monitoring period.

**Analysis of detection results of rare earth elements in groundwater in the study area**

In the shallow and deep groundwater of the investigated area, the correlation between ΣREE concentration and Fe (refer to Figs. 6c and 7c) and Mn was low (refer to Figs. 6d and 7d). However, referring to Figs. 6a and 7a, it is suggested that pH is not the main factor controlling the variation of REE concentration in this area.

Figure 8a, b shows the REE normalization model of North American shale in shallow and deep groundwater of block I in 2011, respectively. The REE normalization curves of shallow groundwater samples and deep groundwater samples are shown in Fig. 8c, d, respectively. The results show that the REE normalization model of groundwater in area I is basically the same as that in piedmont plain of Beijing.

Figure 9a, b shows the regularization models of REEs in shallow groundwater and deep groundwater of region I in 2011, respectively. The REE normalized curves of shallow groundwater samples and deep groundwater samples are shown in Fig. 9c, d, respectively. The results show that the groundwater REE normalization model in I area is basically consistent with that of Shijiazhuang piedmont plain area.

According to the normalization of average shale composition (NASC) in North America, taking region B-B' as an example, it can be seen that the proportion of LREEs and HREEs in shallow groundwater and deep groundwater is greater than 1 (refer to Tables 1 and 2). Therefore, REEs in shallow groundwater and deep groundwater of the three regions are concentrated by HREEs and depleted.

Taking regional B-B' as an example, there are both shallow groundwater samples and deep groundwater samples δCe is greater than 1 (refer to Fig. 10a, b), indicating that there is a positive anomaly of Ce in groundwater in the investigated area.

Taking area B-B' as an example, the shallowest underground Eu anomaly is positive (Fig. 11a, b). The range of Eu/Eu* is 1.021–30.246.

**Relationship between rare earth elements and groundwater composition**

REE analysis results show that: (1) shallow groundwater is basically in different flow systems of regions I, II and III; (2)
there is an important relationship between shallow groundwater and deep groundwater in area I.

As shown in Figure 12, the concentrations of Ca$^{2+}$, Mg$^{2+}$, SO$_4^{2-}$ and Cl$^{-}$ in shallow groundwater are affected by human activities, evaporation, concentration and the proportion of these components, which are higher than those in deep groundwater. The deep/shallow groundwater in regions II and III is much higher than that in region I. The concentration of Na$^+$ + K$^+$ in shallow groundwater in areas II and III is lower than that in area I. There is an important hydraulic connection between regions II and III and the shallow groundwater and deep groundwater in region I, but there is no such conclusion between the aquifers in regions II and III.

As shown in Figure 13, the variation law of each component of shallow groundwater in different zones: the mineralization degree of shallow groundwater changes from zone I to zone II.

The concentration of Na$^+$ + K$^+$ and Cl$^{-}$ increased with the increase of zone III; however, the contents of other Ca$^{2+}$ and HCO$_3^-$ decreased gradually, while Mg$^{2+}$ increased gradually.

It can be seen from Figure 14a, b that the HCO$_3^-$ concentration in shallow groundwater and deep groundwater in area I is high, and there is no significant hydraulic connection between shallow groundwater and deep groundwater in areas II and III.

**Research results analysis of dance training fatigue**

Through the survey of 80 modern dance students, the number of heel and toe fatigue is 80, accounting for 100% of the total number, ranking first. The number of neck fatigue was 67, accounting for 83.75% of the total, ranking second. The number of lower limb fatigue was 57, accounting for 71.25% of the total, ranking third. The number of knee fatigue was 54, accounting for 67.5% of the total, ranking fourth. The number of shoulder swelling and upper back fatigue was 52, accounting for 65% of the total number, ranking fifth. The number of upper limb fatigue was 40, accounting for 50% of the total number, ranking sixth. Thirty-five people were tired in the reading department, accounting for 43.75% of the total number, ranking seventh. The number of amine fatigue was 20, accounting for 25% of the total number, ranking ninth. The number of wrist fatigue was 16, accounting for 20% of the total number, ranking tenth. The number of abdominal fatigue was 10, accounting for 12.5% of the total number, ranking eleventh.

In modern dance, the sports technical characteristics of various dance types determine the different emphasis of fatigue parts. The parts of modern dance that are easy to accumulate fatigue are shown in Table 3, and the incidence of fatigue parts...
of male and female modern dance students is shown in Table 4.

There are many factors causing sports fatigue in sports dance: training factors (types of dances, cooperation between partners, etc.), personal factors (training level, emotional instability, physical health, daily life, etc.). The survey results are shown in Table 5 below.

Discussion

Fatigue prevention in dance training

Reasonable arrangement of exercise load

Reasonable preparation

Fatigue prevention in dance training

Reasonable arrangement of exercise load

Reasonable preparation

and Abdelsalam 2018)}

The survey results are shown in Table 5 below.

There are many factors causing sports fatigue in sports dance training. The elimination of fatigue may cause the deterioration of physical and psychological abilities. Therefore, the elimination of fatigue should improve physical and psychological abilities. In the same time, the amount of preparatory activities need not produce a sense of psychological pressure.
There are more physical organs and organs in sports training, so the requirement for physical quality is very high and comprehensive. Therefore, the preparatory activities before training should be taken seriously, and the best way to do it is to take special preparatory activities. To this end, the contents of the proposed preparatory activities are as follows:

The cross training of knee flexion and extension class is as follows: stand on the same feet, keep the body straight, the upper limbs are horizontal and the neck and shoulders are straight. Tighten buttocks, inner thigh stitches and thigh biceps. Keep your knees together, and focus on the ball of your toes. Bend the knee forward and down as far as possible until the femoral joint touches the heel. At this time, the hips and waist are in the same vertical plane, and the whole body weight is carried on the sole and toe. If the knee is bent to the minimum, the muscles of the front leg centered on the quadriceps will contract rapidly, and the body will squeeze downward. With the help of the ground, the foot will be punctured, and the body will rise slowly until the knee joint and heel rise, and the body will straighten slowly. If the knee is bent downward, when the knee is extended upward, the shoulders should resist the downward reaction force, and the process of flexion and extension should be completed slowly.

**Fatigue prevention after dance training**

**Improved metabolic method**

It refers to improving and accelerating the blood circulation of muscles, promoting the excretion of metabolites, making muscles not stiff and recovering the sense of burnout. The commonly used methods are as follows: finishing activities, warm water bath, hot compress, massage, etc.

The physiological changes caused by exercise will not disappear because of the cessation of limb movement. In order to supplement the lack of oxygen during the exercise, the internal organs must maintain a high level of operation after the high-intensity limb activity stops. At this point, if the body suddenly stops moving, the rest position of the body will prevent strong breathing and affect the intake of oxygen. At the same time, static posture can prevent venous reflux, heart rate drops sharply, blood pressure drops sharply, blood supply to the brain is insufficient, resulting in dizziness, nausea and other unpleasant feelings, and even affect the gravity. Moreover, through finishing activities, the human body can slowly transfer from the nervous state to a quiet state. Completing activities can promote muscle relaxation, eliminate the accumulation of lactic acid, recover from fatigue and

| Dance | Technical characteristics | Parts that are easy to accumulate fatigue |
|-------|---------------------------|------------------------------------------|
| Waltz | Dancing ups and downs, open pace | Knee, heel, waist, neck |
| Tango | The action is simple and powerful, the knees are slightly flexed | Neck, upper limbs, knees |
| Trot  | Knee joint cushioning, rhythmic flexion and extension movement of the ankle joint | Calf, knee, impatient, foot shame |
| Vienna| Stretch the movement, control the left of gravity to rotate | Knee, heel, foot shame |

### Table 3

| Dance | Technical characteristics | Parts that are easy to accumulate fatigue |
|-------|---------------------------|------------------------------------------|
| Waltz | Dancing ups and downs, open pace | Knee, heel, waist, neck |
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| Trot  | Knee joint cushioning, rhythmic flexion and extension movement of the ankle joint | Calf, knee, impatient, foot shame |
| Vienna| Stretch the movement, control the left of gravity to rotate | Knee, heel, foot shame |

### Table 4

| Dance | Technical characteristics | Parts that are easy to accumulate fatigue |
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| Trot  | Knee joint cushioning, rhythmic flexion and extension movement of the ankle joint | Calf, knee, impatient, foot shame |
| Vienna| Stretch the movement, control the left of gravity to rotate | Knee, heel, foot shame |

| Number of male students | Incidence rate% | Number of female students | Incidence rate% |
|-------------------------|-----------------|---------------------------|-----------------|
| Neck                    | 30              | 83.34                     | 37              | 84.08           |
| Upper back of shoulder blade | 33            | 91.65                     | 19              | 43.19           |
| Upper limb              | 28              | 77.76                     | 12              | 27.28           |
| Wrist                   | 16              | 44.45                     | 0               | 0               |
| Chest                   | 25              | 69.45                     | 0               | 0               |
| Waist                   | 6               | 16.66                     | 14              | 31.82           |
| Belly                   | 3               | 8.3                       | 7               | 15.92           |
| Hip                     | 10              | 27.77                     | 25              | 56.82           |
| Lower limbs             | 22              | 61.12                     | 35              | 79.53           |
| Knee                    | 26              | 72.24                     | 28              | 63.65           |
| Ankle                   | 36              | 100                       | 44              | 100             |
| Toes                    | 36              | 100                       | 44              | 100             |
promote the recovery of the body. It is a simple method. Therefore, it is very important to organize after training activities.

The content, order and intensity of sorting activities must be scientific. In principle, the content of the organizing activity can be the same as that of the preparation activity, but the configuration order must be reversed. The amount of work done must not be too much, and action must be more moderate. In order to relax muscles, it must be done in the order of intensity from high to low.

Some stretching exercises can be selected for the arrangement of sports dance, which can eliminate muscle contracture, reduce muscle soreness and stiffness and develop the body’s soft initial quality, which also plays a good role in preventing sports injury. For example: under the soothing music, raise your arms up, extend upward as far as possible, then extend your side waist to the left and right sides, and then bend forward and stretch directly below.

According to the characteristics of heavy load of lower limbs in sports dance, the front, side and rear legs of the stick can be pressed. After that, stand in a positive leg pressing position, and use the palms of both hands to drive the thigh and calf muscles to shake, so as to relieve the muscle stiffness. The upper limbs can help each other through the students, holding the hands of the relaxed four fingers, first left and right, then up and down, shaking the arms alternately. The jigger amplitude should be small, and the frequency should be fast.

In addition, active rest can be regarded as a special organizational activity. As we all know, finishing activities generally emphasize the gradual reduction of fatigue after a lot of exercise, while active rest focuses on eliminating muscle fatigue by changing the activities of other muscle groups.

Therefore, according to the training characteristics of sports dance, we can choose ball games, which will play a certain role in promoting fatigue recovery after training (Abdelmalik and Abdelmohsen 2019).

Massage can promote the transformation of excitation and inhibition in the cerebral cortex. Different techniques have different effects on the nervous system, such as excitement and wheezing. Using the same technique in different ways, the inhibition methods of nervous system function are also different. Generally speaking, the forced action is heavier, and the faster frequency and the shorter stimulation massage technique are better than the slow frequency and long-time massage technique. In this way, in order to restore the comfort and quiet of the central nervous system, accelerate the body recovery, but also contribute to the recovery of normal brain function, and at the same time, adjust the functional activities of internal organs, and eliminate the neuromodulatory disorder caused by fatigue.

Massage can promote blood circulation and lymph circulation, reducing the burden on the heart. Moreover, it may also affect the composition of the blood. After massage, the number of red blood cells, hemoglobin and white blood cells increased to eliminate fatigue (Abotalib et al. 2016). Massage can open the expansion of muscle capillaries, accelerate blood circulation, so as to properly supplement the oxygen and nutrients needed by muscles, promote the absorption and discharge of lactate and other metabolic substances and promote the elimination of fatigue. It can improve muscle activity, prevent and control muscle atrophy. By massaging the joints, the flexibility of the primary belt can be improved, the range of motion of the joints can be expanded and the adverse effects on the joints and tendons caused by too long fixation after bone and joint injuries can be eliminated.

### Conclusion

Based on the traditional two-dimensional SAR imaging, this paper extends to three-dimensional imaging and studies two three-dimensional imaging methods: front side looking tomographic SAR and front side looking curvilinear SAR. The principle of SAR imaging is studied, and the causes of two-dimensional SAR image distortion are analyzed. Firstly, according to the geometric model of SAR imaging, the principle of obtaining radial and lateral high resolution of SAR is studied, which is extended from one-dimensional range profile to two-dimensional SAR imaging. The reason of range migration is analyzed, and the influence of parameters on range migration is explained. The correlation between ΣREE concentration and Ce, Mn, pH is low, which may be related to the composition of surrounding rocks flowing in shallow groundwater, the exchange and adsorption of rare earth elements in deep groundwater and surrounding rocks. Finally, the characteristics and elimination methods of sports dance sports fatigue are unified. This paper provides many ways to eliminate and restore fatigue. Only when students understand the special fatigue performance and causes of sports dance, and according to their different physiological differences, can they choose several appropriate methods to use, can they correctly and
pertinently speed up the elimination of their own fatigue symptoms and can they achieve the purpose of continuous learning and improving sports dance ability.

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Declarations

Conflict of interest The authors declare that they have no competing interests.

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