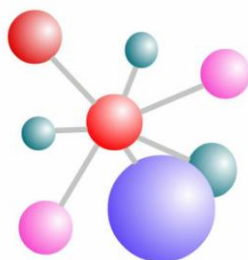


Inglês



Ciências Exatas e da Terra

Instruções

1	Confira se os dados contidos na parte inferior desta capa estão corretos e, em seguida, assine no espaço reservado para isso. Se, em qualquer outro local deste Caderno, você assinar, rubricar, escrever mensagem, etc., será excluído do Exame.
2	Este Caderno contém 5 questões discursivas referentes à Prova da Língua Estrangeira escolhida pelo candidato. Não destaque nenhuma folha.
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4	Será avaliado apenas o que estiver escrito no espaço reservado para cada resposta, razão por que os rascunhos não serão considerados.
5	Escreva de modo legível, pois dúvida gerada por grafia, sinal ou rasura implicará redução de pontos.
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7	A Comperve recomenda o uso de caneta esferográfica, confeccionada em material transparente, de tinta preta. Em nenhuma hipótese se avaliará resposta escrita com grafite.
8	Utilize para rascunhos, o verso de cada página deste Caderno.
9	Você dispõe de, no máximo, três horas, para responder as 5 questões que constituem a Prova.
10	Antes de retirar-se definitivamente da sala, devolva ao Fiscal este Caderno.

Assinatura do Candidato: _____

As questões de 01 a 05, cujas respostas deverão ser redigidas EM PORTUGUÊS, referem-se ao texto abaixo.

Web-Scale Multidimensional Visualization of Big Spatial Data to Support Earth Sciences—A Case Study with Visualizing Climate Simulation Data

Sizhe Wang, Wenwen Li, and Feng Wang

The world is undergoing significant environmental and global climate change due to increasing population growth, urbanization, and industrialization. These changes are exemplified in the Earth's polar regions, as evidenced by melting sea ice and glacier retreat, which significantly affect the living environment of wildlife and biodiversity in these areas. To better understand these climate phenomena and their driving mechanics, there exists an urgent need for new data, techniques, and tools to support scientific studies and the development of effective strategies to mitigate their negative influences.

Climate simulation has been considered a critically important means to address the aforementioned research challenges. Global or regional climate models, such as WRF (Weather Research and Forecasting), are often used by the climate modeling community to unveil the historical climate trajectory and make projections for future changes. Through long-duration computations, these simulation models often generate very large climate data. It is estimated that worldwide climate simulation data will reach hundreds of exabytes by 2020. Besides falling into the category of "big data" due to its size, climate data is multidimensional in nature. In other words, the time-series data not only spread across a geographic area on the Earth's surface (horizontal dimension), but they also occupy different altitudes with varying pressure levels (vertical dimensions).

Scientific visualization is considered an effective vehicle for studying such complex, big volume, and multiple dimension data. By providing visual representations and analytics, visualization has the capability to validate hypothesis, uncover hidden patterns, and identify driving factors of various climate and atmospheric phenomena. Nonetheless, the scientific visualization community still faces challenges in efficient handling of big data, the complex projection between the viewport system and the raw geospatial dataset, and finding innovative ways to present the voluminous data in order to reveal hidden knowledge. With the widespread adoption of Web technology, there is also an urgent demand for a Web-based visualization platform to allow web-scale access, visualization, and analysis of spatial dataset.

This paper introduces our PolarGlobe solution, a Web-based virtual globe platform that supports multi-faceted visualization and analysis of multi-dimensional scientific data. Built upon the popular Cesium 3D globe system, the PolarGlobe tool has the advantage of being seamlessly integrative with Web browsers, eliminating the need to install or configure any plug-ins before data viewing. In addition, an emerging graphics language (WebGL) is utilized to operate the GPU (Graphics Processing Unit) and develop functions for data rendering.

Technically, the major contributions of this work include: (1) a server-client architecture powered up by a new octree model to support efficient spatial indexing, transmission, and rendering of big climate data; (2) a combined value and spatial filter to enable perception-based visualization and interactive data exploration; and (3) vertical profile visualization to allow examination of variations in climate variables on a cross-section inside the data cube. Although primarily tested on climate simulation data, visualization techniques can be widely applied to other Earth science domains, such as oceanography, hydrology, and geology. We believe this platform will provide strong support to scientists for testing models and validating hypotheses, as well as for the general public to understand different components of the Earth system and its interactions.

In the future, we will enhance the PolarGlobe system in the following directions: first, methods will be developed to effectively present multivariate geoscientific data for an integrated analysis; second, strategies for visualizing vector data on the globe will also be exploited; and third, we will extend the current visualization capability with advanced data mining or spatial analysis capability, to equip PolarGlobe as not only a system for visualization but also for knowledge discovery.

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Questão 1

Pesquisas teóricas ou empíricas buscam preencher lacunas deixadas por pesquisas anteriores, respondendo aos desafios enfrentados pela comunidade científica. Discorra sobre os desafios da comunidade científica que levaram os autores a desenvolver este estudo.

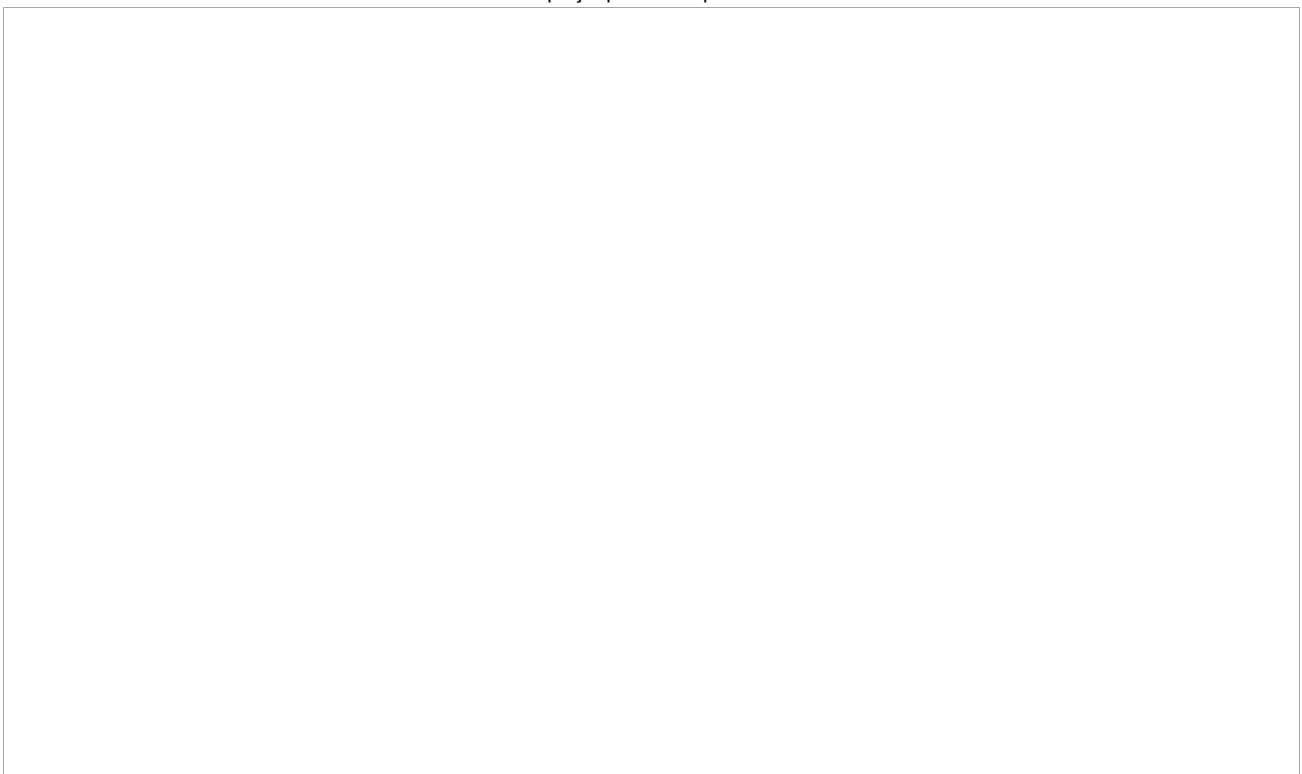
Espaço para Resposta



Questão 2

Discorra sobre modelos de simulação climática, explicando, segundo os autores, a sua função e amplitude.

Espaço para Resposta



Questão 3

Apresente a solução aos desafios encontrada pelos autores e, dessa forma, as contribuições do seu trabalho.

Espaço para Resposta

**Questão 4**

Para os autores, mesmo diante da solução apresentada aos desafios científicos, aperfeiçoamentos precisam ser feitos no futuro. Apresente-os.

Espaço para Resposta

