

MILLENNIUM Project on GÉANT2

Simulation of the Climate of the last Millennium

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MILLENNIUM reconstructs historical climates

- The Millennium project, coordinated by The Max Planck Institute for Meteorology, has applied a state-of-the-art Earth System model, including an interactive Carbon Cycle, to simulate the climate from the last millennium and into the future (800–2200 AD)
- To better understand climate variability, the model makes use of new reconstructions taking into account natural external factors (orbital, solar, volcanic), man-made land-use factors and greenhouse gas effects
- The MILLENNIUM data library can be accessed, via the World Data Centre for Climate, by researchers worldwide, making it a truly international project



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Climate simulation techniques

- Historical data, such as tree rings, corals, written descriptions or pictures, are used as input for the climate reconstructions
- The Earth System Model contains sub-models for atmosphere, ocean, land surface, ocean-biogeochemistry, and chemical air quality
- A highly sophisticated video-rendering machine converts the resulting data into visual information for scientists to analyse
- The model is executable only on high-performance computers, employing many processors (CPUs) in parallel



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GÉANT2 and MILLENNIUM

- GÉANT2 is crucial to the project's success by providing multi-gigabit links to collaborating research centres
- The immense computing power of GÉANT2 and PRACE will enable the success of the project
- The project outputs immense amounts of data, 10s of terabytes, so advanced, high speed networks, such as GÉANT2, are required to transmit this information
- Employing complex and diverse collaboration techniques, MILLENNIUM enables scientists to reconstruct the climate of the last millennium, and identify the factors that result in environmental changes



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MILLENNIUM data access and its use

- The World Data Centre for Climate stores the data from the MILLENNIUM experiment
- Data retrieval is made easy by employing modern metadata annotation and user interface techniques
- Scientific results can easily be produced using modern rendering technology over the network
- Scientific collaboration within Europe and worldwide is essential to the MILLENNIUM project, and is only possible with fast, geographically diverse networks



Max-Planck-Institut für Meteorologie
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www.mpimet.mpg.de/en/wissenschaft/working-groups/millennium.html

GÉANT2
www.geant2.net