

# EU's *Millennium* project and *ClimatePrediction.net*

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[climateprediction.net](http://climateprediction.net)

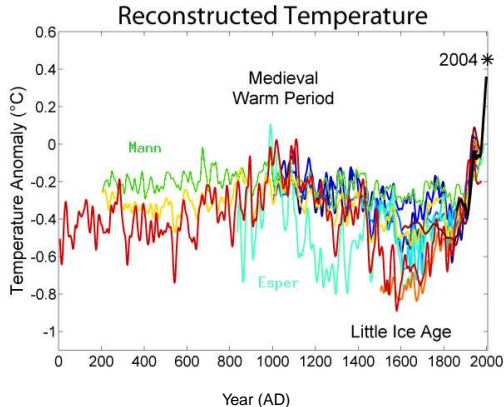
27 July, 2006

# Outline

- 1 What is the Millennium Project?
  - Question
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  - Numerical model
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## Question

Does the natural variability of climate exceed the warming of the 20th century?



[http://en.wikipedia.org/wiki/Image:2000\\_Year\\_Temperature\\_Comparison.png](http://en.wikipedia.org/wiki/Image:2000_Year_Temperature_Comparison.png) (Annotated by HY)

## Strategy

The Millennium Project attempts to reconstruct the European climate of the last 1000 years to quantify the natural variability.

EU's Millennium project is

- 4 year project (started January 2006)
- ~200 scientists involved



<http://geography.swansea.ac.uk/millennium/>

## Strategy

The Millennium Project attempts to reconstruct the European climate of the last 1000 years to quantify the natural variability.

Millennium will

- Obtain new climate proxy data from
  - Documentary records
  - Tree rings (width, density, isotopic ratio)
  - Sediments
  - Marine (shells).
- Reconstruct European climate with new and old data.
- Simulate global climate evolution with GCMs.

# Numerical model

Our main model is

## HadCM3L

- Full featured coupled GCM (IPCC 3)
- Developed by Hadley Centre, UK Met Office  
<http://www.metoffice.gov.uk/research/hadleycentre/>
- Used by [ClimatePrediction.net](#) BBC experiment

# HadCM3L

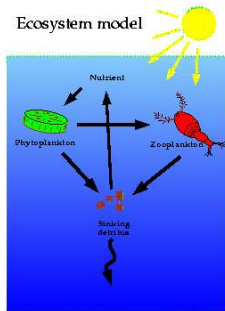
## Atmosphere Model

- 3D GCM
- Resolution:  $3.75^\circ \times 2.5^\circ$
- 19 vertical levels (troposphere and lower stratosphere)
- With interactive sulphur cycle (inc. aerosols)

# HadCM3L

## Ocean

- 3D GCM (Jones et al., 2005)
- Resolution:  $3.75^\circ \times 2.5^\circ$ ; 20 levels.  
(Also working on accelerating standard  $1.25^\circ$  model.)



- With carbon cycle model (HadOCC).

[http://www.metoffice.gov.uk/research/hadleycentre/models/carbon\\_cycle/models\\_coupled.htm](http://www.metoffice.gov.uk/research/hadleycentre/models/carbon_cycle/models_coupled.htm)



# Job Class

We'll run global climate GCMs of 2 types:

- A handful of **full-resolution** integrations.
  - We can only afford a few long runs.
- Large ensemble of modest resolution simulations!
  - **Volcanic** activity
  - **Solar** activity
  - **Land-use** change
  - Several models with different physics.  
(including carbon cycle and dynamic vegetation).

# Computational Resources

- **Full resolution runs:**

We use a new **in-house cluster** for the full-resolution runs.



- 5 computational nodes and 1 storage node
- Each computational node has 8 CPU cores
- Nodes are connected with InfiniPath

- **Modest resolution runs:**

We use the distributed computing platform of the **climateprediction.net** project.

## Summary

- EU's Millennium project will run HadCM3L to study the climate change of the last 1200 years.
- A in-house cluster will run several high-resolution simulations.
- CPDN will distribute modest resolution runs over the Internet to improve our understanding of the climate system.