

Global Change in Climatic Type due to CO₂ Increase

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Background:

Since the end of the 20th century, climate change and its impacts due to the anthropogenic global warming have been issued under great concern in various fields. The overall topics related to the issue were the climatic changes themselves of major climate variables, such as surface air temperature and precipitation, and their impacts in socio-economic aspect. Among the topics, we pay attention to vegetation distribution resulted from the changes of temperature and precipitation.

Objectives:

One of the conclusive remarks obtained through model intercomparison projects such as AMIP and CMIP is that multi-model ensemble result is closer to observation and is more reliable than a single model simulation chosen as the best (WGNE AMIP Panel 2001). On the other hand, there is a meaningful evaluation acknowledged among especially CMIP participating groups. It is that projection of future climate change by climate models (e.g. difference between 1XCO₂ and 2XCO₂ climates) is more significant than prediction of future climate itself by the models (IPCC 2001). Based on these two points as well-known consensus, we pursue to find out how Koeppen climate classification based upon vegetation distribution is going to change in CO₂ doubling period, and to have a profound discussion on the result and its implication.

Methodology:

1. Get the global map of Koeppen climatic types from CMIP I and II multi-model ensembles

2. Embed the difference between CMIP I and II ensembles in the observed present climate, and thus obtain a new future Koeppen climatic type map on CO₂ doubling period:
 - Find the difference ensemble (DIFF) of temperature and precipitation between CMIP I and II
 - Use CRU 2.0 dataset for the observed present climate (OBS) from 1971 to 2000
 - Add the DIFF to the OBS and get a future Koeppen climatic type map (OBS CO₂) in CO₂ doubling period.

References:

IPCC, 2001: Climate change 2001: Scientific basis. A Report of the Working Group I of the Inter-governmental Panel on Climate Change. Cambridge Press, 881pp.

WGNE AMIP Panel, 2001: AMIP newsletter No.10. [Available online at <http://www-pcmdi.llnl.gov/amip/NEWS/amipnl10.pdf>.]