



HAL
open science

Intercomparison of Simulated Global Vegetation Distributions in Response to 6 kyr BP Orbital Forcing

S. Harrison, D. Jolly, F. Laarif, A. Abe-Ouchi, B. Dong, K. Herterich, C. Hewitt, S. Joussaume, J. Kutzbach, J. Mitchell, et al.

► **To cite this version:**

S. Harrison, D. Jolly, F. Laarif, A. Abe-Ouchi, B. Dong, et al.. Intercomparison of Simulated Global Vegetation Distributions in Response to 6 kyr BP Orbital Forcing. *Journal of Climate*, 1998, 11 (11), pp.2721-2742. 10.1175/1520-0442(1998)0112.0.CO;2 . hal-03119630

HAL Id: hal-03119630

<https://hal.science/hal-03119630>

Submitted on 25 Jan 2021

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.



FIG. 1. (Continued)

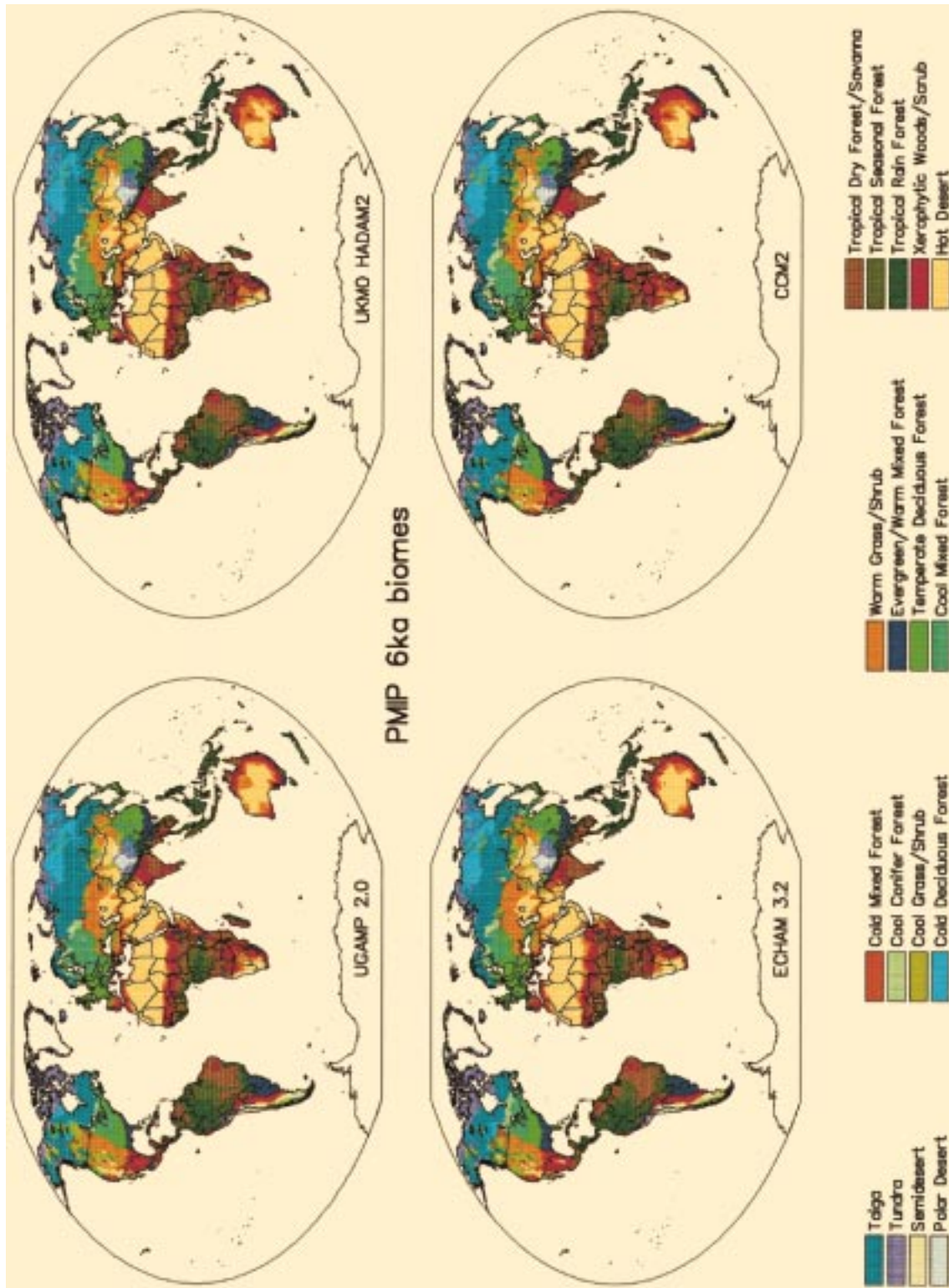


FIG. 2. (Continued)

- ulated climate and biomes of Africa during the late Quaternary: Comparison with pollen and lake status data. *Quat. Sci. Rev.*, **17**, 629–657.
- , and Coauthors, 1998b: Biome reconstruction from pollen and plant macrofossil data for Africa and the Arabian peninsula at 0 and 6 ka. *J. Biogeogr.*, in press.
- Joussaume, S., and K. E. Taylor, 1995: Status of the Paleoclimate Modeling Intercomparison Project (PMIP). *Proc. First Int. AMIP Science Conf.*, Monterey, CA, WCRP, 425–430.
- , J. Jouzel, and R. Sadourny, 1989: Simulations of the last glacial maximum with an atmospheric general circulation model including paleoclimatic tracer cycles. *Understanding Climatic Change, Geophys. Monogr.*, No. 52, Amer. Geophys. Union, 159–162.
- Kattenberg, A., and Coauthors, 1996: Climate models—Projections of future climate. *Climate Change 1995: The Science of Climate Change*, J. T. Houghton, L. G. Meira Filho, B. A. Callander, N. Harris, A. Kattenberg, and K. Maskell, Eds., Cambridge University Press, 285–357.
- Kiehl, J. T., 1994: Sensitivity of a GCM climate simulation to differences in continental versus maritime cloud drop size. *J. Geophys. Res.*, **99**, 23 107–23 115.
- , B. Boville, B. Briegleb, J. Hack, P. Rasch, and D. Williamson, 1996: Description of the NCAR Community Climate Model (CCM3). NCAR Tech. Note NCAR/TN-420-STR, NCAR, Boulder, CO. [Available from National Center for Atmospheric Research, P. O. Box 3000, Boulder, CO 80307.]
- Kutzbach, J. E., and B. L. Otto-Bleisner, 1982: The sensitivity of the African-Asian monsoonal climate to orbital parameter changes for 9000 years B. P. in a low-resolution general circulation model. *J. Atmos. Sci.*, **39**, 1177–1188.
- , and P. J. Guetter, 1986: The influence of changing orbital parameters and surface boundary conditions on climate simulations for the past 18 000 years. *J. Atmos. Sci.*, **43**, 1726–1759.
- , and R. G. Gallimore, 1988: Sensitivity of a coupled atmosphere/mixed layer ocean model to changes in orbital forcing at 9000 years BP. *J. Geophys. Res.*, **93**, 803–821.
- , P. J. Guetter, P. Behling, and R. Selin, 1993: Simulated climatic changes: Results of the COHMAP climate-model experiments. *Global Climates since the Last Glacial Maximum*, H. E. Wright Jr., J. E. Kutzbach, T. Webb III, W. F. Ruddiman, F. A. Street-Perrott, and P. J. Bartlein, Eds., University of Minnesota Press, 24–93.
- , G. B. Bonan, J. A. Foley, and S. P. Harrison, 1996: Feedbacks between climate and grasslands/soils in northern Africa during the middle Holocene. *Nature*, **384**, 623–626.
- , R. Gallimore, S. P. Harrison, P. Behling, R. Selin, and F. Laarif, 1998: Climate simulations for the past 21,000 years. *Quat. Sci. Rev.*, **17**, 473–506.
- Lautenschlager, M., and K. Herterich, 1990: Atmospheric response to ice-age conditions: Climatology near the earth's surface. *J. Geophys. Res.*, **95** (D13), 22 547–22 557.
- Leemans, R., and W. Cramer, 1991: The IIASA climate database for mean monthly values of temperature, precipitation and cloudiness on a terrestrial grid. Research Rep. RR-91-18, IIASA, Laxenburg, Austria, 62 pp. [Available from International Institute for Applied Systems Analysis, Schlossplatz 1, Laxenburg A-2361, Austria.]
- Liao, X., F. A. Street-Perrott, and J. F. B. Mitchell, 1994: GCM experiments with different cloud parameterization: Comparisons with palaeoclimatic reconstructions for 6000 years B. P. *Palaeoclim.: Data Modell.*, **1**, 99–123.
- Lohzkin, A. V., 1993: Geochronology of late Quaternary events in northeastern Russia. *Radiocarbon*, **35**, 429–433.
- Maat, P. B., and W. C. Johnson, 1996: Thermoluminescence and new ¹⁴C age estimates for late Quaternary loesses in southwestern Nebraska. *Geomorphology*, **17**, 115–128.
- Manabe, S., and D. G. Hahn, 1977: Simulation of the tropical climate of an ice age. *J. Geophys. Res.*, **82**, 3889–3911.
- , and A. J. Broccoli, 1985: The influence of continental ice sheets on the climate of an ice age. *J. Geophys. Res.*, **90**, 2167–2190.
- , J. Smagorinsky, and R. F. Strickler, 1965: Simulated climatology of a general circulation model with a hydrologic cycle. *Mon. Wea. Rev.*, **93**, 769–798.
- Markgraf, V., 1993: Climatic history of Central and South America since 18,000 yr B.P.: Comparison of pollen records and model simulations. *Global Climates since the Last Glacial Maximum*, H. E. Wright Jr., J. E. Kutzbach, T. Webb III, W. F. Ruddiman, F. A. Street-Perrott, and P. J. Bartlein, Eds., University of Minnesota Press, 357–385.
- , J. R. Dodson, A. P. Kershaw, M. S. McGlone, and N. Nicholls, 1992: Evolution of late Pleistocene and Holocene climates in the circum-South Pacific land areas. *Climate Dyn.*, **6**, 193–211.
- Matthews, E., 1983: Global vegetation and land use: New high-resolution data bases for climate studies. *J. Climate Appl. Meteor.*, **22**, 474–487.
- Mitchell, J. F. B., N. S. Grahame, and K. J. Needham, 1988: Climate simulations for 9000 years before present: Seasonal variations and effect of the Laurentide ice sheet. *J. Geophys. Res.*, **93**, 8283–8303.
- Monserud, R. A., 1990: Methods for comparing global vegetation maps. Working Paper WP-90-40, IIASA, Laxenburg, Austria, 22 pp. [Available from International Institute for Applied Systems Analysis, Schlossplatz 1, Laxenburg A-2361, Austria.]
- , and R. Leemans, 1992: Comparing global vegetation maps with the Kappa statistic. *Ecol. Modell.*, **62**, 275–293.
- Muhs, D. R., 1985: Age and paleoclimatic significance of Holocene sand dunes in northeastern Colorado. *Ann. Assoc. Amer. Geogr.*, **74**, 566–582.
- , and P. B. Maat, 1993: The potential response of Great Plains eolian sands to greenhouse warming and precipitation reduction. *J. Arid Environ.*, **25**, 351–361.
- Overpeck, J. T., R. S. Webb, and T. Webb III, 1992: Mapping eastern North American vegetation change of the past 18 ka: No-analogs and the future. *Geology*, **20**, 1071–1074.
- Peltier, W. R., 1994: Ice age paleotopography. *Science*, **265**, 195–201.
- Pollard, D., and S. L. Thompson, 1995: Use of a land-surface-transfer scheme (LSX) in a global climate model: The response to doubling stomatal resistance. *Global Planet. Change*, **10**, 129–161.
- Prentice, I. C., and T. Webb III, 1998: BIOME 6000: Reconstructing global mid-Holocene vegetation patterns from paleoecological records. *J. Biogeogr.*, in press.
- , W. Cramer, S. P. Harrison, R. Leemans, R. A. Monserud, and A. M. Solomon, 1992: A global biome model based on plant physiology and dominance, soil properties and climate. *J. Biogeogr.*, **19**, 117–134.
- , M. T. Sykes, M. Lautenschlager, S. P. Harrison, O. Denissenko, and P. J. Bartlein, 1994: Modelling the increase in terrestrial carbon storage after the last glacial maximum. *Global Ecol. Biogeogr. Lett.*, **3**, 67–76.
- , J. Guiot, B. Huntley, D. Jolly, and R. Cheddadi, 1996: Reconstructing biomes from palaeoecological data: A general method and its application to European pollen data at 0 and 6 ka. *Climate Dyn.*, **12**, 185–194.
- Preuss, J. H., and J.-F. Geleyn, 1980: Surface albedos derived from satellite data and their impact on forecast models. *Arch. Meteor. Geophys. Bioklimatol.*, **29A**, 345–356.
- Richard, P. J. H., 1995: Le couvert végétal du Québec-Labrador il y a 6000 ans BP: Essai. *Geogr. Phys. Quat.*, **49**, 117–140.
- Rind, D., 1987: Components of the ice age circulation. *J. Geophys. Res.*, **92**, 4241–4281.
- Ritchie, J. C., 1987: *The Postglacial Vegetation of Canada*. Cambridge University Press, 187 pp.
- , and S. P. Harrison, 1993: Western Canada—Pollen and lake level data for climatic history. *Global Climates since the Last Glacial Maximum*, H. E. Wright Jr., J. E. Kutzbach, T. Webb III, W. F. Ruddiman, F. A. Street-Perrott, and P. J. Bartlein, Eds., University of Minnesota Press, 401–414.

