SOUTHBOUND

Late Pleistocene Peopling of Latin America

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Late Pleistocene Peopling of Latin America

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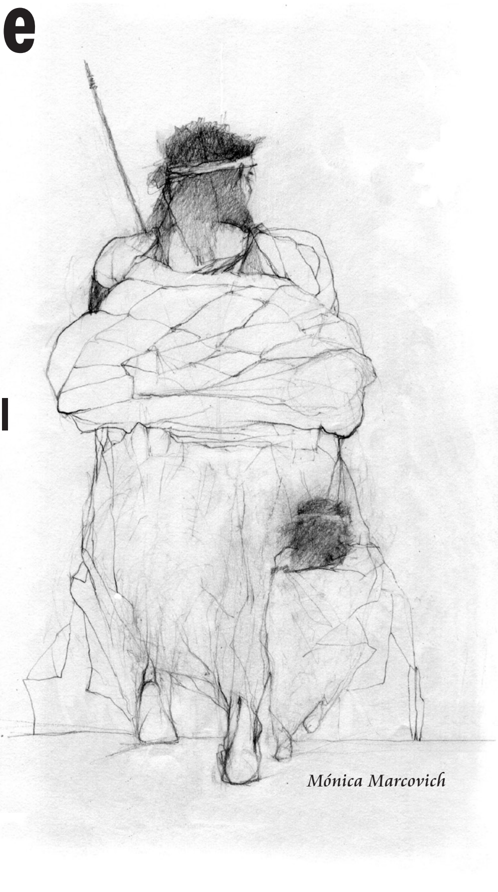
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SOUTHBOUND: LATE PLEISTOCENE PEOPLING OF LATIN AMERICA

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Part 1
Peopling Models and Bioanthropology

GIS Model of Topographic Accessibility to South America

Lucía Magnin[1], *Diego Gobbo*[2], *Juan Carlos Gómez*[3], *and Antonio Ceraso*[4]

➤**Keywords:** South America, topographic accessibility, first Americans

In this paper we analyze the surface of South American territory to create accessibility models (Llobera 2000) related to two different theoretical models of the entrance routes to the South American continent, as described in detail in Miotti and Magnin ("South America 18,000 Years Ago: Topographic Accessibility and Human Spread," this volume). The accessibility models are drawn at a continental scale and seek to incorporate data useful as proxies of the environment at the Last Glacial Maximum (LGM) (ca. 20,000–18,000 RCYBP) (Miotti 2006).

The methodology employed here is oriented toward delimiting natural corridors of low resistance to pedestrian movement for the South American continent using GIS. It differs from the calculation of least-cost paths because it does not show the shortest path to link one origin and one destination point. Instead, the corridor is a surface which, owing to its ease of accessibility, is potentially usable as a pathway (Cerrillo 2008; Llobera 2000, 2006). The objective is to use present topography to model ancient coastlines (Isla and Bujalesky 2008), to take into account the extension of glacial masses (Clapperton 1983; Hollin and Schilling 1981; Rabassa 2008; Stanford et al. 2005) as barriers to passage, and to use topography as a surface to calculate access costs (Llobera 2000).

The specific objective of this work is to generate two predictive maps, one considering rivers as partially permeable barriers, and the second considering rivers and marine coasts as movement stimulators.

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Data and Methods

The general methodology used here is the Optimal Displacement Model delineated by Fábrega (2006). However, we depart from that author´s perspective because in our model the origin points are not archaeological sites, but random points within a grid of polygons that cover the study area.

This analysis does not seek to establish optimal access between sites (for an example of this approach see Anderson and Gillam 2000), but to characterize the terrain according to its natural accessibility irrespective of the point of origin for the movement, thus generating a model for natural mobility. This methodology based on a grid of random points was previously applied at a different scale to another study problem by Cerrillo (2008).

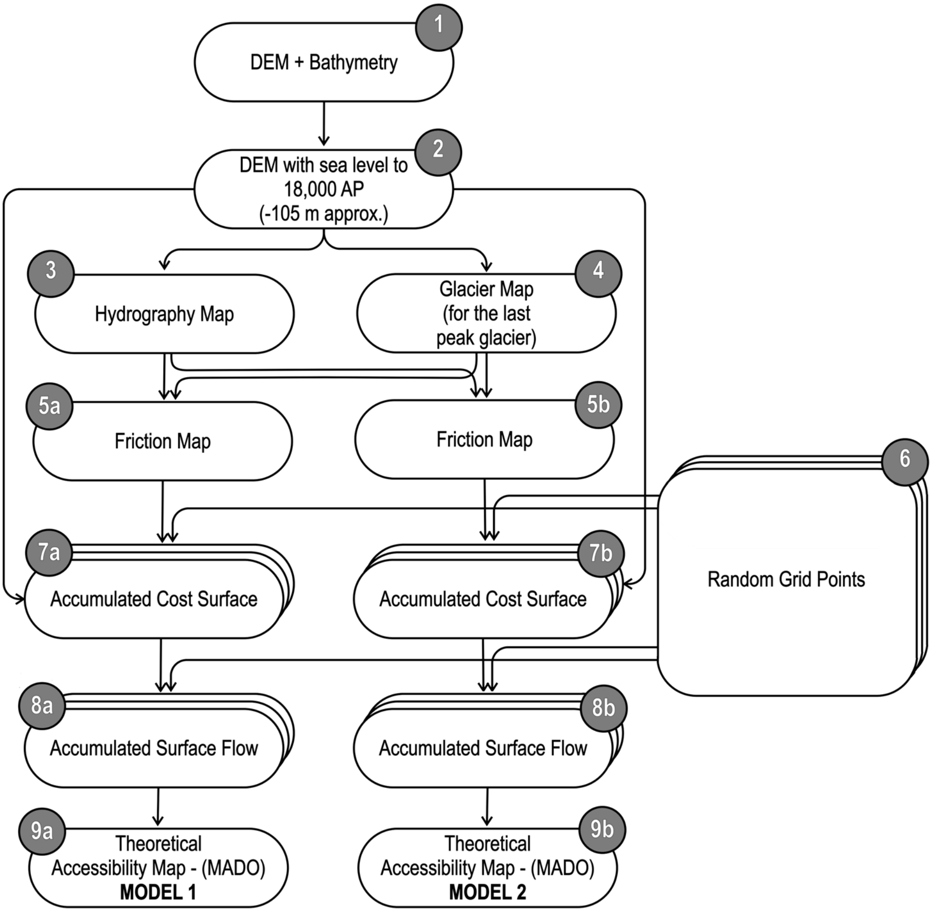

Figure 1. The input data, reprocesses applied, and models obtained in the GIS analysis.

In this contribution we use SIG (ArcMap-9.2 and Grass-6.4) to model the main accessibility characteristics that the South American territory could have presented during the LGM. The different processes applied can be viewed in the diagram in Figure 1. Owing to the flexibility of GIS (Geographic Information Systems) in managing, testing, and revising models, the data used here can be revised in the future. The analysis followed through nine steps, as described below.

1. As basic data we used a digital elevation model GEBCO_08 Grid. This is a three-dimensional model of ocean bathymetry and emerged topography with a spatial resolution of 30 arc-seconds (each pixel measures 945.44 m on each side). These data and all products were projected to WGS 1984 UTM Zone 20S.
2. These basic data were used to model the extent of land area in the LGM. Sea level was set at 105 m below present level (Isla and Bujalesky 2008). The resulting grid file has 6109 columns and 8993 rows. This modeling procedure is a simple device that models shorelines broadly; however, it is a simplification of a reconstruction process (Waters 1992, Dincauze 2000).
3. The hydrographic network was modeled by the module ESRI ArcHydro-1.3 via the command for calculating accumulated flow. The resulting hydrographic network is a raster file composed by continuous-flow accumulation values. The lower values do not represent a significant barrier to the passage, and conversely, higher values constitute a potential barrier to be crossed by purely pedestrian means.
4. The extent of glaciers as barriers was incorporated into the model from the scanning, georeferencing, and orthorectification of maps published in Rabassa (2008:163) and Stanford et al. (2005:338).
5. From the digital elevation model (2), hydrography map (3) and glacier map (4), two friction surfaces were generated. In Figure 1, the friction map "5a" expresses extremely low accessibility values for glaciers (considered barriers to passage); accessibility values for rivers become lower as their cumulative flow values increase from the headwaters to the mouths. The friction map "5b" also considers glaciers as barriers to access, but it assigns high accessibility values to the network of rivers and a coastline of 50 km around the perimeter of the continent, which are considered attractors to movement.
6. A regular grid of polygons of 300 by 300 km was generated to cover the entire study area, and one point was randomly chosen within each polygon (N = 244).
7. Each of these points in turn was set as the origin to generate a cumulative cost surface using the GRASS module "r.walk" (http://grass.fbk.eu/grass70/manuals/html70_user/r.walk.html). This algorithm is superior to others because it includes Naismith rules for calculating cost estimates of specific slope intervals, it makes anisotropic estimates, and it resolves the tendency to generate polygonal artifacts in the resulting surfaces using the "chess knight's move" (Whitley and Burns 2007). In Figure 1, the cumulative cost surface maps resulting from the use of friction map 5a were named "7a," and the maps resulting from the use of friction map 5b were named "7b".
8. Using each accumulated-cost surface map, flow-accumulation surface maps were generated using the GRASS module "r.watershed," setting the remaining points of the grid as the origin, and establishing the destination point by the accumulated-cost surface map used every time. This was achieved using a python script, which automates the process of calcu-

lating the cost maps (r.walk) and flow-accumulation map (r.watershed).

9. The final step is summing the accumulated flow surface maps derived from the friction maps (“5a” and “5b” in Figure 1).

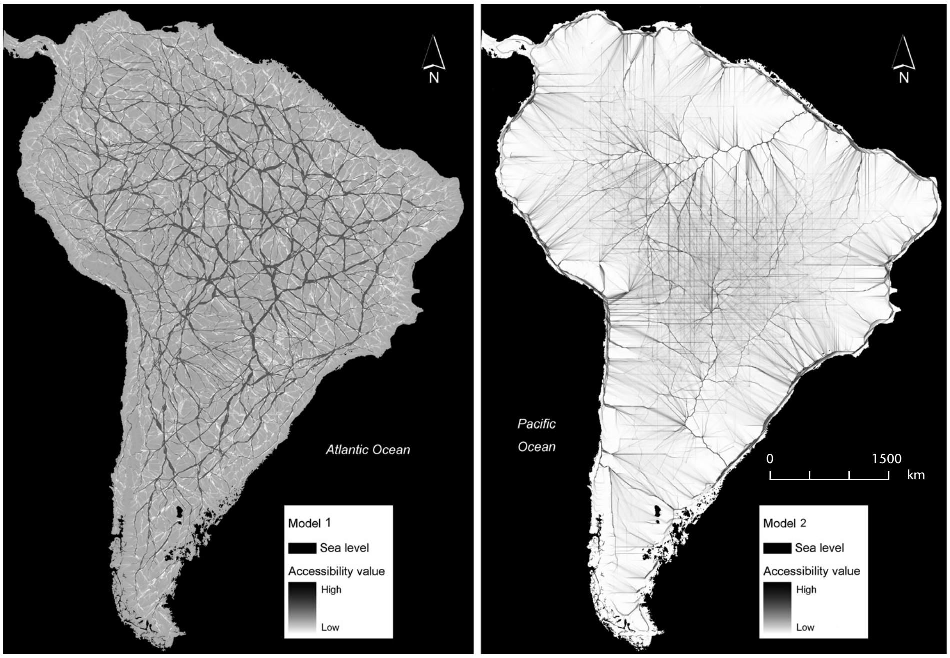

Figure 2. Dual accessibility models produced by the GIS analysis presented in text and Figure 1.

Results and Conclusions

Models of general accessibility of America were generated (Figure 2). These do not assume points of origin or destination for pedestrian population flow into the continent. They are continuous data surfaces with cells containing values that express areas of higher accessibility considering the total origin points analyzed.

This methodology proved to be a useful tool for creating a formal, reproducible description of two theoretical models of population movements of the first Americans, which is explored in more detail in Miotti and Magnin (this volume).

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References Cited

Anderson, D., and J. C. Gillam 2000 Paleoindian Colonization of the Americas: Implications from an Examination of Physiography, Demography, and Artifact Distribution. *American Antiquity* 65(1):43–66.

Cerrillo Cuenca, E. 2011 Recorriendo un territorio desaparecido: restitución fotogramétrica y análisis del paisaje de la necrópolis prehistórica del vado de Alconétar, In *Tecnologías de Información Geográfica y Análisis Arqueológico del Territorio.* Actas del V Simposio Internacional de Arqueología de Mérida. SIG y análisis arqueológico del territorio, edited by V. Mayoral Herrera and S. Celestino Pérez, pp. 145–59, ANEJOS de AESPA LIX, Madrid.

Clapperton, C. M. 1983 The Glaciation of the Andes. *Quaternary Science Reviews* 2:83–155.

Dincauze, D. F. 2000 *Environmental Archaeology: Principles and Practice*, Cambridge University Press, Cambridge.

Fábrega Alvarez, P. 2006 Moving without Destination. A Theoretical Gis-Based Determination of Movement from a Given Origin. *Archaeological Computing Newsletter* 64:7–11.

GEBCO_08 Grid, version 20091120, http://www.gebco.net

Hollin, J. T., and D. H. Schilling 1981 Mountain Glaciers and Small Ice Caps. In *The Last Great Ice Sheets*, edited by G. H. Denton and T. J. Hughes, pp. 179–206. Wiley, New York.

Isla, F., and G. Bujalesky 2008 Coastal Geology and Morphology of Patagonia and the Fuegian Archipelago. In *The Late Cenozoic of Patagonia and Tierra del Fuego*, edited by J. Rabassa, pp. 227–40. Elsevier, Amsterdam.

Llobera, M. 2000 Understanding Movement: A Pilot Model towards the Sociology of Movement. In *Beyond the Map: Archaeology and Spatial Technologies*, edited by G. Lock, pp. 65–83. IOS Press, Amsterdam.

——— 2006 Arqueología del paisaje en el siglo XXI: reflexiones sobre el uso de los SIG y modelos matemáticos. In *Territorios antiguos y nuevas tecnologías. La aplicación de los SIG en la arqueología del paisaje. Jornadas de arqueología,* edited by I. Grau Mira, pp. 109-124. Universidad de Alicante Press, Alicante.

Miotti, L. 2006 La fachada atlántica, como puerta de ingreso alternativa de la colonización humana de América del Sur durante la transición Pleistoceno/Holoceno. In *2do. Simposio Internacional El Hombre temprano en América*, edited by José C. Jiménez López, Oscar Polaco, Gloria Martínez and Rocío Hernández, pp.155–89. CONACULTA- INAH, Museo del Desierto de Coahuila, México.

Miotti, L. L., and L. A. Magnin 2010 América del Sur desde hace 18.000 años: accesibilidad topográfica y dispersión humana, In *V Simposio Internacional: El Hombre Temprano en América: a cien años del debate Ameghino-Hrdlicka (1910-2010)*, *Book of* Abstracts, pp. 130–31. Cooperativa Gráfica El Río Suena.

Rabassa, J. 2008 Late Cenozoic Glaciations in Patagonia and Tierra del Fuego. In *The Late Cenozoic of Patagonia and Tierra del Fuego*, edited by J. Rabassa, pp. 151–204. Elsevier, Amsterdam.

Stanford, D., R. Bonnichsen, B. Meggers, and G. Steele 2005 Paleoamerican Origins: Models, Evidence, and Future Directions. In *Paleoindian Origins: Beyond Clovis,* edited by R. Bonnichsen, B. T. Lepper, D. Stanford, and M. R. Waters, pp. 313–53, Center for the Study of the First American, Texas A&M University Press, College Station.

Waters, M. R. 1992 *Principles of Geoarchaeology.* The University of Arizona Presss, Tucson.

Whitley, T. G., and G. Burns 2007 Conditional GIS Surfaces and their Potential for Archaeological Predictive Modelling. In *Layers of Perception. Proceedings of the 35th International Conference on Computer Applications and Quantitative Methods in Archaeology (CAA),* edited by A. Posluschny, K. Lambers, and I. Herzog, pp. 292–98. Berlin.