Territorial subdivisions and geographic borders are essential for understanding phenomena in sociology, political science, history, and economics. They influence the interregional flow of information and cross-border trade and affect the diffusion of innovation and technology. However, it is unclear if existing administrative subdivisions that typically evolved decades ago still reflect the most plausible organizational structure of today. The complexity of modern human communication, the ease of long-distance movement, and increased interaction across political borders complicate the operational definition and assessment of geographic borders that optimally reflect the multi-scale nature of today’s human connectivity patterns. What border structures emerge directly from the interplay of scales in human interactions is an open question. Based on a massive proxy dataset, we analyze a multi-scale human mobility network and compute effective geographic borders inherent to human mobility patterns in the United States. We propose two computational techniques for extracting these borders and for quantifying their strength. We find that effective borders only partially overlap with existing administrative borders, and show that some of the strongest mobility borders exist in unexpected regions. We show that the observed structures cannot be generated by gravity models for human traffic. Finally, we introduce the concept of link significance that clarifies the observed structure of effective borders. Our approach represents a
novel type of quantitative, comparative analysis framework for spatially embedded multi-scale interaction networks in general and may yield important insight into a multitude of spatiotemporal phenomena generated by human activity.

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